CAS SciFinder

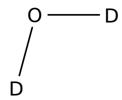
Task History

Initiating Search

February 22, 2025, 12:57 PM

Substances:

Filtered By:



Structure Match: **As Drawn**

Search Tasks

Task	Search Type	View
Returned Substance Results + Filters (1,728)	Substances	View Results
Exported: Retrieved Related Reaction Results + Filters (1,493)	Reactions	View Results

Filtered By:

Substance Role: **Reagent, Solvent**

Catalyst: [(1,2,3,4,5,6-η)-1-Methyl-4-(1-methylethyl)benzene](2,4,6-trimethylbenzoato-κ*O*)(2,4,6-trimethylbenzoato-κ*O*,κ*O'*)ruthenium, [(1,2,3,4,5,6-η)-1-Methyl-4-(1-methylethyl)benzene](tricyclo[3.3.1.1^{3,7}]decane-1-carboxylato-κ*O*)(tricyclo[3.3.1.1^{3,7}]decane-1-carboxylato-κ*O*,κ*O'*)ruthenium, [μ-[(2*R*,2'*S*)-1,1'-Bis[(4*S*)-4-(1,1-dimethylethyl)-4,5-dihydro-2-oxazolyl-κN^3]-2,2'-bis(diphenylphosphino-κ*P*)ruthenocene]]tetrachlorobis(triphenylphosphine)diruthenium, (Acetato-κ*O*)(acetato-κ*O*,κ*O'*)[(1,2,3,4,5,6-η)-1-methyl-4-(1-methylethyl)benzene]ruthenium, (Acetonitrile)[2-[bis(1-methylethyl)phosphino-κ*P*]-4-(1,1-dimethylethyl)-1-methyl-1*H*-imidazole-κN^3](η^5-2,4-cyclopentadien-1-yl)ruthenium(1+), Bis(2,2'-bipyridine)ruthenium(2+), Bis(η^6-benzene)di-μ-chlorodichlorodiruthenium, Bis(acetato-κ*O*)[(1,2,3,4,5,6-η)-1-methyl-4-(1-methylethyl)benzene]ruthenium, Bis(acetato-κ*O*)bis(triphenylphosphine)ruthenium, Bis(dichloro(η^6-*p*-cymene)ruthenium), Carbonylchloro[2-(diphenylphosphino-κ*P*)-*N*-[2-(diphenylphosphino-κ*P*)ethyl]ethanamine-κ*N*]hydroruthenium, Carbonylchlorohydrotris(triphenylphosphine)ruthenium, Carbonylchlorotris(triphenylphosphine)ruthenium(1+), Chloro[(1,2,5,6-η)-1,5-cyclooctadiene][(1,2,3,4,5-η)-1,2,3,4,5-pentamethyl-2,4-cyclopentadien-1-yl]ruthenium, Chloro(η^5-cyclopentadienyl)bis(triphenylphosphine)ruthenium, Chloro(η^5-indenyl)bis(triphenylphosphine)ruthenium, μ-Chlorodichloro-μ-hydrobis[(1,2,3,4,5,6-η)-1-methyl-4-(1-methylethyl)benzene]diruthenium, Chloro[[*N*,*N'*-(1,3-dimethyl-1,3-propanediylidene)bis[2,6-dimethylbenzenaminato-κ*N*]](1-)][(1,2,3,4,5-η)-1,2,3,4,5-pentamethyl-2,4-cyclopentadien-1-yl]ruthenium, Chloro[[*N*,*N'*-(1,3-dimethyl-1,3-propanediylidene)bis[3,5-bis(trifluoromethyl)benzenaminato-κ*N*]](1-)][(1,2,3,4,5-η)-1,2,3,4,5-pentamethyl-2,4-cyclopentadien-1-yl]ruthenium, Chloro[[*N*,*N'*-(1,3-dimethyl-1,3-propanediylidene)bis[3,5-dimethylbenzenaminato-κ*N*]](1-)][(1,2,3,4,5-η)-1,2,3,4,5-pentamethyl-2,4-cyclopentadien-1-yl]ruthenium, Dichloro[(1,2,3,4,5-η)-1,2,3,4,5-pentamethyl-2,4-cyclopentadien-1-yl]ruthenium, Dichloro[(1,2,3,4,5-η)-1,2,3,4,5-

pentamethyl-2,4-cyclopentadien-1-yl](triphenylphosphine)ruthenium, Dichloro[(1,2,3,4,5,6-
η)-1-methyl-4-(1-methylethyl)benzene]ruthenium, Dichloro[(1,2,5,6-η)-1,5-
cyclooctadiene]ruthenium, Dichloro[[2-(dimethylphosphino-κ*P*)ethyl]dimethylphosphine
oxide][(1,2,3,4,5,6-η)-1-methyl-4-(1-methylethyl)benzene]ruthenium,
Dichlorobis(triphenylphosphine)ruthenium, Di-μ-chlorodichlorobis[(1,2,3,4,5-η)-1,2,3,4,5-
pentamethyl-2,4-cyclopentadien-1-yl]diruthenium, Dichloro[[(dimethylphosphino-
κ*P*)methyl]dimethylphosphine oxide][(1,2,3,4,5,6-η)-1-methyl-4-(1-
methylethyl)benzene]ruthenium, Dichloro(*N*,*N*,*N'*,*N'*,*N''*,*N''*-hexamethylphosphorous
triamide-κ*P*)[(1,2,3,4,5,6-η)-1-methyl-4-(1-methylethyl)benzene]ruthenium,
Dichlorotetrakis(triphenylphosphine)ruthenium,
Dichlorotris(triphenylphosphine)ruthenium, (Dihydrogen-
κ*H*,κ*H'*)dihydrotris(triphenylphosphine)ruthenium, Hexacarbonyldi-μ-
chlorodichlorodiruthenium, Hydro[(1,2,3,3a,7a-η)-1*H*-inden-1-yl][1,1'-methylenebis[1,1-
diphenylphosphine-κ*P*]]ruthenium, Hydroiodotris(triphenylphosphine)ruthenium, Iridium,
compd. with ruthenium (1:2), Iridium, compd. with ruthenium (2:1), [*N*-[(1*R*,2*R*)-2-(Amino-
κ*N*)-1,2-diphenylethyl]-2,3,4,5,6-pentafluorobenzenesulfonamidato-κ*N*]chloro[(1,2,3,4,5,6-η)-
1-methyl-4-(1-methylethyl)benzene]ruthenium, [*N*-[(1*R*,2*R*)-2-(Amino-κ*N*)-1,2-diphenylethyl]-
4-methylbenzenesulfonamidato-κ*N*]chloro[(1,2,3,4,5,6-η)-1-methyl-4-(1-
methylethyl)benzene]ruthenium, [[*N*,*N'*-[1,3-Bis(trifluoromethyl)-1,3-
propanediylidene]bis[3,5-bis(trifluoromethyl)benzenaminato-κ*N*]](1-)]chloro[(1,2,3,4,5-η)-
1,2,3,4,5-pentamethyl-2,4-cyclopentadien-1-yl]ruthenium, [[*N*,*N'*-[1,3-Bis(trifluoromethyl)-
1,3-propanediylidene]bis[3,5-dimethylbenzenaminato-κ*N*]](1-)]chloro[(1,2,3,4,5-η)-1,2,3,4,5-
pentamethyl-2,4-cyclopentadien-1-yl]ruthenium, (*OC*-6-12)-Hydro[[*N*,*N'*-(1*H*-isoindole-
1,3(2*H*)-diyl-κ*N*)bis[6-methyl-2-pyridinaminato-κN^1]](1-)](triphenylphosphine)ruthenium,
(*OC*-6-13)-Carbonyl[2-(diphenylphosphino-κ*P*)-*N*-[2-(diphenylphosphino-
κ*P*)ethyl]ethanamine-κ*N*][tetrahydroborato(1-)-κ*H*]ruthenium, (*OC*-6-14)-Dichloro(2-
pyridinemethanamine-κN^1,κN^2)bis(triphenylphosphine)ruthenium, (*OC*-6-22)-Bis(acetato-
κ*O*,κ*O'*)[(1*R*)-[1,1'-binaphthalene]-2,2'-diylbis[diphenylphosphine-κ*P*]]ruthenium, (*OC*-6-32)-
[2-[6-[(Amino-κ*N*)methyl]-2-pyridinyl-κ*N*]-5-methylphenyl-κ*C*][1,1'-(1,4-butanediyl)bis[1,1-
diphenylphosphine-κ*P*]](formato-κ*O*)ruthenium, (*OC*-6-32)-Diaqua[*N*,*N*-bis[(2-pyridinyl-
κ*N*)methyl]-2-pyridinemethanamine-κN^1,κN^2]ruthenium(2+), (*OC*-6-32)-[*rel*-(11*R*,12*R*)-1,8-
Bis(diphenylphosphino-κ*P*)-9,10-dihydro-11,12-bis(hydroxymethyl)-9,10-ethanoanthracen-9-
yl-κ*C*]dicarbonylchlororuthenium, (*OC*-6-34)-
Carbonylchlorohydrotris(triphenylphosphine)ruthenium, (*OC*-6-43)-Aqua[α-(2-pyridinyl-
κ*N*)-*N*,*N*-bis[(2-pyridinyl-κ*N*)methyl]-2-pyridinemethanamine-κN^1,κN^2]ruthenium(2+), (*OC*-6-
52)-[4,5-Bis[[bis(1-methylethyl)phosphino-κ*P*]methyl]acridine-
κ*N*]carbonylchlorohydroruthenium, (*OC*-6-52)-Carbonylchloro[2-(diphenylphosphino-κ*P*)-*N*-
[2-(diphenylphosphino-κ*P*)ethyl]ethanamine-κ*N*]hydroruthenium, (*OC*-6-54)-Aqua[6-[[bis[(2-
pyridinyl-κ*N*)methyl]amino-κ*N*]methyl]-2-pyridinecarboxylato-κN^1,κO^2]ruthenium(1+),
Poly(oxy-1,2-ethanediyl), α-methyl-ω-hydroxy-, ether with dichloro[4-(hydroxymethyl)-1,3-
bis(2,4,6-trimethylphenyl)-2-imidazolidinylidene][[2-(1-methylethoxy-κ*O*)phenyl]methylene-
κ*C*]ruthenium, Ruthenate(1-), [1,3-bis(2,4,6-trimethylphenyl)-2-imidazolidinylidene][[5-(2-
carboxylatoethyl)-2-(1-methylethoxy-κ*O*)phenyl]methylene-κ*C*]dichloro-, hydrogen, (*SP*-5-
41)-, Ruthenate(1-), dichloro(diethyl phosphito-κ*P*)[(1,2,3,4,5,6-η)-1-methyl-4-(1-
methylethyl)benzene]-, hydrogen (1:1), Ruthenate(1-), dichloro(*P*,*P*-dimethylphosphinito-κ*P*)
[(1,2,3,4,5,6-η)-1-methyl-4-(1-methylethyl)benzene]-, hydrogen (1:1), Ruthenate(4-),
[29*H*,31*H*-phthalocyanine-2,9,16,23-tetrasulfonato(6-)-κN^{29},κN^{30},κN^{31},κN^{32}]-, (*SP*-4-1)-,
Ruthenate(4-), di-μ-chlorodichlorotetrakis[3-(diphenylphosphino-κ*P*)benzenesulfonato]di-,
sodium (1:4), Ruthenate(5-), (η^6-benzene)chlorobis[[3,3',3''-(phosphinidyne-
κ*P*)tris[benzenesulfonato]](3-)]-, sodium chloride (1:6:1), Ruthenium, Ruthenium(1+), [1,3-
bis(2,4,6-trimethylphenyl)-2-imidazolidinylidene][3-[[(4-bromo-2,6-dimethylphenyl)imino-
κ*N*]methyl]-4-(hydroxy-κ*O*)-*N*,*N*,*N*-trimethylbenzenaminiumato]chloro(phenylmethylene)-,
chloride (1:1), (*TB*-5-12)-, Ruthenium(1+), [1,3-bis(2,4,6-trimethylphenyl)-2-
imidazolidinylidene]dichloro[[2-[(1,1-dimethylpiperidinium-4-yl)oxy-κ*O*]phenyl]methylene-
κ*C*]-, chloride (1:1), (*SP*-5-41)-, Ruthenium(1+), [1,3-bis(2,4,6-trimethylphenyl)-2-
imidazolidinylidene]dichloro[[2-(1-methylethoxy-κ*O*)-4-
(diethylmethylammonio)phenyl]methylene-κ*C*]-, (*SP*-5-41)-, hexafluorophosphate(1-) (1:1),
Ruthenium(1+), [1,3-bis(2,4,6-trimethylphenyl)-2-imidazolidinylidene]dichloro[[2-(1-
methylethoxy-κ*O*)-4-(diethylmethylammonio)phenyl]methylene-κ*C*]-, (*SP*-5-41)-,
tetrafluoroborate(1-) (1:1), Ruthenium(1+), [1,3-bis(2,4,6-trimethylphenyl)-2-
imidazolidinylidene]dichloro[[2-(1-methylethoxy-κ*O*)-5-(pyridiniomethyl)phenyl]methylene-
κ*C*]-, (*SP*-5-41)-, hexafluorophosphate(1-) (1:1), Ruthenium(1+), [1,3-bis(2,4,6-
trimethylphenyl)-2-imidazolidinylidene]dichloro[[2-(1-methylethoxy-κ*O*)-5-

pyridiniophenyl]methylene-κC]-, (SP-5-41)-, hexafluorophosphate(1-) (1:1), Ruthenium(1+), [1,3-bis(2,4,6-trimethylphenyl)-2-imidazolidinylidene]dichloro[[4-(diethylmethylammonio)-2-(1-methylethoxy-κO)phenyl]methylene-κC]-, iodide (1:1), (SP-5-41)-, Ruthenium, [(1,2,3,4,5,6-η)-1-methyl-4-(1-methylethyl)benzene]bis(trifluoromethanesulfonato-κO)-, Ruthenium(1+), [2-(amino-κN)ethanol-κO]chloro[(1,2,3,4,5,6-η)-1-methyl-4-(1-methylethyl)benzene]-, chloride, compd. with [2-(amino-κN)ethanolato-κO]chloro[(1,2,3,4,5,6-η)-1-methyl-4-(1-methylethyl)benzene]ruthenium (1:1:1), Ruthenium(1+), [4-(2-aminoethoxy)-2-quinolinecarboxylato-κN^1,κO^2](η^5-2,4-cyclopentadien-1-yl)(η^3-2-propen-1-yl)-, hexafluorophosphate(1-) (1:1), Ruthenium(1+), [[[4-[[[2-(amino-κN)ethyl]amino-κN]sulfonyl]phenyl]methyl][3-[[6-[4-methoxy-2,5-bis(2-phenylethenyl)phenoxy]hexyl]amino]-3-oxopropyl]diphenylphosphoniumato]chloro[(1,2,3,4,5,6-η)-1-methyl-4-(1-methylethyl)benzene]-, bromide (1:1), Ruthenium(1+), [4-(aminomethyl)-1,3-bis(2,4,6-trimethylphenyl)-2-imidazolidinylidene]dichloro[[2-(1-methylethoxy-κO)-5-[(trimethylammonio)methyl]phenyl]methylene-κC]-, chloride, hydrochloride (1:1:1), (SP-5-41)-, Ruthenium(1+), (η^5-2,4-cyclopentadien-1-yl)(4-methoxy-2-quinolinecarboxylato-κN^1,κO^2)(η^3-2-propen-1-yl)-, hexafluorophosphate(1-) (1:1), Ruthenium(1+), (acetonitrile)[2-[bis(1-methylethyl)phosphino-κP]-4-(1,1-dimethylethyl)-1-methyl-1H-imidazole-κN^3](η^5-2,4-cyclopentadien-1-yl)-, hexafluorophosphate(1-) (1:1), Ruthenium(1+), (acetonitrile)(η^5-2,4-cyclopentadien-1-yl)bis[2-(1,1-dimethylethyl)-6-(diphenylphosphino-κP)pyridine]-, hexafluorophosphate(1-) (1:1), Ruthenium(1+), [μ-(benzenethiolato)]bis[μ-[4-(1,1-dimethylethyl)benzenemethanethiolato]]bis[(1,2,3,4,5,6-η)-1-methyl-4-(1-methylethyl)benzene]di-, chloride (1:1), Ruthenium(1+), bis[(1,2,3,4,5,6-η)-1-methyl-4-(1-methylethyl)benzene]tris[μ-(4-methylbenzenethiolato)]di-, Ruthenium(1+), bis[μ-[4-(1,1-dimethylethyl)benzenemethanethiolato]][μ-[4-(1,1-dimethylethyl)benzenethiolato]]bis[(1,2,3,4,5,6-η)-1-methyl-4-(1-methylethyl)benzene]di-, chloride (1:1), Ruthenium(1+), bis(acetonitrile)(η^5-2,4-cyclopentadien-1-yl)(trimethylphosphine)-, stereoisomer of hexakis[μ-[[N,N'-1,5-naphthalenediylbis[2,3-di(hydroxy-κO)benzamidato]](4-)]]tetragallate(12-) (1:1), Ruthenium(1+), bis(acetonitrile)(η^5-2,4-cyclopentadien-1-yl)(triphenylphosphine)-, hexafluorophosphate(1-) (1:1), Ruthenium(1+), bis(acetonitrile)[hydrotris(1H-pyrazolato-κN^1)borato(1-)-κN^2,κ$N^{2'}$,κ$N^{2''}$](triphenylphosphine)-, (OC-6-23)-, hexafluorophosphate(1-) (1:1), Ruthenium(1+), bis[μ-(benzeneethanethiolato)][μ-[4-(1-methylethyl)benzenethiolato]]bis[(1,2,3,4,5,6-η)-1-methyl-4-(1-methylethyl)benzene]di-, chloride (1:1), Ruthenium(1+), bis[μ-(benzeneethanethiolato)][μ-[4-(mercapto-κS:κS)phenolato]]bis[(1,2,3,4,5,6-η)-1-methyl-4-(1-methylethyl)benzene]di-, chloride (1:1), Ruthenium(1+), bis[μ-(benzenemethanethiolato)][μ-[4-(1,1-dimethylethyl)benzenethiolato]]bis[(1,2,3,4,5,6-η)-1-methyl-4-(1-methylethyl)benzene]di-, chloride (1:1), Ruthenium(1+), bis[μ-(benzenemethanethiolato)][μ-(4-bromobenzenethiolato-κS:κS)]bis[(1,2,3,4,5,6-η)-1-methyl-4-(1-methylethyl)benzene]di-, chloride (1:1), Ruthenium(1+), carbonylhydro(η^6-benzene)(tricyclohexylphosphine)-, tetrafluoroborate(1-) (1:1), Ruthenium(1+), chloro[(1,2,3,4,5,6-η)-1-methyl-4-(1-methylethyl)benzene](4,4',5,5'-tetrahydro-2,2'-bi-1H-imidazole-κN^3,κ$N^{3'}$)-, chloride (1:1), Ruthenium(1+), chloro(4,4'-dimethoxy-2,2'-bipyridine-κN^1,κ$N^{1'}$)[(1,2,3,4,5,6-η)-1-methyl-4-(1-methylethyl)benzene]-, tetrafluoroborate(1-) (1:1), Ruthenium(1+), diaqua[μ-[1H-pyrazole-3,5-dicarboxylato(3-)-κN^1,κO^5:κN^2,κO^3]]bis(2,2':6',2''-terpyridine-κN^1,κ$N^{1'}$,κ$N^{1''}$)di-, Ruthenium(1+), dichloro[[2-(1-methylethoxy-κO)-5-nitrophenyl]methylene-κC][4-[(trimethylammonio)methyl]-1,3-bis(2,4,6-trimethylphenyl)-2-imidazolidinylidene]-, chloride (1:1), (SP-5-41)-, Ruthenium(1+), dichloro[4-[(4-ethyl-4-methylpiperazinium-1-yl)methyl]-1,3-bis(2,4,6-trimethylphenyl)-2-imidazolidinylidene][[2-(1-methylethoxy-κO)phenyl]methylene-κC]-, chloride (1:1), (SP-5-41)-, Ruthenium(1+), hydro[N-methyl-N-(6-methyl-2-pyridinyl-κN)-1-[(6-methyl-2-pyridinyl-κN)imino]-1H-isoindol-3-amine-κN^2](1,1,1-trifluoromethanesulfonato-κO)(triphenylphosphine)-, (OC-6-26)-, 1,1,1-trifluoromethanesulfonate (1:1), Ruthenium(1+), (nickel)[(1,2,3,4,5-η)-1,2,3,4,5-pentamethyl-2,4-cyclopentadien-1-yl]peroxy[μ-[[2,2'-[1,3-propanediylbis(methylimino-κN)]bis[ethanethiolato-κS:κS]](2-)]]-, stereoisomer, nitrate (1:1), Ruthenium(1+), tris[μ-[4-(1,1-dimethylethyl)benzenethiolato]]bis[(1,2,3,4,5,6-η)-1-methyl-4-(1-methylethyl)benzene]di-, chloride (1:1), Ruthenium(1+), tri-μ-chlorobis[(1,2,3,4,5,6-η)-1-methyl-4-(1-methylethyl)benzene]di-, hexafluorophosphate(1-) (1:1), Ruthenium(1+), tris(acetonitrile)[(1,2,3,4,5-η)-1,2,3,4,5-pentamethyl-2,4-cyclopentadien-1-yl]-, hexafluorophosphate(1-) (1:1), Ruthenium(1+), tris(acetonitrile)[(1,2,3,4,5-η)-1,2,3,4,5-pentamethyl-2,4-cyclopentadien-1-yl]-, (OC-6-11)-hexafluoroantimonate(1-), Ruthenium(1+), tris(acetonitrile)(η^5-2,4-cyclopentadien-1-yl)-, hexafluorophosphate(1-) (1:1), Ruthenium(1+), tris(acetonitrile)(η^5-2,4-cyclopentadien-1-yl)-, (OC-6-11)-hexafluoroantimonate(1-) (1:1), Ruthenium(2+), [1,3-bis(2,4,6-trimethylphenyl)-2-imidazolidinylidene]dichloro[[5-

[[dimethyl[2-(trimethylammonio)ethyl]ammonio]methyl]-2-(1-methylethoxy-κ*O*)phenyl]methylene-κ*C*]-, chloride (1:2), (*SP*-5-41)-, Ruthenium(2+), (2,2'-bipyridine-κN^1,κ$N^{1'}$)bis(1,10-phenanthroline-κN^1,κN^{10})-, dichloride, (*OC*-6-22)-, Ruthenium(2+), (2,2'-bipyrimidine-κN^1,κ$N^{1'}$)[(1,2,3,4,5,6-η)-1-methyl-4-(1-methylethyl)benzene](pyridine)-, Ruthenium(2+), [2-amino-7,9-dihydro-9-[4-(4'-methyl[2,2'-bipyridin]-4-yl-κN^1,κ$N^{1'}$)butyl]-1*H*-purine-6,8-dione]bis(2,2'-bipyridine-κN^1,κ$N^{1'}$)-, chloride (1:2), (*OC*-6-33)-, Ruthenium, (2,2'-bipyridine-κN^1,κ$N^{1'}$)[1,1'-(1,4-butanediyl)bis[1,1-diphenylphosphine-κ*P*]]dichloro-, (*OC*-6-32)-, Ruthenium(2+), aqua([2,2'-bipyridine]-4,4'-diol-κN^1,κ$N^{1'}$)[(1,2,3,4,5,6-η)-1,2,3,4,5,6-hexamethylbenzene]-, sulfate (1:1), Ruthenium(2+), aqua(2,2'-bipyridine-κN^1,κ$N^{1'}$)(2,2':6',2''-terpyridine-κN^1,κ$N^{1'}$,κ$N^{1''}$)-, perchlorate (1:2), Ruthenium(2+), aqua[α-(2-pyridinyl-κ*N*)-*N*,*N*-bis[(2-pyridinyl-κ*N*)methyl]-2-pyridinemethanamine-κN^1,κN^2]-, (*OC*-6-43)-, hexafluorophosphate(1-) (1:2), Ruthenium(2+), aquapentakis(2,2-dimethylpropanenitrile)-, (*OC*-6-22)-, tetrafluoroborate(1-) (1:2), Ruthenium(2+), diaquabis(2,9-dimethyl-1,10-phenanthroline-κN^1,κN^{10})-, (*OC*-6-22)-, hexafluorophosphate(1-) (1:2), Ruthenium(2+), diaqua[*N*,*N*-bis[(2-pyridinyl-κ*N*)methyl]-2-pyridinemethanamine-κN^1,κN^2]-, (*OC*-6-32)-, hexafluorophosphate(1-) (1:2), Ruthenium(2+), dichloro[[2-[(1,1-dimethylpiperidinium-4-yl)oxy-κ*O*]phenyl]methylene-κ*C*][4-[(4-ethyl-4-methylpiperazinium-1-yl)methyl]-1,3-bis(2,4,6-trimethylphenyl)-2-imidazolidinylidene]-, chloride (1:2), (*SP*-5-41)-, Ruthenium(2+), hexaaqua-, (*OC*-6-11)-, 4-methylbenzenesulfonate (1:2), Ruthenium(2+), trichlorobis[(1,2,3,4,5,6-η)-1,2,3,4,5,6-hexamethylbenzene][μ_3-[*N*-[6-[[[[6-[[(1,10-phenanthrolin-4-yl-κN^1,κN^{10})carbonyl]amino]-2-pyridinyl-κ*N*]methyl][(2-pyridinyl-κ*N*)methyl]amino-κ*N*]methyl]-2-pyridinyl-κ*N*]-1,10-phenanthroline-4-carboxamidato-κN^1,κN^{10}:κO^4]]tri-, stereoisomer, hexafluorophosphate(1-) (1:2), Ruthenium(2+), trichlorobis[(1,2,3,4,5,6-η)-1-methyl-4-(1-methylethyl)benzene][μ_3-[*N*-[6-[[[[6-[[(1,10-phenanthrolin-4-yl-κN^1,κN^{10})carbonyl]amino]-2-pyridinyl-κ*N*]methyl][(2-pyridinyl-κ*N*)methyl]amino-κ*N*]methyl]-2-pyridinyl-κ*N*]-1,10-phenanthroline-4-carboxamidato-κN^1,κN^{10}:κO^4]]tri-, stereoisomer, hexafluorophosphate(1-) (1:2), Ruthenium(2+), tris(2,2'-bipyrazine-κN^1,κ$N^{1'}$)-, (*OC*-6-11)-, hexafluorophosphate(1-) (1:2), Ruthenium(2+), tris(acetonitrile)[(1,2,3,4,5,6-η)-1-methyl-4-(1-methylethyl)benzene]-, (*OC*-6-11)-hexafluoroantimonate(1-) (1:2), Ruthenium(3+), bis[4,4'-bis(1,1-dimethylethyl)-2,2'-bipyridine-κN^1,κ$N^{1'}$][chloro[(1,2,3,4,5-η)-1,2,3,4,5-pentamethyl-2,4-cyclopentadien-1-yl]rhodium][μ-(dipyrido[3,2-5,6:3',2'-5,6]quinoxalino[2,3-*f*][1,10]phenanthroline-κN^4,κN^5:κN^{13},κN^{14})]-, chloride hexafluorophosphate(1-) (1:1:2), Ruthenium(4+), aquatris(2,2'-bipyridine-κN^1,κ$N^{1'}$)[μ-[4-(2-pyridinyl-κ*N*)-2,2'-bipyrimidine-κN^1,κ$N^{1'}$:κN^3,κ$N^{3'}$]]di-, tetrafluoroborate(1-) (1:4), Ruthenium(6+), aquatetrakis(2,2'-bipyridine-κN^1,κ$N^{1'}$)bis[μ-(2,2'-bipyrimidine-κN^1,κ$N^{1'}$:κN^3,κ$N^{3'}$)](pyridine)tri-, stereoisomer, tetrafluoroborate(1-) (1:6), Ruthenium, (η^6-benzene)dichloro[(pentafluorophenyl)diphenylphosphine-κ*P*]-, Ruthenium, [6-[[bis(1,1-dimethylethyl)phosphino-κ*P*]methyl]-2,2'-bipyridine-κN^1,κ$N^{1'}$]carbonylchlorohydro-, (*OC*-6-64)-, Ruthenium(6+), tris[μ-[5,8-di(hydroxy-κ*O*)-1,4-naphthalenedionato(2-)-κO^1:κO^4]]hexakis[(1,2,3,4,5,6-η)-1-methyl-4-(1-methylethyl)benzene]bis[μ_3-[2,4,6-tri(4-pyridinyl-κ*N*)-1,3,5-triazine]]hexa-, 1,1,1-trifluoromethanesulfonate (1:6), Ruthenium carbide, Ruthenium, μ-chlorodichloro-μ-hydrobis[(1,2,3,4,5,6-η)-1-methyl-4-(1-methylethyl)benzene]di-, (*Ru-Ru*), Ruthenium, di-μ-carbonyldicarbonylbis(η^5-2,4-cyclopentadien-1-yl)di-, (*Ru-Ru*), Ruthenium dioxide, Ruthenium oxide, Ruthenium trichloride, Ruthenium, trichloro[4-(3,5-dimethyl-1*H*-pyrazol-1-yl-κN^2)-6-(4-methylphenyl)-*N*-(2-pyridinyl-κ*N*)-1,3,5-triazin-2-amine-κN^3]-, (*OC*-6-31)-, (*SP*-5-41)-[1,3-Bis(2,4,6-trimethylphenyl)-2-imidazolidinylidene]dichloro[[2-(1-methylethoxy-κ*O*)-5-nitrophenyl]methylene-κ*C*]ruthenium, (*SP*-5-41)-[1,3-Bis(2,4,6-trimethylphenyl)-2-imidazolidinylidene]dichloro[[2-(1-methylethoxy-κ*O*)phenyl]methylene-κ*C*]ruthenium, (*SP*-5-41)-[1,3-Bis[2,6-bis(1-methylethyl)phenyl]-2-imidazolidinylidene]dichloro(phenylmethylene)(tricyclohexylphosphine)ruthenium, (*SP*-5-41)-Dichloro[[2-(1-methylethoxy-κ*O*)phenyl]methylene-κ*C*][4-[97-(tricyclo[3.3.1.$1^{3,7}$]dec-1-yloxy)-2,5,8,11,14,17,20,23,26,29,32,35,38,41,44,47,50,53,56,59,62,65,68,71,74,77,80,83,86,89,92,95-dotriacontaoxaheptanonacont-1-yl]-1,3-bis(2,4,6-trimethylphenyl)-2-imidazolidinylidene]ruthenium, (*SP*-5-52)-[6-[[Bis(1,1-dimethylethyl)phosphino-κ*P*]methylene]-*N*,*N*-diethyl-1,6-dihydro-2-pyridinemethanaminato-κN^1,κN^2]carbonylhydroruthenium, Stereoisomer of dichloro[(1,2,3,6,7,8-η)-(2*E*,6*E*)-2,7-dimethyl-2,6-octadiene-1,8-diyl](triphenylphosphine)ruthenium, stereoisomer of Di-μ-chlorodichlorobis[(1,2,3,4,5,6-η)-1-methyl-4-(1-methylethyl)benzene]diruthenium, Stereoisomer of dihydro[(1,2,3,3a,7a-η)-1-phenyl-1*H*-inden-1-yl](triethylsilyl)(triphenylphosphine)ruthenium, stereoisomer of Di-μ-iododiiodobis[(1,2,3,4,5,6-η)-1-methyl-4-(1-methylethyl)benzene]diruthenium, (*TB*-5-23)-[4,5-Bis[[bis(1-methylethyl)phosphino-κ*P*]methyl]-9,10-dihydroacridinato-κ*N*]carbonylhydroruthenium, Tetracarbonyl-μhydro[(1,2,3,4,5-η)-1-hydroxylato-2,3,4,5-tetraphenyl-2,4-cyclopentadien-1-yl][(1,2,3,4,5-η)-1-hydroxy-2,3,4,5-tetraphenyl-2,4-cyclopentadien-1-yl]diruthenium, Tri-μ-chlorochloro(η^2-ethene)[(1,2,3,4,5,6-η)-1-methyl-4-(1-methylethyl)benzene](tricyclohexylphosphine)diruthenium, Tri-μ-chlorochloro(η^2-ethene)[(1,2,3,4,5,6-η)-1-methyl-4-(1-methylethyl)benzene](tricyclopentylphosphine)diruthenium, Tri-μ-chlorochloro(η^2-ethene)[(1,2,3,4,5,6-η)-1-methyl-4-(1-methylethyl)benzene](triphenylphosphine)diruthenium, Tri-μ-chlorodichloro[(1,2,3,4,5,6-η)-1-methyl-4-(1-methylethyl)benzene](tricyclohexylphosphine)diruthenium, Tri-μ-chlorodichloro[(1,2,3,4,5,6-η)-1-methyl-4-(1-methylethyl)benzene](tricyclopentylphosphine)diruthenium, Tris(2,2'-bipyridyl)ruthenium(II) chloride, Tris(2,2'-bipyridyl)dichlororuthenium(II) hexahydrate, Tris(2,2'-bipyridine)ruthenium(2+) bis(hexafluorophosphate), Tris(2,2'-bipyridine)ruthenium(2+), Triruthenium dodecacarbonyl

Document Type: Journal

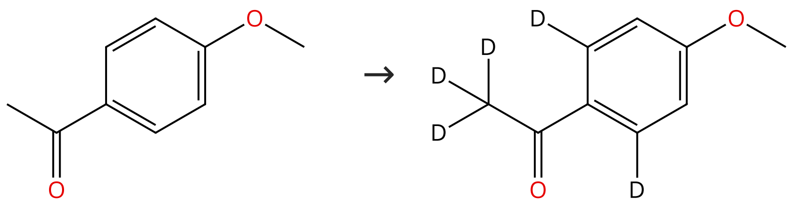
Language: English

Reactions (438)

View in CAS SciFinder

Scheme 1 (1 Reaction)

Steps: **1** Yield: **100%**



Suppliers (103)

31-116-CAS-24181135

Steps: **1** Yield: **100%**

1.1 **Reagents:** Water-d_2
Catalysts: 4-Chlorobenzoic acid, Silver hexafluoroantimonate, Bis(dichloro(η^6-*p*-cymene)ruthenium), 2-Methyl-3-(trifluoromethyl)aniline
Solvents: 1,2-Dichloroethane; rt → 120 °C; 16 h, 120 °C

Experimental Protocols

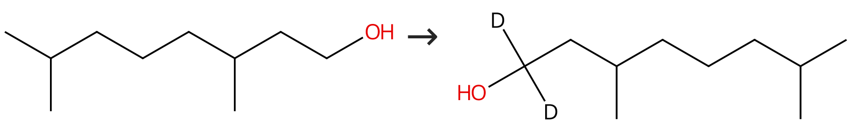
Ruthenium-Catalyzed Deuteration of Aromatic Carbonyl Compounds with a Catalytic Transient Directing Group

By: Kopf, Sara; et al

Chemistry - A European Journal (2021), 27(38), 9768-9773.

Scheme 2 (1 Reaction)

Steps: **1** Yield: **100%**



Suppliers (71)

31-116-CAS-13382533

Steps: **1** Yield: **100%**

1.1 **Reagents:** Hydrogen, Water-d_2
Catalysts: Ruthenium
Solvents: Water-d_2; 24 h, 1 atm, 80 °C

1.2 **Reagents:** Water
Solvents: Diethyl ether; rt

Experimental Protocols

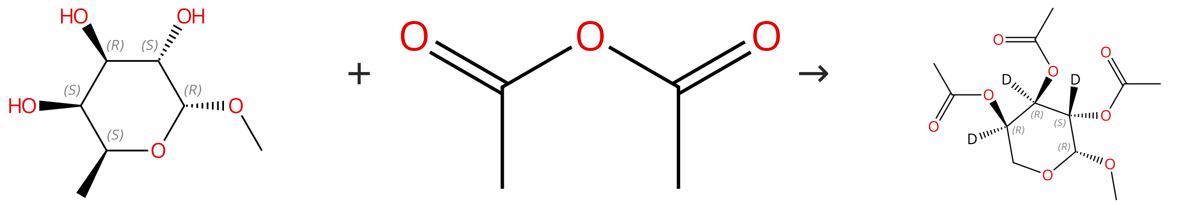
A convenient and effective method for the regioselective deuteration of alcohols

By: Maegawa, Tomohiro; et al

Advanced Synthesis & Catalysis (2008), 350(14+15), 2215-2218.

Scheme 3 (1 Reaction)

Steps: **1** Yield: **100%**



Absolute stereochemistry shown

Suppliers (56)

Suppliers (90)

Absolute stereochemistry shown, Rotation (-)

31-116-CAS-3285143	Steps: **1** Yield: **100%**
1.1	**Reagents:** Hydrogen **Catalysts:** Ruthenium **Solvents:** Water-d_2; 24 h, 80 °C; 80 °C → rt
1.2	**Reagents:** Water
1.3	**Reagents:** Pyridine; 24 h, rt

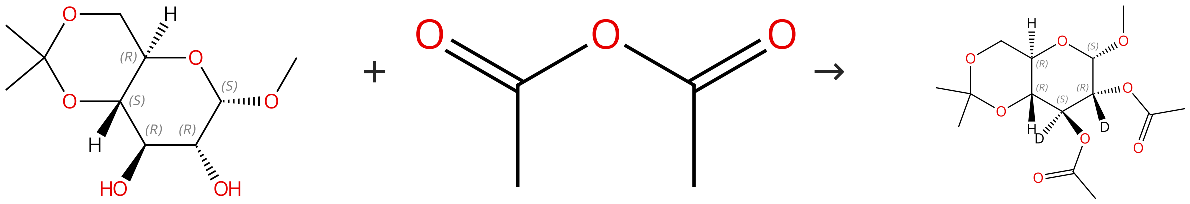
Experimental Protocols

Stereo- and Regioselective Direct Multi-Deuterium-Labeling Methods for Sugars

By: Sawama, Yoshinari; et al

Chemistry - A European Journal (2012), 18(51), 16436-16442.

Scheme 4 (1 Reaction) Steps: **1** Yield: **100%**



Absolute stereochemistry shown, Rotation (+)

Suppliers (2)

Suppliers (90)

Absolute stereochemistry shown

31-116-CAS-5713136	Steps: **1** Yield: **100%**
1.1	**Reagents:** Lithium hydroxide, Hydrogen **Catalysts:** Ruthenium **Solvents:** Water-d_2; 24 h, 80 °C; 80 °C → rt
1.2	**Reagents:** Water
1.3	**Reagents:** Pyridine; 24 h, rt

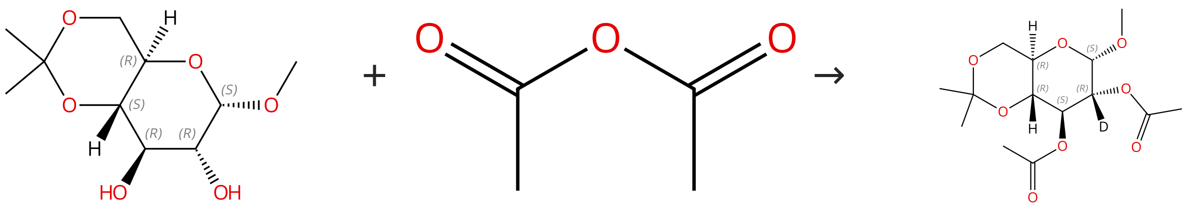
Experimental Protocols

Stereo- and Regioselective Direct Multi-Deuterium-Labeling Methods for Sugars

By: Sawama, Yoshinari; et al

Chemistry - A European Journal (2012), 18(51), 16436-16442.

Scheme 5 (1 Reaction) Steps: **1** Yield: **100%**



Absolute stereochemistry shown, Rotation (+)

Suppliers (2)

Suppliers (90)

Absolute stereochemistry shown

31-116-CAS-13903854	Steps: **1** Yield: **100%**
1.1	**Reagents:** Tripropylamine, Hydrogen **Catalysts:** Ruthenium **Solvents:** Water-d_2; 24 h, 80 °C; 80 °C → rt
1.2	**Reagents:** Water
1.3	**Reagents:** Pyridine; 24 h, rt

Experimental Protocols

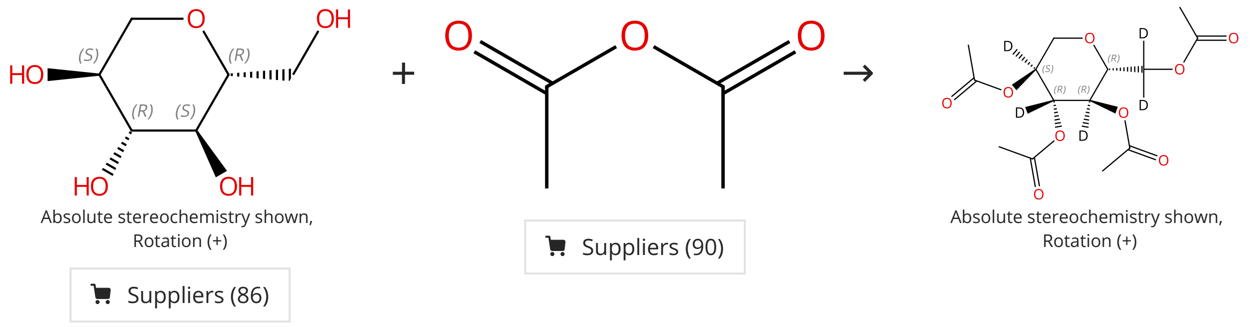
Stereo- and Regioselective Direct Multi-Deuterium-Labeling Methods for Sugars

By: Sawama, Yoshinari; et al

Chemistry - A European Journal (2012), 18(51), 16436-16442.

Scheme 6 (1 Reaction)

Steps: **1** Yield: **100%**



31-116-CAS-5421937

Steps: **1** Yield: **100%**

1.1 **Reagents:** Hydrogen
Catalysts: Ruthenium
Solvents: Water-d_2; 24 h, 80 °C; 80 °C → rt

1.2 **Reagents:** Water

1.3 **Reagents:** Pyridine; 24 h, rt

Experimental Protocols

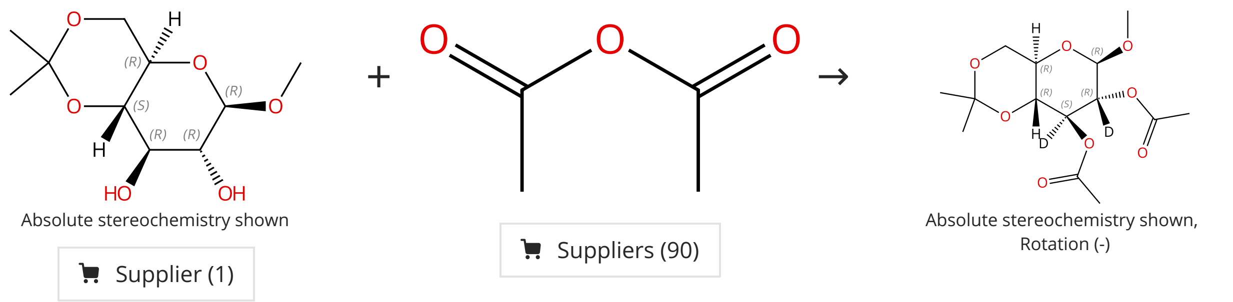
Stereo- and Regioselective Direct Multi-Deuterium-Labeling Methods for Sugars

By: Sawama, Yoshinari; et al

Chemistry - A European Journal (2012), 18(51), 16436-16442.

Scheme 7 (1 Reaction)

Steps: **1** Yield: **100%**



31-116-CAS-7845010

Steps: **1** Yield: **100%**

1.1 **Reagents:** Sodium hydroxide, Hydrogen
Catalysts: Ruthenium
Solvents: Water-d_2; 24 h, 80 °C; 80 °C → rt

1.2 **Reagents:** Water

1.3 **Reagents:** Pyridine; 24 h, rt

Experimental Protocols

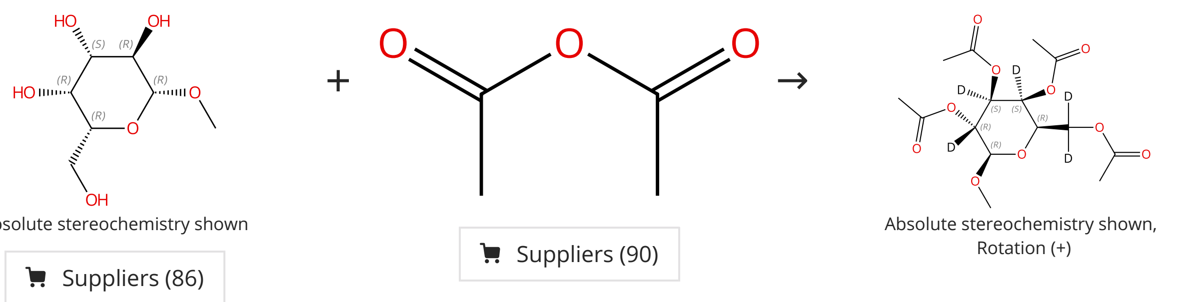
Stereo- and Regioselective Direct Multi-Deuterium-Labeling Methods for Sugars

By: Sawama, Yoshinari; et al

Chemistry - A European Journal (2012), 18(51), 16436-16442.

Scheme 8 (2 Reactions)

Steps: **1** Yield: **100%**



31-116-CAS-7560526	Steps: **1** Yield: **100%**
1.1	**Reagents:** Hydrogen **Catalysts:** Ruthenium **Solvents:** Water-d_2; 24 h, 80 °C; 80 °C → rt
1.2	**Reagents:** Water
1.3	**Reagents:** Pyridine; 24 h, rt
Experimental Protocols	

Stereo- and Regioselective Direct Multi-Deuterium-Labeling Methods for Sugars

By: Sawama, Yoshinari; et al

Chemistry - A European Journal (2012), 18(51), 16436-16442.

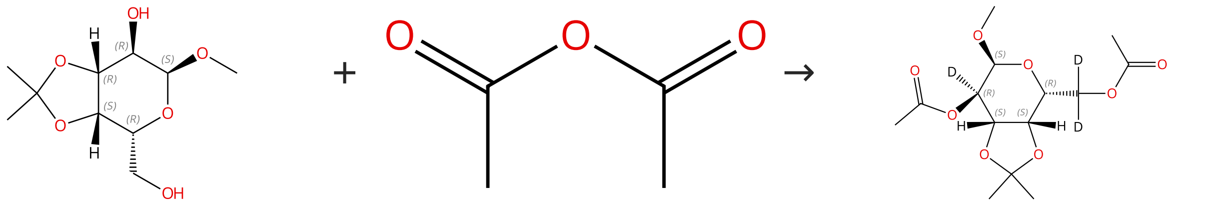
31-116-CAS-7443588	Steps: **1** Yield: **100%**
1.1	**Reagents:** Hydrogen, Water-d_2 **Catalysts:** Ruthenium, Carbon **Solvents:** Water-d_2; 72 h, 1 atm, 80 °C; 80 °C → rt
1.2	**Reagents:** Pyridine **Solvents:** Pyridine; 24 h, rt
Experimental Protocols	

Method for regio-, chemo- and stereoselective deuterium labeling of sugars based on ruthenium-catalyzed C-H bond activation

By: Fujiwara, Yuta; et al

Chemical Communications (Cambridge, United Kingdom) (2010), 46(27), 4977-4979.

Scheme 9 (1 Reaction) Steps: **1** Yield: **100%**



Absolute stereochemistry shown, Rotation (+)

Suppliers (17)

Suppliers (90)

Absolute stereochemistry shown, Rotation (-)

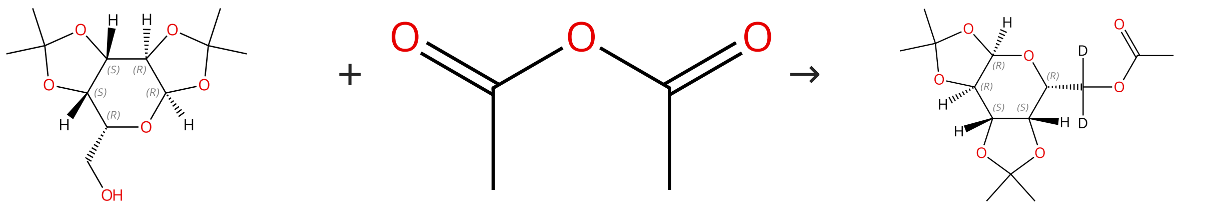
31-116-CAS-9969033	Steps: **1** Yield: **100%**
1.1	**Reagents:** Lithium hydroxide, Hydrogen **Catalysts:** Ruthenium **Solvents:** Water-d_2; 80 °C; 80 °C → rt
1.2	**Reagents:** Water
1.3	**Reagents:** Pyridine; 24 h, rt
Experimental Protocols	

Stereo- and Regioselective Direct Multi-Deuterium-Labeling Methods for Sugars

By: Sawama, Yoshinari; et al

Chemistry - A European Journal (2012), 18(51), 16436-16442.

Scheme 10 (1 Reaction) Steps: **1** Yield: **100%**



Absolute stereochemistry shown, Rotation (-)

Suppliers (79)

Suppliers (90)

Absolute stereochemistry shown, Rotation (-)

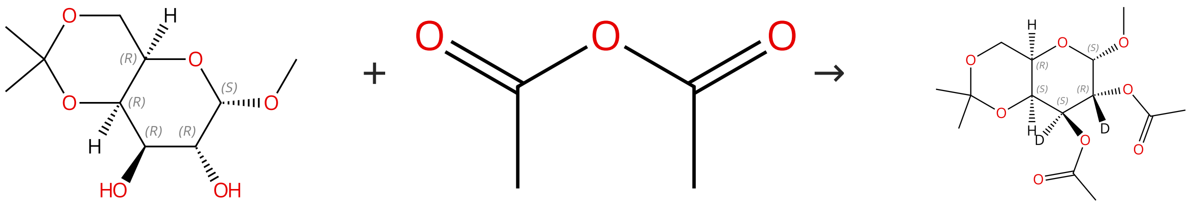
31-116-CAS-14225819	Steps: **1** Yield: **100%**
1.1	**Reagents:** Sodium hydroxide, Hydrogen **Catalysts:** Ruthenium **Solvents:** Water-d_2; 80 °C; 80 °C → rt
1.2	**Reagents:** Water
1.3	**Reagents:** Pyridine; 24 h, rt
Experimental Protocols	

Stereo- and Regioselective Direct Multi-Deuterium-Labeling Methods for Sugars

By: Sawama, Yoshinari; et al

Chemistry - A European Journal (2012), 18(51), 16436-16442.

Scheme 11 (1 Reaction) Steps: **1** Yield: **100%**



Absolute stereochemistry shown

Suppliers (90)

Absolute stereochemistry shown

31-116-CAS-12096622 Steps: **1** Yield: **100%**

1.1 **Reagents:** Lithium hydroxide, Hydrogen
Catalysts: Ruthenium
Solvents: Water-*d*$_2$; 80 °C; 80 °C → rt

1.2 **Reagents:** Water

1.3 **Reagents:** Pyridine; 24 h, rt

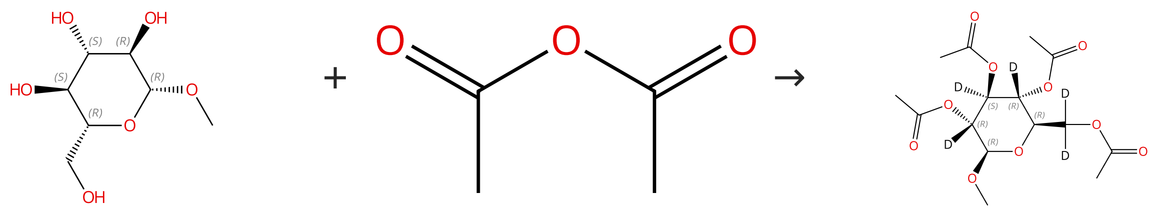
Experimental Protocols

Stereo- and Regioselective Direct Multi-Deuterium-Labeling Methods for Sugars

By: Sawama, Yoshinari; et al

Chemistry - A European Journal (2012), 18(51), 16436-16442.

Scheme 12 (2 Reactions) Steps: **1** Yield: **100%**



Absolute stereochemistry shown, Rotation (-)

Suppliers (78)

Suppliers (90)

Absolute stereochemistry shown, Rotation (-)

31-116-CAS-12423064 Steps: **1** Yield: **100%**

1.1 **Reagents:** Hydrogen
Catalysts: Ruthenium
Solvents: Water-*d*$_2$; 24 h, 80 °C; 80 °C → rt

1.2 **Reagents:** Water

1.3 **Reagents:** Pyridine; 24 h, rt

Experimental Protocols

Stereo- and Regioselective Direct Multi-Deuterium-Labeling Methods for Sugars

By: Sawama, Yoshinari; et al

Chemistry - A European Journal (2012), 18(51), 16436-16442.

31-116-CAS-12321531 Steps: **1** Yield: **100%**

1.1 **Reagents:** Hydrogen, Water-*d*$_2$
Catalysts: Ruthenium, Carbon
Solvents: Water-*d*$_2$; 24 h, 1 atm, 80 °C; 80 °C → rt

1.2 **Reagents:** Pyridine
Solvents: Pyridine; 24 h, rt

Experimental Protocols

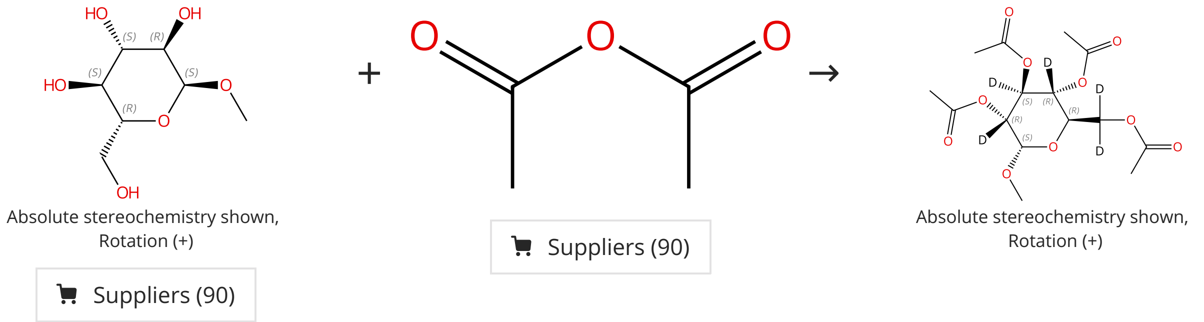
Method for regio-, chemo- and stereoselective deuterium labeling of sugars based on ruthenium-catalyzed C-H bond activation

By: Fujiwara, Yuta; et al

Chemical Communications (Cambridge, United Kingdom) (2010), 46(27), 4977-4979.

Scheme 13 (2 Reactions)

Steps: **1** Yield: **97-100%**



31-116-CAS-3401088

Steps: **1** Yield: **100%**

1.1 **Reagents:** Hydrogen
Catalysts: Ruthenium
Solvents: Water-d_2; 24 h, 80 °C; 80 °C → rt

1.2 **Reagents:** Water

1.3 **Reagents:** Pyridine; 24 h, rt

Experimental Protocols

Stereo- and Regioselective Direct Multi-Deuterium-Labeling Methods for Sugars

By: Sawama, Yoshinari; et al

Chemistry - A European Journal (2012), 18(51), 16436-16442.

31-116-CAS-1357090

Steps: **1** Yield: **97%**

1.1 **Reagents:** Hydrogen, Water-d_2
Catalysts: Ruthenium, Carbon
Solvents: Water-d_2; 24 h, 1 atm, 80 °C; 80 °C → rt

1.2 **Reagents:** Pyridine
Solvents: Pyridine; 24 h, rt

Experimental Protocols

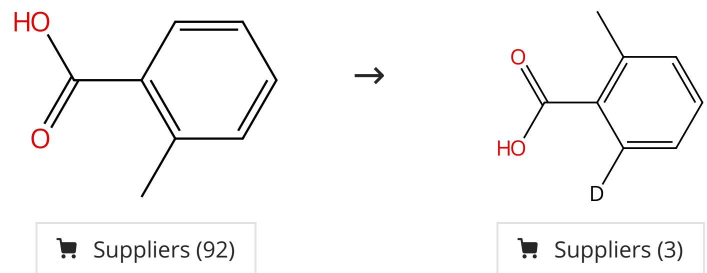
Method for regio-, chemo- and stereoselective deuterium labeling of sugars based on ruthenium-catalyzed C-H bond activation

By: Fujiwara, Yuta; et al

Chemical Communications (Cambridge, United Kingdom) (2010), 46(27), 4977-4979.

Scheme 14 (7 Reactions)

Steps: **1** Yield: **10-100%**



31-116-CAS-23508869

Steps: **1** Yield: **100%**

1.1 **Reagents:** Cesium carbonate, Water-d_2
Catalysts: Bis(dichloro(η^6-*p*-cymene)ruthenium)
Solvents: Dimethylacetamide; 18 h, 120 °C; cooled

1.2 **Reagents:** Hydrochloric acid
Solvents: Water

Experimental Protocols

Ru-Catalyzed (E)-Specific ortho-C-H Alkenylation of Arenecar boxylic Acids by Coupling with Alkenyl Bromides

By: Hu, Zhiyong; et al

Organic Letters (2021), 23(9), 3541-3545.

31-116-CAS-20858311

Steps: **1** Yield: **97%**

1.1 **Reagents:** Water-d_2
Catalysts: [(1,2,3,4,5,6-η)-1-Methyl-4-(1-methylethyl)benzene](tricyclo[3.3.1.1^{3,7}]decane-1-carboxylato-κ*O*)(tricyclo[3.3.1.1^{3,7}]decane-1-carboxylato-κ*O*,κ*O'*)ruthenium
Solvents: 1,4-Dioxane; 16 h, 100 °C

Experimental Protocols

Ruthenium(II)-Catalyzed Hydrogen Isotope Exchange of Pharmaceutical Drugs by C-H Deuteration and C-H Tritiation

By: Mueller, Valentin; et al

ChemCatChem (2020), 12(1), 100-104.

31-116-CAS-20662437 Steps: 1 Yield: 88%	Oxazolinyl-Assisted Ru(II)-Catalyzed C-H Allylation with Allyl Alcohols and Synthesis of 4-Methyleneisochroman-1-ones
1.1 **Reagents:** Potassium carbonate, Water-d_2 **Catalysts:** Bis(dichloro(η^6-*p*-cymene)ruthenium); rt → 85 °C; 12 h, 85 °C	By: Singh, Diksha; et al
Experimental Protocols	Journal of Organic Chemistry (2019), 84(20), 12881-12892.

31-116-CAS-21925189 Steps: 1 Yield: 10%	Enhancing Ru(II)-catalysis with visible-light-mediated dye-sensitized TiO_2 photocatalysis for oxidative C-H olefination of arene carboxylic acids at room temperature
1.1 **Catalysts:** Titania (Erythrosine B modified), Erythrosine (surface modified on titania) **Solvents:** Methanol; 30 min, rt	By: Dana, Suman; et al
1.2 **Reagents:** Potassium acetate, Phenyl vinyl sulfone, Oxygen, Water-d_2 **Catalysts:** Bis(dichloro(η^6-*p*-cymene)ruthenium); 8 h, rt	Chemistry - An Asian Journal (2020), 15(5), 564-567.
Experimental Protocols	

31-614-CAS-37729693 Steps: 1	Redox-Neutral Site-Selective C-H Allylation and Iodolacto nization of Benzoic Acids Using Morita- Baylis-Hillman Adducts in Water
1.1 **Reagents:** Cesium acetate, Water-d_2 **Catalysts:** Bis(dichloro(η^6-*p*-cymene)ruthenium); 12 h, 100 °C	By: Bhattacharyya, Hemanga; et al
Experimental Protocols	Organic Letters (2023), 25(37), 6830-6834.

31-116-CAS-23908706 Steps: 1	Merging C-H Activation and Strain-Release in Ruthenium-Catalyzed Isoindolinone Synthesis
1.1 **Reagents:** Water-d_2, Propanoic acid, 2,2-dimethyl-, potassium salt (1:1) **Catalysts:** Bis(dichloro(η^6-*p*-cymene)ruthenium) **Solvents:** Toluene; 10 min, 140 °C	By: Hu, Xiao-Qiang; et al
Experimental Protocols	Organic Letters (2021), 23(16), 6332-6336.

31-116-CAS-19248941 Steps: 1	Regioselective C-H Alkylation via Carboxylate-Directed Hydroarylation in Water
1.1 **Reagents:** Trilithium phosphate **Catalysts:** Bis(dichloro(η^6-*p*-cymene)ruthenium) **Solvents:** Water-d_2; 12 h, 110 °C	By: Zhang, Guodong; et al
Experimental Protocols	Chemistry - A European Journal (2018), 24(18), 4537-4541.

Scheme 15 (1 Reaction) Steps: 1 Yield: 100%

Absolute stereochemistry shown, Rotation (-)

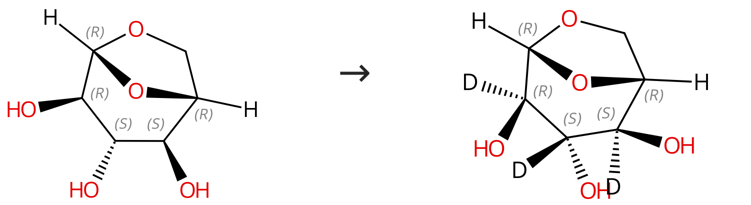
Absolute stereochemistry shown

Suppliers (80)

31-116-CAS-5366143 Steps: 1 Yield: 100%	Stereo- and Regioselective Direct Multi-Deuterium-Labeling Methods for Sugars
1.1 **Reagents:** Sodium hydroxide, Hydrogen **Catalysts:** Ruthenium **Solvents:** Water-d_2; 80 °C; 80 °C → rt	By: Sawama, Yoshinari; et al
1.2 **Reagents:** Water	Chemistry - A European Journal (2012), 18(51), 16436-16442.
Experimental Protocols	

Scheme 16 (1 Reaction)

Steps: **1** Yield: **100%**



Absolute stereochemistry shown

Suppliers (117)

Absolute stereochemistry shown, Rotation (-)

31-116-CAS-7220221

Steps: **1** Yield: **100%**

1.1 **Reagents:** Hydrogen
Catalysts: Ruthenium
Solvents: Water-d_2; 80 °C; 80 °C → rt

1.2 **Reagents:** Water

Experimental Protocols

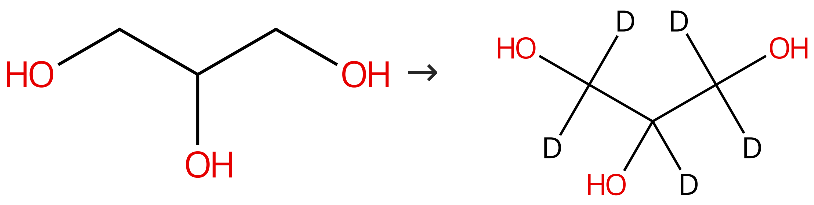
Stereo- and Regioselective Direct Multi-Deuterium-Labeling Methods for Sugars

By: Sawama, Yoshinari; et al

Chemistry - A European Journal (2012), 18(51), 16436-16442.

Scheme 17 (1 Reaction)

Steps: **1** Yield: **100%**



Suppliers (337)

Suppliers (57)

31-116-CAS-3912216

Steps: **1** Yield: **100%**

1.1 **Reagents:** Hydrogen, Water-d_2
Catalysts: Ruthenium
Solvents: Water-d_2; 24 h, 1 atm, 80 °C

1.2 **Reagents:** Water
Solvents: Diethyl ether; rt

Experimental Protocols

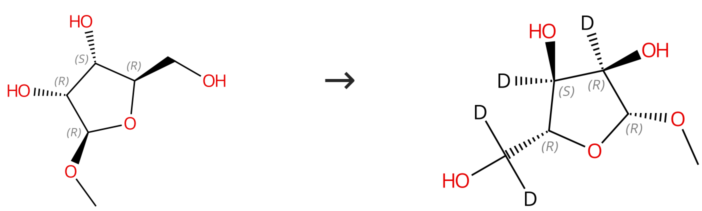
A convenient and effective method for the regioselective deuteration of alcohols

By: Maegawa, Tomohiro; et al

Advanced Synthesis & Catalysis (2008), 350(14+15), 2215-2218.

Scheme 18 (1 Reaction)

Steps: **1** Yield: **100%**



Absolute stereochemistry shown

Suppliers (91)

Absolute stereochemistry shown

31-116-CAS-21872410

Steps: **1** Yield: **100%**

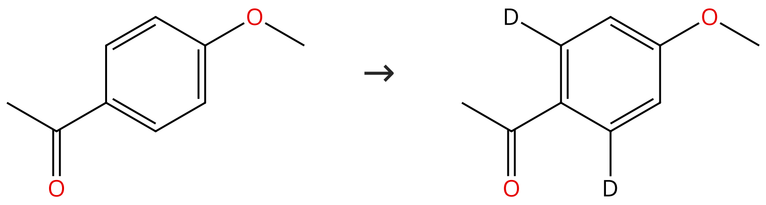
1.1 **Reagents:** Sodium hydroxide, Water-d_2
Catalysts: Ruthenium; 24 h, 80 °C

Practical and reliable synthesis of 2',3',5',5''-tetradeuterated uridine derivatives

By: Miyamoto, Noriko; et al

Nucleosides, Nucleotides & Nucleic Acids (2020), 39(1-3), 236-244.

Scheme 19 (1 Reaction) Steps: **1** Yield: **99%**



Suppliers (103)

31-116-CAS-20984005 Steps: **1** Yield: **99%**

1.1 **Reagents:** Zinc, Water-d_2
Catalysts: Cuprous iodide, Dichlorotris(triphenylphosphine) ruthenium
Solvents: 1,4-Dioxane; 16 h, 80 °C

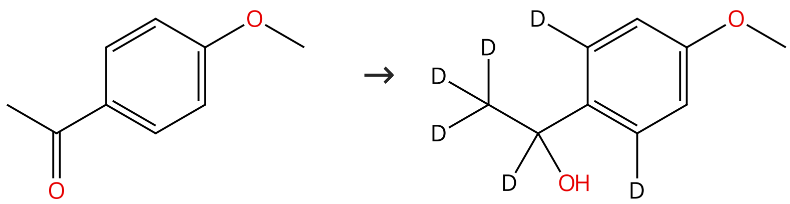
Experimental Protocols

Mild, Selective Ru-Catalyzed Deuteration Using D_2O as a Deuterium Source

By: Eisele, Pascal; et al

Chemistry - A European Journal (2019), 25(72), 16550-16554.

Scheme 20 (1 Reaction) Steps: **1** Yield: **99%**



Suppliers (103)

31-116-CAS-20984007 Steps: **1** Yield: **99%**

1.1 **Reagents:** Zinc, Water-d_2, Potassium hydroxide (K(OD))
Catalysts: Dichlorotris(triphenylphosphine)ruthenium
Solvents: 1,4-Dioxane; 62 h, 80 °C

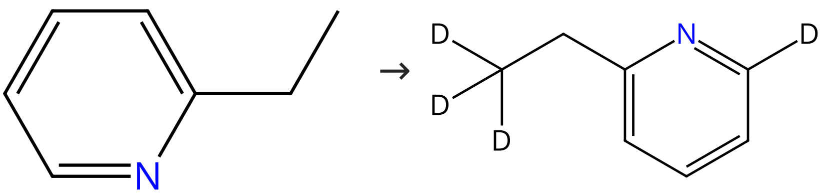
Experimental Protocols

Mild, Selective Ru-Catalyzed Deuteration Using D_2O as a Deuterium Source

By: Eisele, Pascal; et al

Chemistry - A European Journal (2019), 25(72), 16550-16554.

Scheme 21 (1 Reaction) Steps: **1** Yield: **99%**



Suppliers (58)

31-116-CAS-20984028 Steps: **1** Yield: **99%**

1.1 **Reagents:** Zinc, Water-d_2, Potassium hydroxide (K(OD))
Catalysts: Dichlorotris(triphenylphosphine)ruthenium
Solvents: 1,4-Dioxane; 16 h, 80 °C

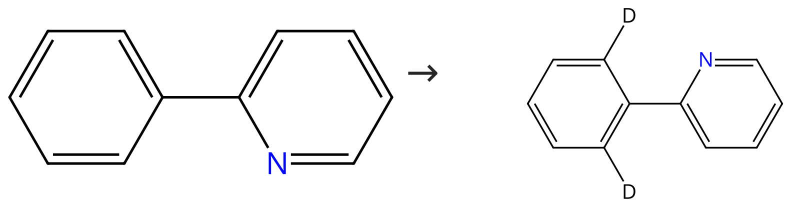
Experimental Protocols

Mild, Selective Ru-Catalyzed Deuteration Using D_2O as a Deuterium Source

By: Eisele, Pascal; et al

Chemistry - A European Journal (2019), 25(72), 16550-16554.

Scheme 22 (6 Reactions) Steps: **1** Yield: **64-99%**



Suppliers (94) Supplier (1)

31-116-CAS-20984008 Steps: **1** Yield: **99%**

1.1 **Reagents:** Zinc, Water-*d*$_2$
Catalysts: Cuprous iodide, Dichlorotris(triphenylphosphine) ruthenium
Solvents: 1,4-Dioxane; 16 h, 80 °C

Experimental Protocols

Mild, Selective Ru-Catalyzed Deuteration Using D_2O as a Deuterium Source

By: Eisele, Pascal; et al

Chemistry - A European Journal (2019), 25(72), 16550-16554.

31-116-CAS-20248700 Steps: **1** Yield: **93%**

1.1 **Reagents:** Water-*d*$_2$
Catalysts: Potassium acetate, Carbonylchlorohydrotris (triphenylphosphine)ruthenium
Solvents: Toluene; 12 h, 120 °C

Experimental Protocols

Ruthenium(II)/acetate catalyzed intermolecular dehydrog enative ortho C-H silylation of 2-aryl N-containing hetero cycles

By: Liu, Shun; et al

Organic & Biomolecular Chemistry (2019), 17(16), 4115-4120.

31-614-CAS-31698259 Steps: **1** Yield: **82%**

1.1 **Reagents:** 2,4,6-Trimethylbenzoic acid, Potassium carbonate, Water-*d*$_2$
Catalysts: Bis(dichloro(η^6-*p*-cymene)ruthenium); 24 h, 100 °C

Experimental Protocols

Distal Ruthenaelectro-Catalyzed meta-C-H Bromination with Aqueous HBr

By: Wang, Yulei; et al

Angewandte Chemie, International Edition (2022), 61(20), e202201595.

31-116-CAS-16445132 Steps: **1** Yield: **72%**

1.1 **Reagents:** Potassium carbonate, Acetic acid-*d*
Catalysts: Bis(dichloro(η^6-*p*-cymene)ruthenium)
Solvents: Water-*d*$_2$; 20 h, 100 °C

Mechanistic insight into ruthenium catalysed meta-sulfon ation of 2-phenylpyridine

By: Marce, Patricia; et al

Catalysis Science & Technology (2016), 6(19), 7068-7076.

31-116-CAS-18829303 Steps: **1** Yield: **64%**

1.1 **Reagents:** Bis(trifluoroacetoxy)iodobenzene, Water-*d*$_2$
Catalysts: Triruthenium dodecacarbonyl, 1*H*-Imidazolium, 4,5-dihydro-1,3-bis(2,4,6-trimethylphenyl)-, chloride (1:1)
Solvents: Bromobenzene; 48 h, 95 °C

Experimental Protocols

Ligand-promoted ruthenium-catalyzed meta C-H chlorination of arenes using N-chloro-2,10-camphorsultam

By: Fan, Zhoulong; et al

Chemical Communications (Cambridge, United Kingdom) (2018), 54(47), 6008-6011.

31-116-CAS-11406524 Steps: **1**

1.1 **Reagents:** Water-*d*$_2$
Catalysts: Stereoisomer of dihydro[(1,2,3,3a,7a-η)-1-phenyl-1*H*-inden-1-yl](triethylsilyl)(triphenylphosphine)ruthenium
Solvents: Toluene; 16 h, 110 °C

Experimental Protocols

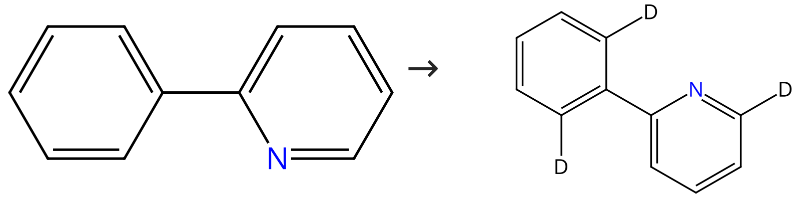
Regioselective ruthenium catalysed H-D exchange using D_2O as the deuterium source

By: Piola, Lorenzo; et al

Organic & Biomolecular Chemistry (2014), 12(43), 8683-8688.

Scheme 23 (2 Reactions)

Steps: **1** Yield: **95-99%**



Suppliers (94)

31-116-CAS-20984009 Steps: **1** Yield: **99%**

1.1 **Reagents:** Zinc, Water-*d*$_2$, Potassium hydroxide (K(OD))
Catalysts: Dichlorotris(triphenylphosphine)ruthenium
Solvents: 1,4-Dioxane; 16 h, 80 °C

Experimental Protocols

Mild, Selective Ru-Catalyzed Deuteration Using D_2O as a Deuterium Source

By: Eisele, Pascal; et al

Chemistry - A European Journal (2019), 25(72), 16550-16554.

31-614-CAS-39940604 Steps: **1** Yield: **95%**

1.1 **Reagents:** Potassium acetate, Water-*d*$_2$
Catalysts: Ruthenium(2+), aquapentakis(2,2-dimethylpropane nitrile)-, (*OC*-6-22)-, tetrafluoroborate(1-) (1:2)
Solvents: Tetrahydrofuran; 24 h, 40 °C

Experimental Protocols

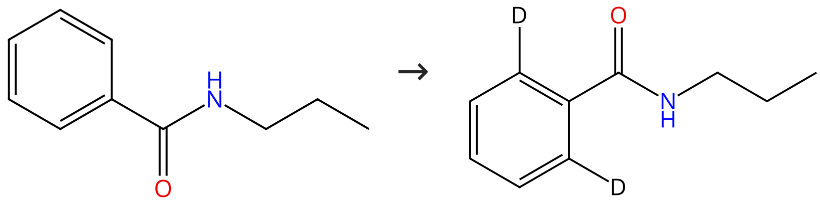
An air- and moisture-stable ruthenium precatalyst for diverse reactivity

By: McArthur, Gillian; et al

Nature Chemistry (2024), 16(7), 1141-1150.

Scheme 24 (1 Reaction)

Steps: **1** Yield: **99%**



Suppliers (32)

31-116-CAS-20984026 Steps: **1** Yield: **99%**

1.1 **Reagents:** Zinc, Water-*d*$_2$, Potassium hydroxide (K(OD))
Catalysts: Dichlorotris(triphenylphosphine)ruthenium
Solvents: 1,4-Dioxane; 62 h, 80 °C

Experimental Protocols

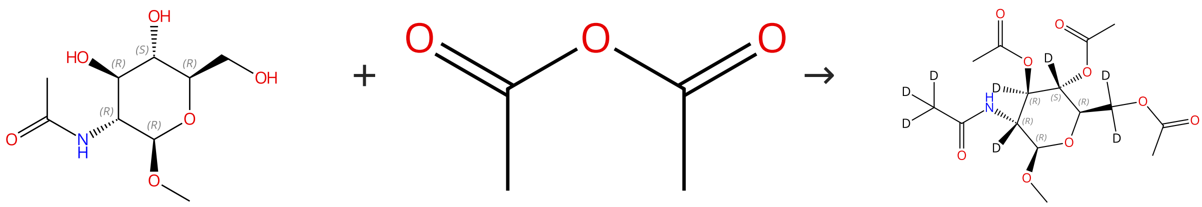
Mild, Selective Ru-Catalyzed Deuteration Using D_2O as a Deuterium Source

By: Eisele, Pascal; et al

Chemistry - A European Journal (2019), 25(72), 16550-16554.

Scheme 25 (1 Reaction)

Steps: **1** Yield: **99%**



Absolute stereochemistry shown, Rotation (-)

Suppliers (51)

Suppliers (90)

Absolute stereochemistry shown

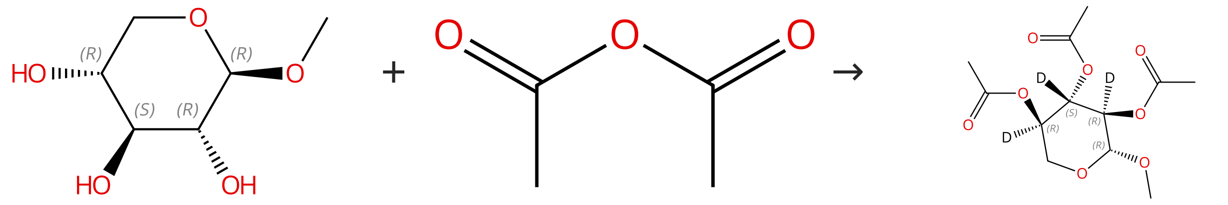
31-116-CAS-3567152	Steps: **1** Yield: **99%**
1.1	**Reagents:** Hydrogen **Catalysts:** Ruthenium **Solvents:** Water-*d*$_2$; 24 h, 80 °C; 80 °C → rt
1.2	**Reagents:** Water
1.3	**Reagents:** Pyridine; 4 d, rt
Experimental Protocols	

Stereo- and Regioselective Direct Multi-Deuterium-Labeling Methods for Sugars

By: Sawama, Yoshinari; et al

Chemistry - A European Journal (2012), 18(51), 16436-16442.

Scheme 26 (2 Reactions) Steps: **1** Yield: **99%**



Absolute stereochemistry shown, Rotation (-)

Suppliers (62)

Suppliers (90)

Absolute stereochemistry shown, Rotation (-)

31-116-CAS-1168046	Steps: **1** Yield: **99%**
1.1	**Reagents:** Hydrogen **Catalysts:** Ruthenium **Solvents:** Water-*d*$_2$; 24 h, 80 °C; 80 °C → rt
1.2	**Reagents:** Water
1.3	**Reagents:** Pyridine; 24 h, rt
Experimental Protocols	

Stereo- and Regioselective Direct Multi-Deuterium-Labeling Methods for Sugars

By: Sawama, Yoshinari; et al

Chemistry - A European Journal (2012), 18(51), 16436-16442.

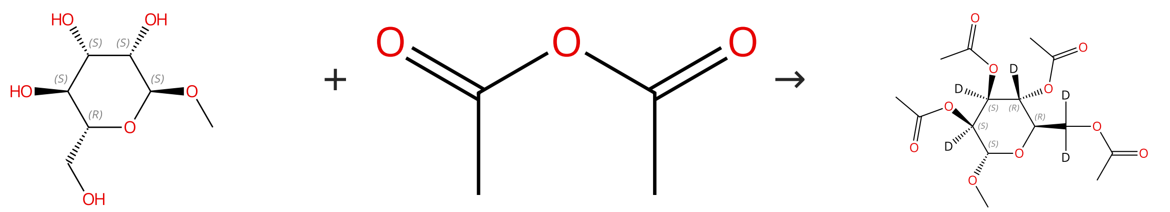
31-116-CAS-1058513	Steps: **1** Yield: **99%**
1.1	**Reagents:** Hydrogen, Water-*d*$_2$ **Catalysts:** Ruthenium, Carbon **Solvents:** Water-*d*$_2$; 24 h, 1 atm, 80 °C; 80 °C → rt
1.2	**Reagents:** Pyridine **Solvents:** Pyridine; 24 h, rt
Experimental Protocols	

Method for regio-, chemo- and stereoselective deuterium labeling of sugars based on ruthenium-catalyzed C-H bond activation

By: Fujiwara, Yuta; et al

Chemical Communications (Cambridge, United Kingdom) (2010), 46(27), 4977-4979.

Scheme 27 (2 Reactions) Steps: **1** Yield: **99%**



Absolute stereochemistry shown

Suppliers (114)

Suppliers (90)

Absolute stereochemistry shown, Rotation (+)

31-116-CAS-14552431	Steps: **1** Yield: **99%**
1.1	**Reagents:** Hydrogen **Catalysts:** Ruthenium **Solvents:** Water-*d*$_2$; 24 h, 80 °C; 80 °C → rt
1.2	**Reagents:** Water
1.3	**Reagents:** Pyridine; 24 h, rt
Experimental Protocols	

Stereo- and Regioselective Direct Multi-Deuterium-Labeling Methods for Sugars

By: Sawama, Yoshinari; et al

Chemistry - A European Journal (2012), 18(51), 16436-16442.

31-116-CAS-14451409 Steps: **1** Yield: **99%**

1.1 **Reagents:** Hydrogen, Water-d_2
Catalysts: Ruthenium, Carbon
Solvents: Water-d_2; 24 h, 1 atm, 80 °C; 80 °C → rt

1.2 **Reagents:** Pyridine
Solvents: Pyridine; 24 h, rt

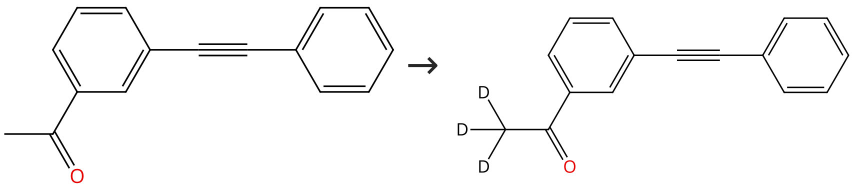
Experimental Protocols

Method for regio-, chemo- and stereoselective deuterium labeling of sugars based on ruthenium-catalyzed C-H bond activation

By: Fujiwara, Yuta; et al

Chemical Communications (Cambridge, United Kingdom) (2010), 46(27), 4977-4979.

Scheme 28 (1 Reaction) Steps: **1** Yield: **99%**



Suppliers (18)

31-116-CAS-20984044 Steps: **1** Yield: **99%**

1.1 **Reagents:** Water-d_2, Potassium hydroxide (K(OD))
Catalysts: Dichlorotris(triphenylphosphine)ruthenium
Solvents: 1,4-Dioxane; 16 h, 80 °C

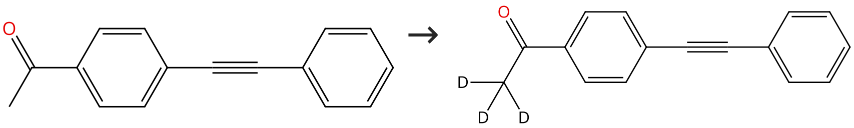
Experimental Protocols

Mild, Selective Ru-Catalyzed Deuteration Using D_2O as a Deuterium Source

By: Eisele, Pascal; et al

Chemistry - A European Journal (2019), 25(72), 16550-16554.

Scheme 29 (1 Reaction) Steps: **1** Yield: **99%**



Suppliers (55)

31-116-CAS-20984041 Steps: **1** Yield: **99%**

1.1 **Reagents:** Water-d_2, Potassium hydroxide (K(OD))
Catalysts: Dichlorotris(triphenylphosphine)ruthenium
Solvents: 1,4-Dioxane; 16 h, 80 °C

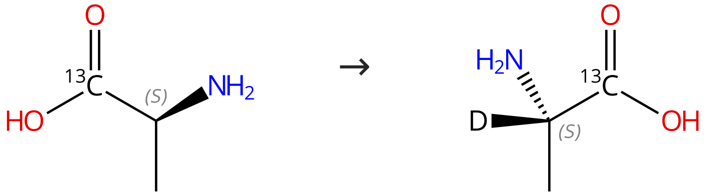
Experimental Protocols

Mild, Selective Ru-Catalyzed Deuteration Using D_2O as a Deuterium Source

By: Eisele, Pascal; et al

Chemistry - A European Journal (2019), 25(72), 16550-16554.

Scheme 30 (1 Reaction) Steps: **1** Yield: **99%**



Absolute stereochemistry shown

Absolute stereochemistry shown

Suppliers (36)

Suppliers (4)

31-116-CAS-20212403

Steps: **1** Yield: **99%**

1.1 **Reagents:** Hydrogen, Water-d_2
Catalysts: Ruthenium carbide; 16 h, 1 atm, 80 °C

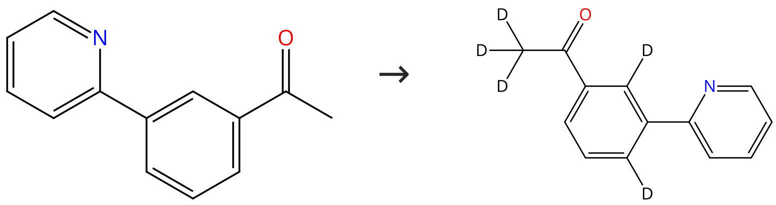
Late-stage deuteration of ^{13}C-enriched substrates for T_1 prolongation in hyperpolarized ^{13}C MRI

By: Taglang, Celine; et al

Chemical Communications (Cambridge, United Kingdom) (2018), 54(41), 5233-5236.

Scheme 31 (2 Reactions)

Steps: **1** Yield: **82-99%**



Suppliers (26)

31-116-CAS-20984039

Steps: **1** Yield: **99%**

1.1 **Reagents:** Water-d_2, Potassium hydroxide (K(OD))
Catalysts: Dichlorotris(triphenylphosphine)ruthenium
Solvents: 1,4-Dioxane; 16 h, 80 °C

Experimental Protocols

Mild, Selective Ru-Catalyzed Deuteration Using D_2O as a Deuterium Source

By: Eisele, Pascal; et al

Chemistry - A European Journal (2019), 25(72), 16550-16554.

31-116-CAS-20984038

Steps: **1** Yield: **82%**

1.1 **Reagents:** Zinc, Water-d_2
Catalysts: Cuprous iodide, Dichlorotris(triphenylphosphine) ruthenium
Solvents: 1,4-Dioxane; 16 h, 80 °C

Experimental Protocols

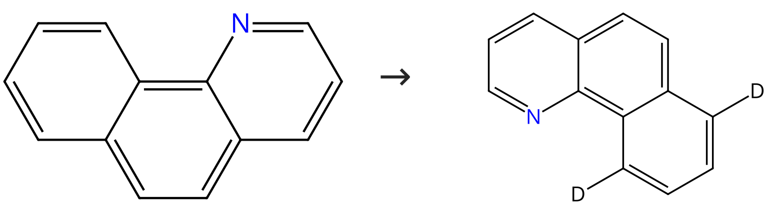
Mild, Selective Ru-Catalyzed Deuteration Using D_2O as a Deuterium Source

By: Eisele, Pascal; et al

Chemistry - A European Journal (2019), 25(72), 16550-16554.

Scheme 32 (1 Reaction)

Steps: **1** Yield: **99%**



Suppliers (81)

31-614-CAS-31790023

Steps: **1** Yield: **99%**

1.1 **Reagents:** Potassium carbonate, Water-d_2
Catalysts: Bis(dichloro(η^6-*p*-cymene)ruthenium)
Solvents: 1,4-Dioxane; 15 h, 125 °C

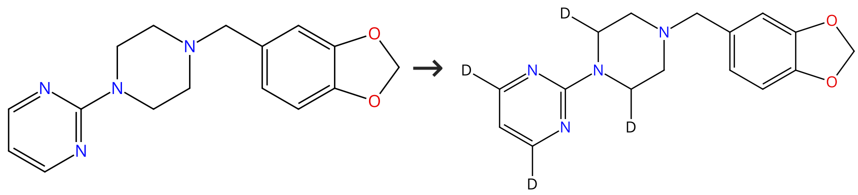
Experimental Protocols

Ruthenium(II)-Catalyzed Chelation-Assisted Desulfitative Arylation of Benzo[h]quinolines with Arylsulfonyl Chlorides

By: Xu, Yi-Xin; et al

Organic Letters (2022), 24(14), 2601-2606.

Scheme 33 (1 Reaction) Steps: **1** Yield: **99%**



Suppliers (72)

31-116-CAS-20984035 Steps: **1** Yield: **99%**

1.1 **Reagents:** Zinc, Water-d_2, Potassium hydroxide (K(OD))
Catalysts: Dichlorotris(triphenylphosphine)ruthenium
Solvents: 1,4-Dioxane; 16 h, 80 °C

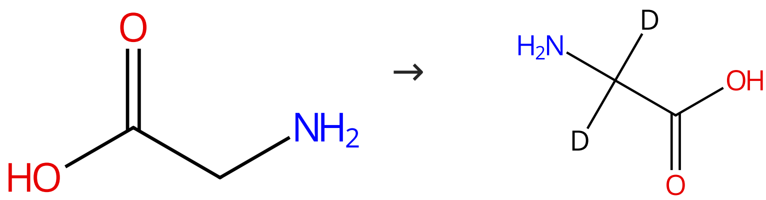
Experimental Protocols

Mild, Selective Ru-Catalyzed Deuteration Using D_2O as a Deuterium Source

By: Eisele, Pascal; et al

Chemistry - A European Journal (2019), 25(72), 16550-16554.

Scheme 34 (1 Reaction) Steps: **1** Yield: **99%**



Suppliers (248)

Suppliers (38)

31-116-CAS-17957976 Steps: **1** Yield: **99%**

1.1 **Reagents:** Sodium hydroxide, Hydrogen, Water- d_2
Catalysts: Ruthenium; 72 h, 70 °C; 70 °C → rt

1.2 **Reagents:** Dowex 50W-X8; pH 5 - 6, rt

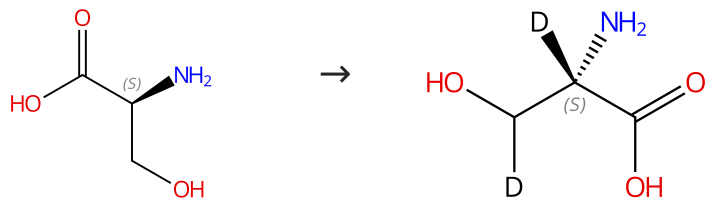
Experimental Protocols

Development and Scale-Up of Stereoretentive α-Deuteration of Amines

By: Michelotti, Alessia; et al

Organic Process Research & Development (2017), 21(11), 1741-1744.

Scheme 35 (1 Reaction) Steps: **1** Yield: **99%**



Absolute stereochemistry shown, Rotation (-)

Absolute stereochemistry shown

Suppliers (177)

31-116-CAS-5173454 Steps: **1** Yield: **99%**

1.1 **Reagents:** Deuterium
Catalysts: Ruthenium
Solvents: Water-d_2; 36 h, 2 bar, 55 °C

Experimental Protocols

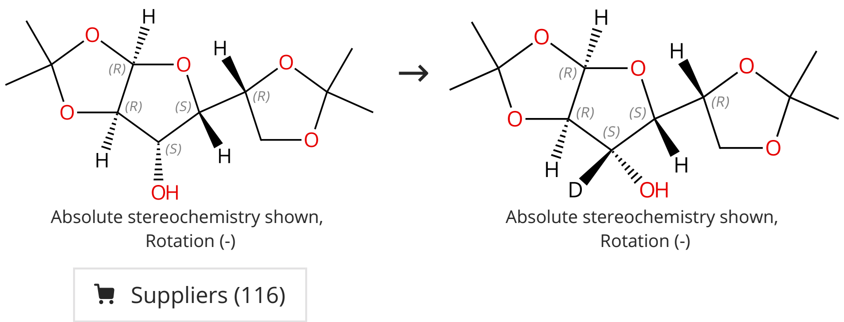
Enantiospecific C-H activation using ruthenium nanocatalysts

By: Taglang, Celine; et al

Angewandte Chemie, International Edition (2015), 54(36), 10474-10477.

Scheme 36 (1 Reaction)

Steps: **1** Yield: **99%**



31-116-CAS-7511854

Steps: **1** Yield: **99%**

1.1 **Reagents:** Sodium hydroxide, Hydrogen
Catalysts: Ruthenium
Solvents: Water-d_2; 80 °C; 80 °C → rt

1.2 **Reagents:** Water

Experimental Protocols

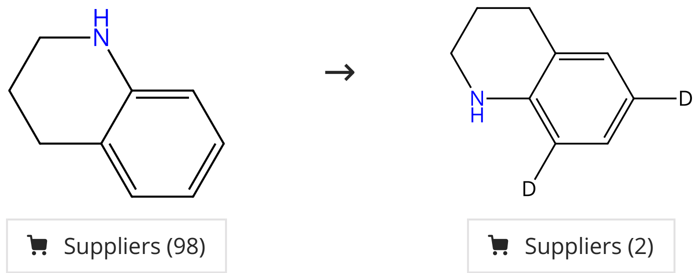
Stereo- and Regioselective Direct Multi-Deuterium-Labeling Methods for Sugars

By: Sawama, Yoshinari; et al

Chemistry - A European Journal (2012), 18(51), 16436-16442.

Scheme 37 (1 Reaction)

Steps: **1** Yield: **99%**



31-116-CAS-7940085

Steps: **1** Yield: **99%**

1.1 **Reagents:** Water-d_2
Catalysts: Triruthenium dodecacarbonyl; 12 h, 120 °C

Experimental Protocols

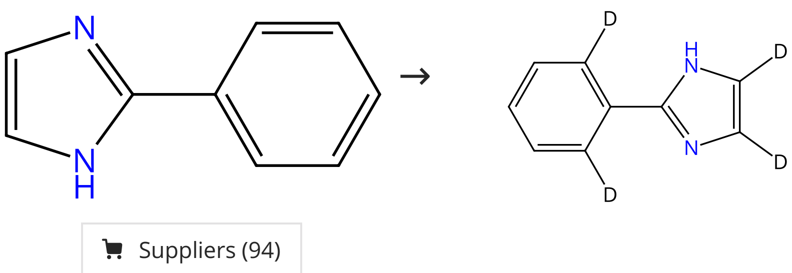
A convenient method for the Ru(0)-catalyzed regioselective deuteration of N-alkyl-substituted anilines

By: Zhan, Miao; et al

Tetrahedron Letters (2014), 55(36), 5070-5073.

Scheme 38 (1 Reaction)

Steps: **1** Yield: **99%**



31-116-CAS-20984011

Steps: **1** Yield: **99%**

1.1 **Reagents:** Water-d_2, Potassium hydroxide (K(OD))
Catalysts: Dichlorotris(triphenylphosphine)ruthenium
Solvents: 1,4-Dioxane; 16 h, 80 °C

Experimental Protocols

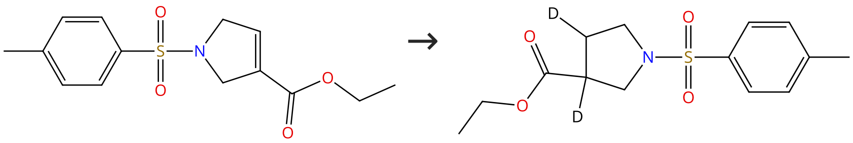
Mild, Selective Ru-Catalyzed Deuteration Using D_2O as a Deuterium Source

By: Eisele, Pascal; et al

Chemistry - A European Journal (2019), 25(72), 16550-16554.

Scheme 39 (1 Reaction)

Steps: **1** Yield: **99%**



Suppliers (2)

31-614-CAS-35386477

Steps: **1** Yield: **99%**

1.1 **Reagents:** Water-*d*$_2$, 2883789-97-5
Catalysts: Tris(2,2'-bipyridyl)ruthenium(II) chloride, (*SP*-4-2)-[[2,2'-[1,2-Phenylenebis[(nitrilo-κ*N*)methylidyne]]bis[4,6-bis(1,1-dimethylethyl)phenolato-κ*O*]](2-)]cobalt
Solvents: Acetonitrile; 18 h, 10 °C; 0 °C

1.2 **Reagents:** Sodium bicarbonate
Solvents: Water

Experimental Protocols

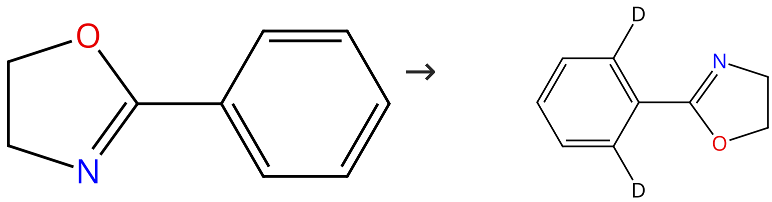
Photocatalytic Deuterium Atom Transfer Deuteration of Electron-Deficient Alkenes with High Functional Group Tolerance

By: Suzuki, Akihiko; et al

Angewandte Chemie, International Edition (2023), 62(3), e202214433.

Scheme 40 (3 Reactions)

Steps: **1** Yield: **99%**



Suppliers (68)

31-116-CAS-20984018

Steps: **1** Yield: **99%**

1.1 **Reagents:** Water-*d*$_2$, Potassium hydroxide (K(OD))
Catalysts: Dichlorotris(triphenylphosphine)ruthenium
Solvents: 1,4-Dioxane; 16 h, 80 °C

Experimental Protocols

Mild, Selective Ru-Catalyzed Deuteration Using D_2O as a Deuterium Source

By: Eisele, Pascal; et al

Chemistry - A European Journal (2019), 25(72), 16550-16554.

31-116-CAS-19743397

Steps: **1**

1.1 **Reagents:** Norbornene, Water-*d*$_2$
Catalysts: Potassium acetate, Dichloro[(1,2,5,6-η)-1,5-cyclooctadiene]ruthenium
Solvents: Toluene; 12 h, 120 °C

Experimental Protocols

Ruthenium(II) Acetate Catalyzed Synthesis of Silylated Oxazoles via C-H Silylation and Dehalogenation

By: Liu, Shun; et al

Organic Letters (2019), 21(4), 1134-1138.

31-116-CAS-19849096

Steps: **1**

1.1 **Reagents:** Cesium acetate, Water-*d*$_2$
Catalysts: Silver hexafluoroantimonate, Bis(dichloro(η^6-*p*-cymene)ruthenium)
Solvents: 1,2-Dichloroethane; rt → 90 °C; 10 h, 90 °C

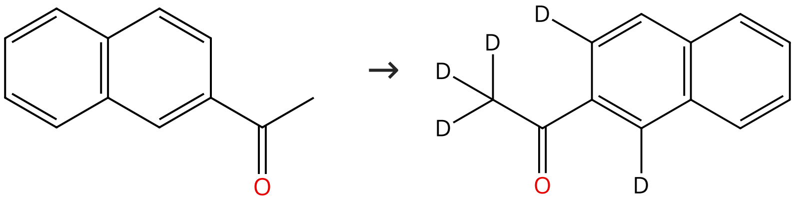
Experimental Protocols

Oxazolinyl-assisted Ru(II)-Catalyzed C-H Functionalization Based on Carbene Migratory Insertion: A One-pot Three-component Cascade Cyclization

By: Kumar, Gangam Srikanth; et al

Advanced Synthesis & Catalysis (2019), 361(1), 73-78.

Scheme 41 (1 Reaction) Steps: **1** Yield: **99%**



Suppliers (96)

31-116-CAS-24181666 Steps: **1** Yield: **99%**

1.1 **Reagents:** Water-*d*$_2$
Catalysts: 4-Chlorobenzoic acid, Silver hexafluoroantimonate, Bis(dichloro(η^6-*p*-cymene)ruthenium), 2-Methyl-3-(trifluor omethyl)aniline
Solvents: 1,2-Dichloroethane; rt → 120 °C; 16 h, 120 °C

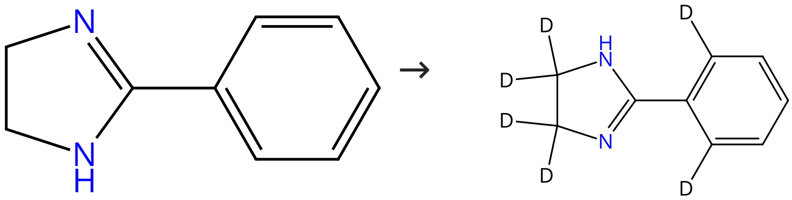
Experimental Protocols

Ruthenium-Catalyzed Deuteration of Aromatic Carbonyl Compounds with a Catalytic Transient Directing Group

By: Kopf, Sara; et al

Chemistry - A European Journal (2021), 27(38), 9768-9773.

Scheme 42 (2 Reactions) Steps: **1** Yield: **99%**



Suppliers (76)

31-116-CAS-20984049 Steps: **1** Yield: **99%**

1.1 **Reagents:** Zinc, Water-*d*$_2$
Catalysts: Cuprous iodide, Hydroiodotris(triphenylphosphine) ruthenium
Solvents: 1,4-Dioxane; 16 h, 80 °C

Experimental Protocols

Mild, Selective Ru-Catalyzed Deuteration Using D_2O as a Deuterium Source

By: Eisele, Pascal; et al

Chemistry - A European Journal (2019), 25(72), 16550-16554.

31-116-CAS-20984014 Steps: **1** Yield: **99%**

1.1 **Reagents:** Zinc, Water-*d*$_2$
Catalysts: Cuprous iodide, Dichlorotris(triphenylphosphine) ruthenium
Solvents: 1,4-Dioxane; 16 h, 80 °C

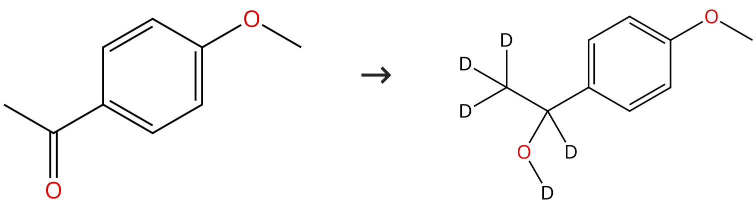
Experimental Protocols

Mild, Selective Ru-Catalyzed Deuteration Using D_2O as a Deuterium Source

By: Eisele, Pascal; et al

Chemistry - A European Journal (2019), 25(72), 16550-16554.

Scheme 43 (1 Reaction) Steps: **1** Yield: **98%**



Suppliers (103)

31-614-CAS-37222113	Steps: **1** Yield: **98%**
1.1	**Reagents:** Methanol-d_4, Potassium hydroxide, Water-d_2 **Catalysts:** Carbonylchloro[2-(diphenylphosphino-κ*P*)-*N*-[2-(diphenylphosphino-κ*P*)ethyl]ethanamine-κ*N*]hydroruthenium; 12 h, 120 °C

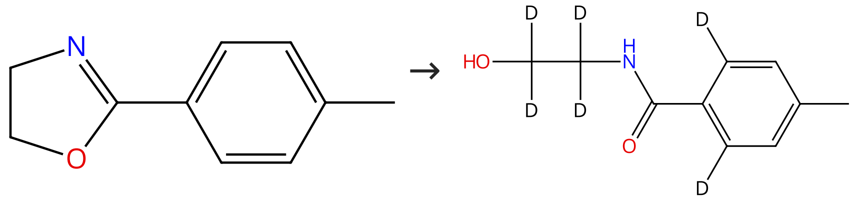
Experimental Protocols

General and selective homogeneous Ru-catalyzed transfer hydrogenation, deuteration, and methylation of functional compounds using methanol

By: Subaramanian, Murugan; et al

Journal of Catalysis (2023), 425, 386-405.

Scheme 44 (1 Reaction) Steps: **1** Yield: **98%**



Suppliers (11)

31-116-CAS-20984019	Steps: **1** Yield: **98%**
1.1	**Reagents:** Zinc, Water-d_2 **Catalysts:** Cuprous iodide, Dichlorotris(triphenylphosphine)ruthenium **Solvents:** 1,4-Dioxane; 16 h, 80 °C

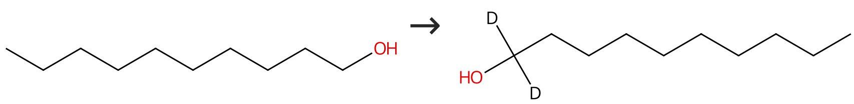
Experimental Protocols

Mild, Selective Ru-Catalyzed Deuteration Using D_2O as a Deuterium Source

By: Eisele, Pascal; et al

Chemistry - A European Journal (2019), 25(72), 16550-16554.

Scheme 45 (3 Reactions) Steps: **1** Yield: **88-98%**



Suppliers (95) Suppliers (8)

31-116-CAS-14616806	Steps: **1** Yield: **98%**
1.1	**Reagents:** Water-d_2 **Catalysts:** Dichlorobis(triphenylphosphine)ruthenium; 30 min, 10 atm, 150 °C

Ruthenium catalyzed deuterium labeling of α-carbon in primary alcohol and primary/secondary amine in D_2O

By: Takahashi, Masaaki; et al

Chemistry Letters (2005), 34(2), 192-193.

31-116-CAS-6713022	Steps: **1** Yield: **88%**
1.1	**Reagents:** Hydrogen, Water-d_2 **Catalysts:** Ruthenium **Solvents:** Water-d_2; 24 h, 1 atm, 80 °C
1.2	**Reagents:** Water **Solvents:** Diethyl ether; rt

Experimental Protocols

A convenient and effective method for the regioselective deuteration of alcohols

By: Maegawa, Tomohiro; et al

Advanced Synthesis & Catalysis (2008), 350(14+15), 2215-2218.

31-116-CAS-12479120	Steps: **1**
1.1	**Reagents:** Water-d_2 **Catalysts:** Dichlorobis(triphenylphosphine)ruthenium; 24 h, 1 atm, reflux

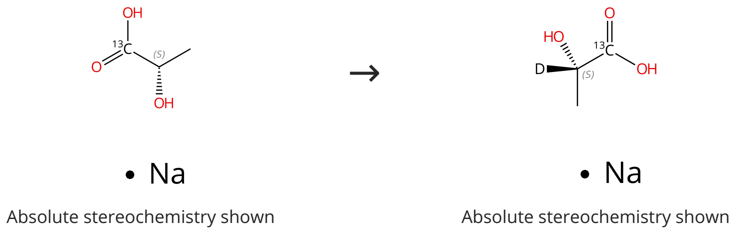
Ruthenium catalyzed deuterium labeling of α-carbon in primary alcohol and primary/secondary amine in D_2O

By: Takahashi, Masaaki; et al

Chemistry Letters (2005), 34(2), 192-193.

Scheme 46 (1 Reaction)

Steps: 1 Yield: 98%



Suppliers (3)

31-116-CAS-20212405

Steps: 1 Yield: 98%

1.1 **Reagents:** Hydrogen, Water-d_2
Catalysts: Ruthenium carbide; 16 h, 1 atm, 80 °C

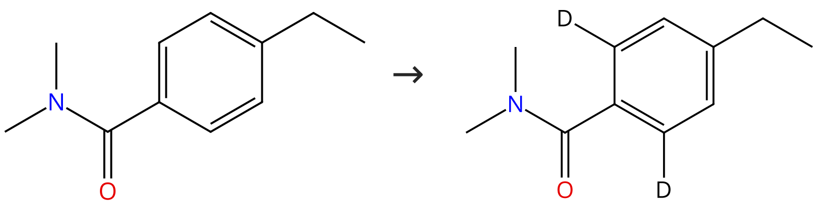
Late-stage deuteration of ^{13}C-enriched substrates for T_1 prolongation in hyperpolarized ^{13}C MRI

By: Taglang, Celine; et al

Chemical Communications (Cambridge, United Kingdom) (2018), 54(41), 5233-5236.

Scheme 47 (1 Reaction)

Steps: 1 Yield: 98%



Suppliers (8)

31-116-CAS-16597297

Steps: 1 Yield: 98%

1.1 **Reagents:** Acetic acid, Water-d_2, Silver hexafluoroantimonate
Catalysts: Bis(dichloro(η^6-*p*-cymene)ruthenium)
Solvents: 1,2-Dichloroethane; rt → 110 °C; 6 h, 110 °C

Experimental Protocols

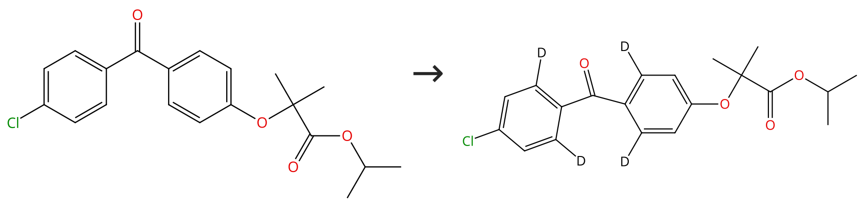
Ruthenium(II)-Catalyzed Oxidant-Free C-H Olefination of Aromatic Carboxamides with Allyl Acetate

By: Li, Feifei; et al

Advanced Synthesis & Catalysis (2016), 358(24), 3932-3937.

Scheme 48 (1 Reaction)

Steps: 1 Yield: 98%



Suppliers (127)

31-116-CAS-24182215

Steps: 1 Yield: 98%

1.1 **Reagents:** Water-d_2
Catalysts: 4-Chlorobenzoic acid, Silver hexafluoroantimonate, Bis(dichloro(η^6-*p*-cymene)ruthenium), 2-Methyl-3-(trifluor omethyl)aniline
Solvents: 1,2-Dichloroethane; rt → 120 °C; 16 h, 120 °C

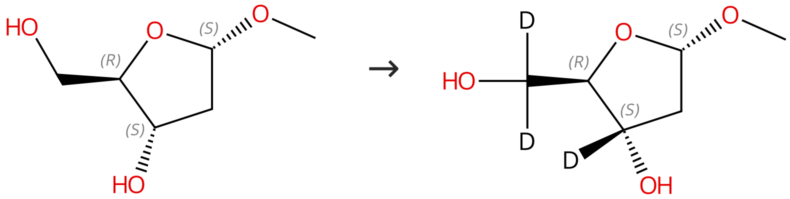
Experimental Protocols

Ruthenium-Catalyzed Deuteration of Aromatic Carbonyl Compounds with a Catalytic Transient Directing Group

By: Kopf, Sara; et al

Chemistry - A European Journal (2021), 27(38), 9768-9773.

Scheme 49 (1 Reaction) — Steps: **1** Yield: **98%**



Absolute stereochemistry shown, Rotation (+) — Suppliers (19)

Absolute stereochemistry shown

31-116-CAS-3370935 — Steps: **1** Yield: **98%**

1.1 **Reagents:** Sodium hydroxide, Hydrogen
Catalysts: Ruthenium
Solvents: Water-d_2; 80 °C; 80 °C → rt

1.2 **Reagents:** Water

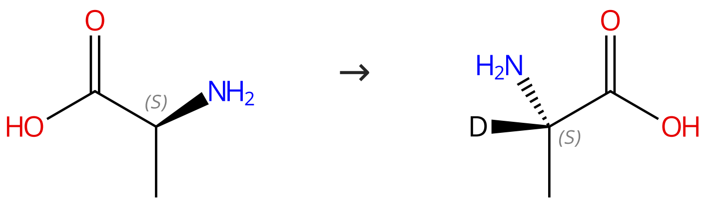
Experimental Protocols

Stereo- and Regioselective Direct Multi-Deuterium-Labeling Methods for Sugars

By: Sawama, Yoshinari; et al

Chemistry - A European Journal (2012), 18(51), 16436-16442.

Scheme 50 (2 Reactions) — Steps: **1** Yield: **92-98%**



Absolute stereochemistry shown, Rotation (+) — Suppliers (195)

Absolute stereochemistry shown, Rotation (+) — Suppliers (27)

31-116-CAS-17957974 — Steps: **1** Yield: **98%**

1.1 **Reagents:** Sodium hydroxide, Hydrogen, Water-d_2
Catalysts: Ruthenium; 6 h, 70 °C; 70 °C → rt

1.2 **Reagents:** Dowex 50W-X8; pH 5 - 6, rt

Experimental Protocols

Development and Scale-Up of Stereoretentive α-Deuteration of Amines

By: Michelotti, Alessia; et al

Organic Process Research & Development (2017), 21(11), 1741-1744.

31-116-CAS-9793291 — Steps: **1** Yield: **92%**

1.1 **Reagents:** Deuterium
Catalysts: Ruthenium
Solvents: Water-d_2; 36 h, 2 bar, 55 °C

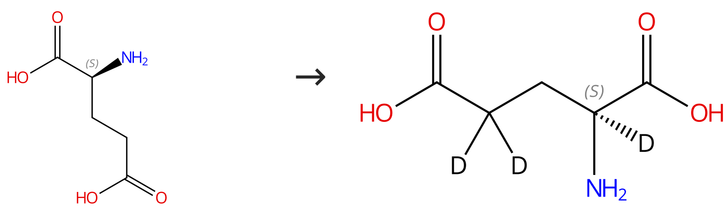
Experimental Protocols

Enantiospecific C-H activation using ruthenium nanocatalysts

By: Taglang, Celine; et al

Angewandte Chemie, International Edition (2015), 54(36), 10474-10477.

Scheme 51 (1 Reaction) — Steps: **1** Yield: **98%**



Absolute stereochemistry shown — Suppliers (189)

Absolute stereochemistry shown — Suppliers (25)

31-116-CAS-17957984 Steps: **1** Yield: **98%**

1.1 **Reagents:** Sodium hydroxide, Hydrogen, Water- d_2
Catalysts: Ruthenium; 24 h, 70 °C; 70 °C → rt

1.2 **Reagents:** Dowex 50W-X8; pH 5 - 6, rt

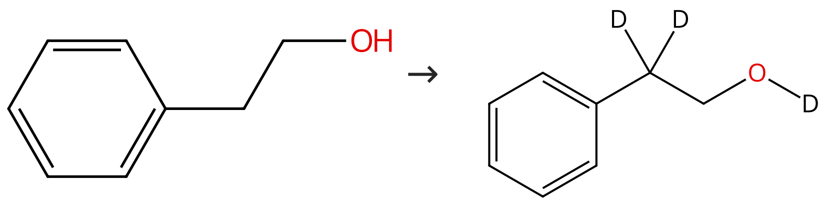
Experimental Protocols

Development and Scale-Up of Stereoretentive α-Deuteration of Amines

By: Michelotti, Alessia; et al

Organic Process Research & Development (2017), 21(11), 1741-1744.

Scheme 52 (2 Reactions) Steps: **1** Yield: **91-98%**



Suppliers (119)

31-116-CAS-5389731 Steps: **1** Yield: **98%**

1.1 **Reagents:** Water-*d*$_2$
Catalysts: Ethanolamine, Potassium hydroxide, Bis(dichloro (η^6-*p*-cymene)ruthenium); 5.5 h, 80 °C

Experimental Protocols

Ruthenium-Catalyzed Regioselective Deuteration of Alcohols at the β-Carbon Position with Deuterium Oxide

By: Tse, Sunny Kai San; et al

Chemistry - A European Journal (2011), 17(49), 13918-13925, S13918/1-S13918/12.

31-116-CAS-3573546 Steps: **1** Yield: **91%**

1.1 **Reagents:** Water-*d*$_2$
Catalysts: Potassium hydroxide, Ruthenium(1+), [2-(amino-κ*N*) ethanol-κ*O*]chloro[(1,2,3,4,5,6-η)-1-methyl-4-(1-methylethyl) benzene]-, chloride, compd. with [2-(amino-κ*N*)ethanolato-κ*O*] chloro[(1,2,3,4,5,6-η)-1-methyl-4-(1-methylethyl)benzene] ruthenium (1:1:1); 5.5 h, 80 °C

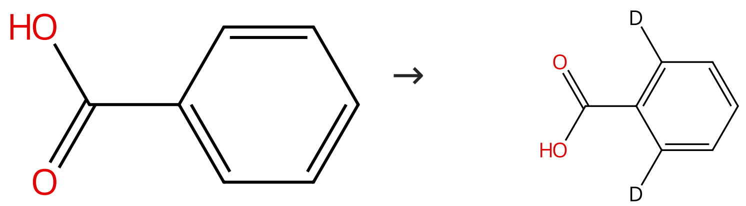
Experimental Protocols

Ruthenium-Catalyzed Regioselective Deuteration of Alcohols at the β-Carbon Position with Deuterium Oxide

By: Tse, Sunny Kai San; et al

Chemistry - A European Journal (2011), 17(49), 13918-13925, S13918/1-S13918/12.

Scheme 53 (2 Reactions) Steps: **1** Yield: **87-98%**



Suppliers (193)

Suppliers (6)

31-116-CAS-20575132 Steps: **1** Yield: **98%**

1.1 **Reagents:** Monosodium phosphate, Water-*d*$_2$
Catalysts: Bis(dichloro(η^6-*p*-cymene)ruthenium); 24 h, 85 °C

Switchable C-H Alkylation of Aromatic Acids with Maleimides in Water: Carboxyl as a Diverse Directing Group

By: Pu, Fan; et al

ChemCatChem (2019), 11(16), 4116-4122.

31-116-CAS-18801524 Steps: **1** Yield: **87%**

1.1 **Reagents:** Oxygen, Water-*d*$_2$
Catalysts: Bis(dichloro(η^6-*p*-cymene)ruthenium); 12 h, 95 °C

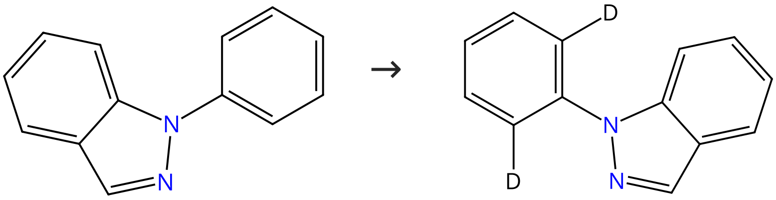
Experimental Protocols

Carboxyl-Directed Conjugate Addition of C-H Bonds to α,β-Unsaturated Ketones in Air and Water

By: Han, Wen-Jing; et al

Advanced Synthesis & Catalysis (2018), 360(7), 1358-1363.

Scheme 54 (2 Reactions) Steps: **1** Yield: **98%**



Suppliers (35)

31-614-CAS-34962039 Steps: **1** Yield: **98%**

1.1 **Reagents:** Water-d_2
Catalysts: Silver hexafluoroantimonate, Bis(dichloro(η^6-*p*-cymene)ruthenium)
Solvents: 1,2-Dichloroethane; 4 h, 100 °C

Regiodivergent Cu-Promoted, AcOH-Switchable Distal Versus Proximal Direct Cyanation of 1-Aryl-1H-indazoles and 2-Aryl-2 H-indazoles via Aerobic Oxidative C-H Bond Activation

By: Sharma, Richa; et al

Journal of Organic Chemistry (2022), 87(24), 16188-16203.

31-614-CAS-31324433 Steps: **1** Yield: **98%**

1.1 **Reagents:** Water-d_2, Silver hexafluoroantimonate
Catalysts: Bis(dichloro(η^6-*p*-cymene)ruthenium)
Solvents: 1,2-Dichloroethane; 4 h, 100 °C

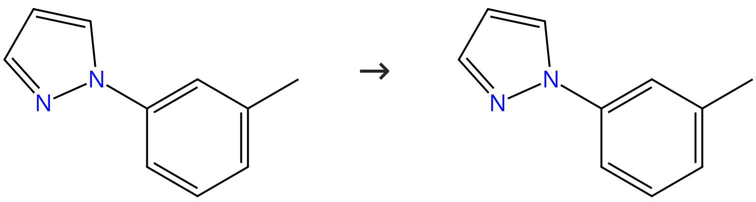
Experimental Protocols

Oxidant-Switched Palladium-Catalyzed Regioselective Mono-versus Bis-ortho-Aroylation of 1-Aryl-1H-indazoles with Aldehydes via C-H Bond Activation

By: Sharma, Richa; et al

Journal of Organic Chemistry (2022), 87(5), 2668-2685.

Scheme 55 (1 Reaction) Steps: **1** Yield: **98%**



Suppliers (43)

31-614-CAS-30525744 Steps: **1** Yield: **98%**

1.1 **Catalysts:** Silver hexafluoroantimonate, Bis(dichloro(η^6-*p*-cymene)ruthenium)
Solvents: Tetrahydrofuran, Water-d_2; 24 h, 100 °C

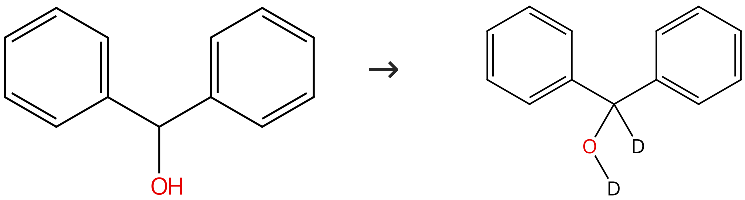
Experimental Protocols

Expedient C-H Amidations of Heteroaryl Arenes Catalyzed by Versatile Ruthenium(II) Catalysts

By: Thirunavukkarasu, Vedhagiri S.; et al

Organic Letters (2013), 15(13), 3286-3289.

Scheme 56 (2 Reactions) Steps: **1** Yield: **98%**



Suppliers (104) Supplier (1)

31-614-CAS-43192915 Steps: **1** Yield: **98%**

1.1 **Reagents:** Potassium hydroxide, Water-*d*2
Catalysts: (*OC*-6-52)-Carbonylchloro[2-(diphenylphosphino-κ*P*)-*N*-[2-(diphenylphosphino-κ*P*)ethyl]ethanamine-κ*N*]hydroruthenium; 24 h, 130 °C

Experimental Protocols

Dehydrogenative Coupling of Alcohols with Hydrazines Under Nickel Catalysis

By: Babu, Reshma; et al

Journal of Organic Chemistry (2025), 90(1), 323-343.

31-116-CAS-13840409 Steps: **1**

1.1 **Reagents:** Potassium *tert*-butoxide
Catalysts: (*OC*-6-52)-Carbonylchloro[2-(diphenylphosphino-κ*P*)-*N*-[2-(diphenylphosphino-κ*P*)ethyl]ethanamine-κ*N*]hydroruthenium
Solvents: Water-*d*2; 12 h, 80 °C

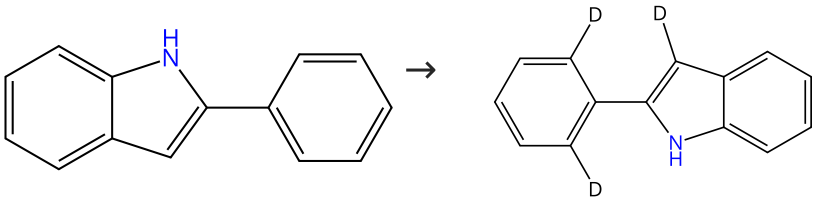
Experimental Protocols

Ruthenium Catalyzed Selective α- and α,β-Deuteration of Alcohols Using D_2O

By: Chatterjee, Basujit; et al

Organic Letters (2015), 17(19), 4794-4797.

Scheme 57 (3 Reactions) Steps: **1** Yield: **94-98%**



Suppliers (88)

31-116-CAS-18656395 Steps: **1** Yield: **98%**

1.1 **Reagents:** Cupric acetate, Silver acetate, Water-*d*2
Catalysts: Bis(dichloro(η^6-*p*-cymene)ruthenium)
Solvents: 1,2-Dichloroethane; rt; 12 h, 100 °C

Ruthenium-Catalyzed Selective C-C Coupling of Allylic Alcohols with Free Indoles: Influence of the Metal Catalyst

By: Xia, Ying-Qi; et al

Chemistry - A European Journal (2018), 24(21), 5474-5478.

31-116-CAS-21806093 Steps: **1** Yield: **94%**

1.1 **Reagents:** Cupric acetate, Silver acetate, Water-*d*2
Catalysts: Bis(dichloro(η^6-*p*-cymene)ruthenium)
Solvents: 1,2-Dichloroethane; 24 h, 100 °C

Photoelectrocyclization Reactions of Conjugated Cycloalkenones. Scope and Reactivity.

By: Zhao, Xuchen; et al

Journal of Organic Chemistry (2020), 85(8), 5449-5463.

31-116-CAS-23754862 Steps: **1**

1.1 **Reagents:** Sodium acetate, Cupric acetate, Water-*d*2, Silver hexafluoroantimonate
Catalysts: Bis(dichloro(η^6-*p*-cymene)ruthenium)
Solvents: 1,2-Dichloroethane; 36 h, 100 °C; 100 °C → rt

1.2 **Reagents:** Water; rt

Experimental Protocols

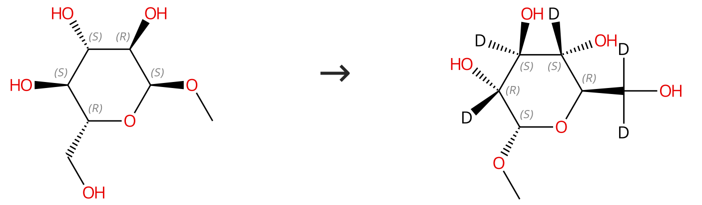
Switchable regioselective hydroalkylation of 2-arylindoles with maleimides

By: Nipate, Dhananjay S.; et al

Organic & Biomolecular Chemistry (2021), 19(22), 4910-4921.

Scheme 58 (1 Reaction)

Steps: **1** Yield: **98%**



Absolute stereochemistry shown, Rotation (+)

Suppliers (90)

Absolute stereochemistry shown

31-614-CAS-35308384

Steps: **1** Yield: **98%**

1.1 **Reagents:** Water-d_2
Catalysts: Ruthenium; 24 h, 80 °C

Experimental Protocols

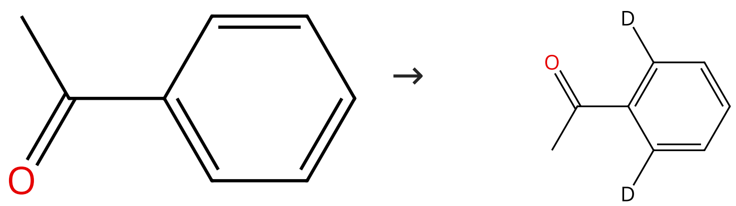
A new deuterium-labeled compound [2,3,4,6,6'-$^2H_5$]-D-glucose for deuterium magnetic resonance metabolic imaging

By: Zou, Chao; et al

NMR in Biomedicine (2023), 36(7), e4890.

Scheme 59 (1 Reaction)

Steps: **1** Yield: **98%**



Suppliers (109)

Supplier (1)

31-116-CAS-20983999

Steps: **1** Yield: **98%**

1.1 **Reagents:** Zinc, Water-d_2
Catalysts: Cuprous iodide, Dichlorotris(triphenylphosphine) ruthenium
Solvents: 1,4-Dioxane; 16 h, 80 °C

Experimental Protocols

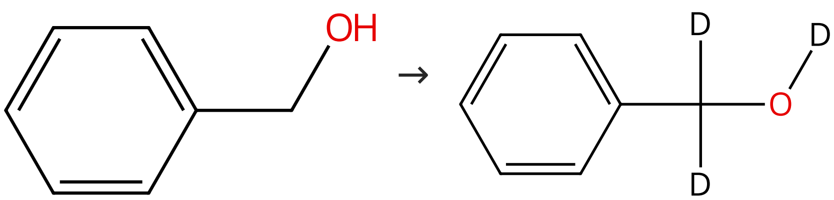
Mild, Selective Ru-Catalyzed Deuteration Using D_2O as a Deuterium Source

By: Eisele, Pascal; et al

Chemistry - A European Journal (2019), 25(72), 16550-16554.

Scheme 60 (5 Reactions)

Steps: **1** Yield: **90-97%**



Suppliers (161)

Supplier (1)

31-116-CAS-15286161

Steps: **1** Yield: **97%**

1.1 **Reagents:** Sodium hydroxide, Water-d_2
Catalysts: Ruthenium, [6-[[bis(1,1-dimethylethyl)phosphino-κ*P*]methyl]-2,2'-bipyridine-κ*N*[1],κ*N*[1']]carbonylchlorohydro-, (*OC*-6-64)-; 24 h, 120 °C

Experimental Protocols

Simple and Efficient Catalytic Reaction for the Selective Deuteration of Alcohols

By: Khaskin, Eugene; et al

ACS Catalysis (2013), 3(3), 448-452.

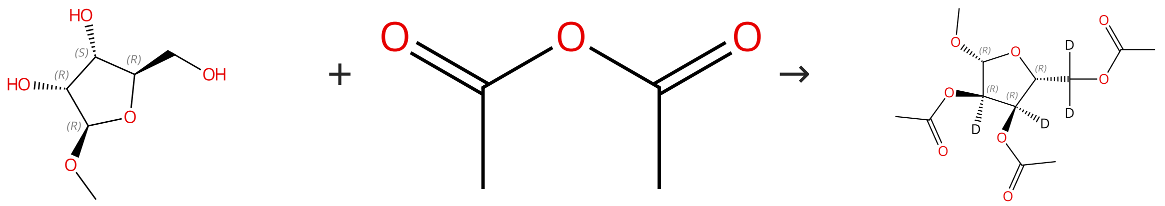
31-614-CAS-43192913 Steps: **1** Yield: **91%**	**Dehydrogenative Coupling of Alcohols with Hydrazines Under Nickel Catalysis**
1.1 **Reagents:** Potassium hydroxide, Water-*d*$_2$ **Catalysts:** (*OC*-6-52)-Carbonylchloro[2-(diphenylphosphino-κ*P*)-*N*-[2-(diphenylphosphino-κ*P*)ethyl]ethanamine-κ*N*]hydroruthenium; 24 h, 130 °C	By: Babu, Reshma; et al
Experimental Protocols	Journal of Organic Chemistry (2025), 90(1), 323-343.

31-614-CAS-37710115 Steps: **1** Yield: **90%**	**Divergence in CH alkylation of indoles under Mn catalysis**
1.1 **Reagents:** Sodium hydroxide, Water-*d*$_2$ **Catalysts:** (*OC*-6-52)-Carbonylchloro[2-(diphenylphosphino-κ*P*)-*N*-[2-(diphenylphosphino-κ*P*)ethyl]ethanamine-κ*N*]hydroruthenium **Solvents:** Water; 24 h, 120 °C	By: Mondal, Akash; et al
Experimental Protocols	Catalysis Science & Technology (2023), 13(19), 5745-5756.

31-116-CAS-19843482 Steps: **1**	**The Rearrangement of Peroxides for the Construction of Fluorophoric 1,4-Benzoxazin-3-one Derivatives**
1.1 **Reagents:** Lithium hydroxide **Catalysts:** (*OC*-6-13)-Carbonyl[2-(diphenylphosphino-κ*P*)-*N*-[2-(diphenylphosphino-κ*P*)ethyl]ethanamine-κ*N*][tetrahydroborato(1-)-κ*H*]ruthenium **Solvents:** Water-*d*$_2$; 6 h, 60 °C	By: Chaudhari, Moreshwar B.; et al
Experimental Protocols	Organic Letters (2019), 21(6), 1617-1621.

31-116-CAS-7055994 Steps: **1**	**Ruthenium Catalyzed Selective α- and α,β-Deuteration of Alcohols Using D_2O**
1.1 **Reagents:** Potassium *tert*-butoxide **Catalysts:** (*OC*-6-52)-Carbonylchloro[2-(diphenylphosphino-κ*P*)-*N*-[2-(diphenylphosphino-κ*P*)ethyl]ethanamine-κ*N*]hydroruthenium **Solvents:** Water-*d*$_2$; 3 h, 60 °C	By: Chatterjee, Basujit; et al
Experimental Protocols	Organic Letters (2015), 17(19), 4794-4797.

Scheme 61 (1 Reaction) Steps: **1** Yield: **97%**



Absolute stereochemistry shown

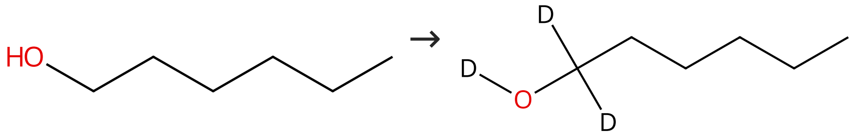
Suppliers (91)

Suppliers (90)

Absolute stereochemistry shown

31-116-CAS-1125274 Steps: **1** Yield: **97%**	**Stereo- and Regioselective Direct Multi-Deuterium-Labeling Methods for Sugars**
1.1 **Reagents:** Sodium hydroxide, Hydrogen **Catalysts:** Ruthenium **Solvents:** Water-*d*$_2$; 80 °C; 80 °C → rt 1.2 **Reagents:** Water 1.3 **Reagents:** Pyridine; 24 h, rt	By: Sawama, Yoshinari; et al
Experimental Protocols	Chemistry - A European Journal (2012), 18(51), 16436-16442.

Scheme 62 (2 Reactions) Steps: **1** Yield: **97%**



Suppliers (105)

31-116-CAS-14463963 Steps: **1** Yield: **97%**

1.1 **Reagents:** Sodium hydroxide, Water-*d*$_2$
Catalysts: Ruthenium, [6-[[bis(1,1-dimethylethyl)phosphino-κ*P*]methyl]-2,2'-bipyridine-κ*N*^{1},κ*N*$^{1'}$]carbonylchlorohydro-, (*OC*-6-64)-; 24 h, 120 °C

Experimental Protocols

Simple and Efficient Catalytic Reaction for the Selective Deuteration of Alcohols

By: Khaskin, Eugene; et al

ACS Catalysis (2013), 3(3), 448-452.

31-116-CAS-2140176 Steps: **1**

1.1 **Reagents:** Potassium *tert*-butoxide
Catalysts: (*OC*-6-52)-Carbonylchloro[2-(diphenylphosphino-κ*P*)-*N*-[2-(diphenylphosphino-κ*P*)ethyl]ethanamine-κ*N*]hydroruthenium
Solvents: Water-*d*$_2$; 12 h, 80 °C

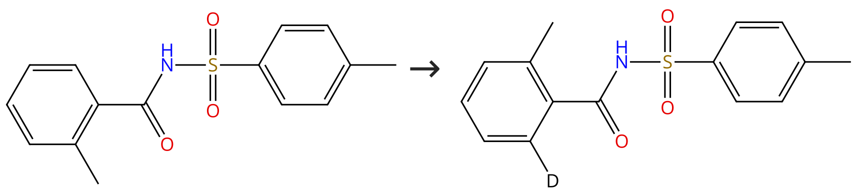
Experimental Protocols

Ruthenium Catalyzed Selective α- and α,β-Deuteration of Alcohols Using D_2O

By: Chatterjee, Basujit; et al

Organic Letters (2015), 17(19), 4794-4797.

Scheme 63 (1 Reaction) Steps: **1** Yield: **97%**



Suppliers (13)

31-116-CAS-20003834 Steps: **1** Yield: **97%**

1.1 **Reagents:** Water-*d*$_2$
Catalysts: Sodium bicarbonate, Bis(dichloro(η^{6}-*p*-cymene)ruthenium)
Solvents: Mesitylene; 24 h, 170 °C

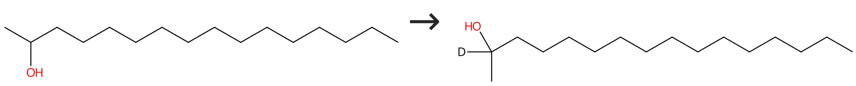
Experimental Protocols

Ruthenium-Catalyzed Synthesis of Isoindolinones via Amide-Directed Addition of Aromatic C-H Bonds to Aldimines

By: Miura, Hiroki; et al

European Journal of Organic Chemistry (2019), 2019(17), 2807-2811.

Scheme 64 (1 Reaction) Steps: **1** Yield: **97%**



Suppliers (46)

31-116-CAS-11587016 Steps: 1 Yield: 97%

1.1 **Reagents:** Hydrogen, Water-d_2
Catalysts: Ruthenium
Solvents: Water-d_2; 3 h, 1 atm, 50 °C

1.2 **Reagents:** Water
Solvents: Diethyl ether; rt

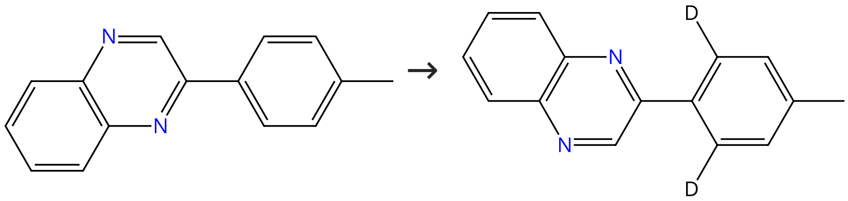
Experimental Protocols

A convenient and effective method for the regiose lective deuteration of alcohols

By: Maegawa, Tomohiro; et al

Advanced Synthesis & Catalysis (2008), 350(14+15), 2215-2218.

Scheme 65 (1 Reaction) Steps: 1 Yield: 97%



Suppliers (17)

31-614-CAS-24227053 Steps: 1 Yield: 97%

1.1 **Catalysts:** 2,4,6-Trimethylbenzoic acid, Silver hexafluoroanti monate, Bis(dichloro(η^6-*p*-cymene)ruthenium)
Solvents: 2,2,2-Trifluoroethanol; 5 min, rt

1.2 **Reagents:** Water-d_2; 16 h, 60 °C

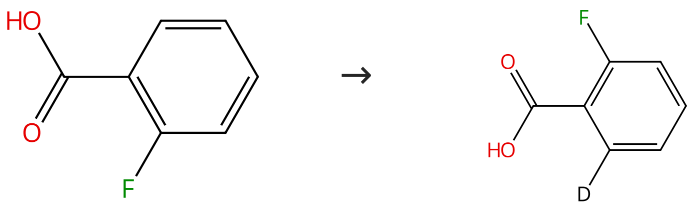
Experimental Protocols

One-Pot Construction of Indolo[2,3-b]quinoxalines through Ruthenium-Catalyzed Ortho C-H Bond Functionalization of 2-Arylquinoxalines with Sulfonyl Azides

By: Laru, Sudip; et al

Organic Letters (2021), 23(19), 7624-7629.

Scheme 66 (2 Reactions) Steps: 1 Yield: 84-97%



Suppliers (98)

31-116-CAS-20873272 Steps: 1 Yield: 97%

1.1 **Reagents:** Potassium carbonate, Methanol-d_4, Water-d_2
Catalysts: Bis(dichloro(η^6-*p*-cymene)ruthenium); 28 h, 50 °C

A ruthenium(II)-catalyzed C-H allenylation-based approach to allenoic acids

By: Wu, Xiaoyan; et al

Chemical Science (2019), 10(25), 6316-6321.

31-614-CAS-41178152 Steps: 1 Yield: 84%

1.1 **Reagents:** Potassium carbonate, Methanol-*d*, Water-d_2
Catalysts: Bis(dichloro(η^6-*p*-cymene)ruthenium); 28 h, 50 °C

Experimental Protocols

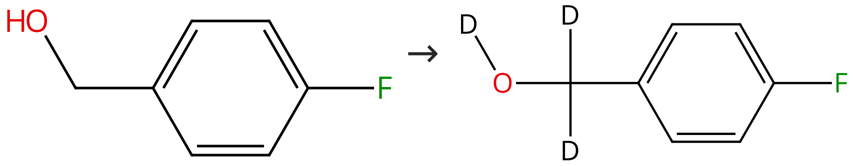
Stereo-selective synthesis of complex dienes and eneynes by sequential hydroarylation and olefinic C-H functionalization

By: Zhu, Yuhang; et al

Organic Chemistry Frontiers (2024), 11(16), 4456-4463.

Scheme 67 (2 Reactions)

Steps: **1** Yield: **97%**



Suppliers (80)

31-116-CAS-6160724

Steps: **1** Yield: **97%**

1.1 **Reagents:** Sodium hydroxide, Water-*d*$_2$
Catalysts: Ruthenium, [6-[[bis(1,1-dimethylethyl)phosphino-κ*P*]methyl]-2,2'-bipyridine-κ*N*^{1},κ*N*$^{1'}$]carbonylchlorohydro-, (*OC*-6-64)-; 24 h, 120 °C

Experimental Protocols

Simple and Efficient Catalytic Reaction for the Selective Deuteration of Alcohols

By: Khaskin, Eugene; et al

ACS Catalysis (2013), 3(3), 448-452.

31-116-CAS-11412860

Steps: **1**

1.1 **Reagents:** Potassium *tert*-butoxide
Catalysts: (*OC*-6-52)-Carbonylchloro[2-(diphenylphosphino-κ*P*)-*N*-[2-(diphenylphosphino-κ*P*)ethyl]ethanamine-κ*N*]hydroruthenium
Solvents: Water-*d*$_2$; 18 h, 80 °C

Experimental Protocols

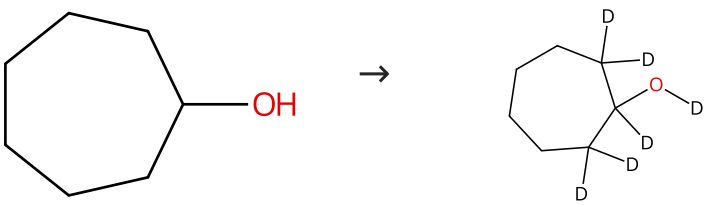
Ruthenium Catalyzed Selective α- and α,β-Deuteration of Alcohols Using D_2O

By: Chatterjee, Basujit; et al

Organic Letters (2015), 17(19), 4794-4797.

Scheme 68 (1 Reaction)

Steps: **1** Yield: **97%**



Suppliers (70)

31-116-CAS-12543497

Steps: **1** Yield: **97%**

1.1 **Reagents:** Sodium hydroxide, Water-*d*$_2$
Catalysts: Ruthenium, [6-[[bis(1,1-dimethylethyl)phosphino-κ*P*]methyl]-2,2'-bipyridine-κ*N*^{1},κ*N*$^{1'}$]carbonylchlorohydro-, (*OC*-6-64)-; 36 h, 120 °C

Experimental Protocols

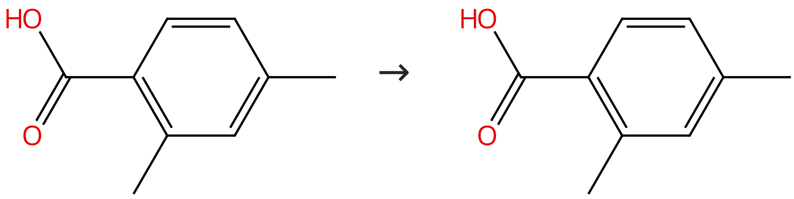
Simple and Efficient Catalytic Reaction for the Selective Deuteration of Alcohols

By: Khaskin, Eugene; et al

ACS Catalysis (2013), 3(3), 448-452.

Scheme 69 (1 Reaction)

Steps: **1** Yield: **97%**



Suppliers (92)

31-614-CAS-29785507 Steps: **1** Yield: **97%**

1.1 **Reagents:** Water-d_2
Catalysts: Potassium acetate, Tricyclohexylphosphine, Bis(dichloro(η^6-*p*-cymene)ruthenium)
Solvents: Mesitylene; 24 h, 170 °C

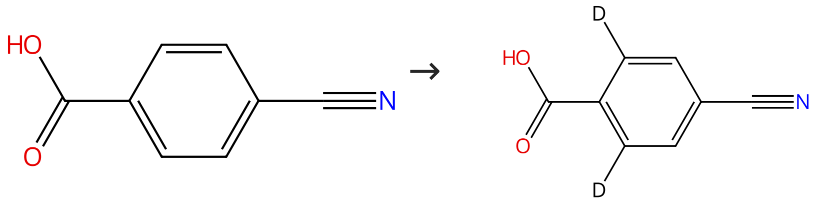
Experimental Protocols

Carboxylate-Directed Addition of Aromatic C-H Bond to Aromatic Aldehydes under Ruthenium Catalysis

By: Miura, Hiroki; et al

ACS Catalysis (2018), 8(7), 6246-6254.

Scheme 70 (1 Reaction) Steps: **1** Yield: **97%**



Suppliers (82)

31-116-CAS-22946711 Steps: **1** Yield: **97%**

1.1 **Reagents:** Water-d_2
Catalysts: [(1,2,3,4,5,6-η)-1-Methyl-4-(1-methylethyl)benzene](tricyclo[3.3.1.1^{3,7}]decane-1-carboxylato-κ*O*)(tricyclo[3.3.1.1^{3,7}]decane-1-carboxylato-κ*O*,κ*O'*)ruthenium
Solvents: 1,4-Dioxane; 16 h, 100 °C

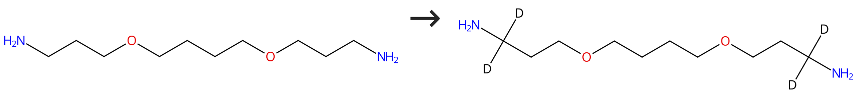
Experimental Protocols

Ruthenium(II)-Catalyzed Hydrogen Isotope Exchange of Pharmaceutical Drugs by C-H Deuteration and C-H Tritiation

By: Mueller, Valentin; et al

ChemCatChem (2020), 12(1), 100-104.

Scheme 71 (1 Reaction) Steps: **1** Yield: **97%**



Suppliers (44)

31-116-CAS-17957989 Steps: **1** Yield: **97%**

1.1 **Reagents:** Hydrogen, Water-d_2
Catalysts: Ruthenium; 24 h, 70 °C; 70 °C → rt

1.2 **Reagents:** Dowex 50W-X8; pH 5 - 6, rt

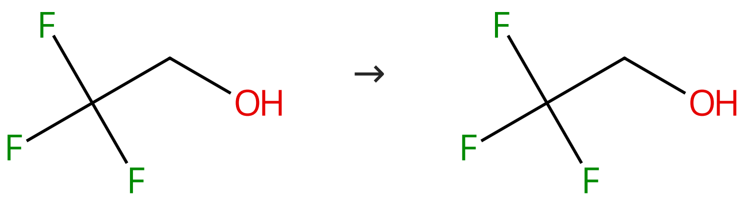
Experimental Protocols

Development and Scale-Up of Stereoretentive α-Deuteration of Amines

By: Michelotti, Alessia; et al

Organic Process Research & Development (2017), 21(11), 1741-1744.

Scheme 72 (1 Reaction) Steps: **1** Yield: **97%**



Suppliers (105)

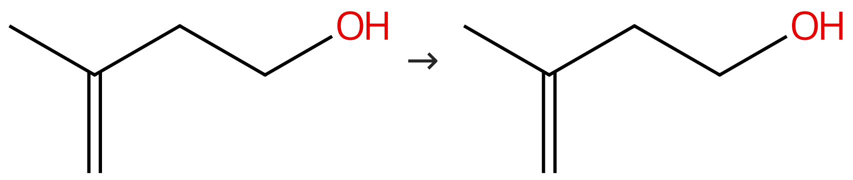
31-614-CAS-28300153	Steps: **1** Yield: **97%**
1.1 **Reagents:** Sodium hydroxide, Water-*d*$_2$ **Catalysts:** Ruthenium, [6-[[bis(1,1-dimethylethyl)phosphino-κ*P*]methyl]-2,2'-bipyridine-κ*N*[1],κ*N*[1']]carbonylchlorohydro-, (*OC*-6-64)-; 40 h, 130 °C	
Experimental Protocols	

Simple and Efficient Catalytic Reaction for the Selective Deuteration of Alcohols

By: Khaskin, Eugene; et al

ACS Catalysis (2013), 3(3), 448-452.

Scheme 73 (1 Reaction) Steps: **1** Yield: **97%**



Suppliers (74)

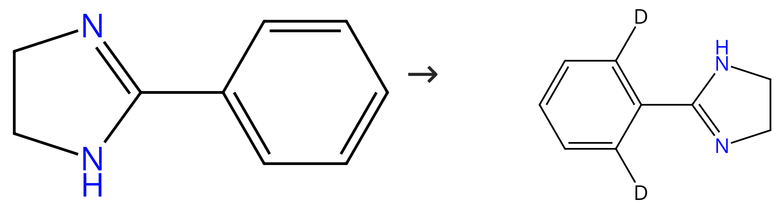
31-614-CAS-27180264	Steps: **1** Yield: **97%**
1.1 **Reagents:** Sodium hydroxide, Water-*d*$_2$ **Catalysts:** Ruthenium, [6-[[bis(1,1-dimethylethyl)phosphino-κ*P*]methyl]-2,2'-bipyridine-κ*N*[1],κ*N*[1']]carbonylchlorohydro-, (*OC*-6-64)-; 24 h, 120 °C	
Experimental Protocols	

Simple and Efficient Catalytic Reaction for the Selective Deuteration of Alcohols

By: Khaskin, Eugene; et al

ACS Catalysis (2013), 3(3), 448-452.

Scheme 74 (1 Reaction) Steps: **1** Yield: **97%**



Suppliers (76)

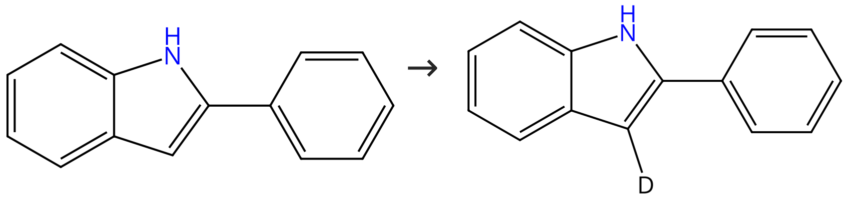
31-116-CAS-20984013	Steps: **1** Yield: **97%**
1.1 **Reagents:** Water-*d*$_2$, Potassium hydroxide (K(OD)) **Catalysts:** Dichlorotris(triphenylphosphine)ruthenium **Solvents:** 1,4-Dioxane; 16 h, 80 °C	
Experimental Protocols	

Mild, Selective Ru-Catalyzed Deuteration Using D_2O as a Deuterium Source

By: Eisele, Pascal; et al

Chemistry - A European Journal (2019), 25(72), 16550-16554.

Scheme 75 (1 Reaction) Steps: **1** Yield: **97%**



Suppliers (88)

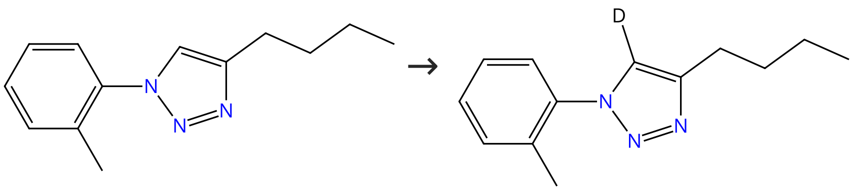
31-116-CAS-18656394	Steps: **1** Yield: **97%**
1.1	**Reagents:** Cupric acetate, Lithium acetate, Silver acetate, Water-d_2 **Catalysts:** Dichlorotris(triphenylphosphine)ruthenium **Solvents:** 1,2-Dichloroethane; rt; 12 h, 130 °C

Ruthenium-Catalyzed Selective C-C Coupling of Allylic Alcohols with Free Indoles: Influence of the Metal Catalyst

By: Xia, Ying-Qi; et al

Chemistry - A European Journal (2018), 24(21), 5474-5478.

Scheme 76 (1 Reaction) Steps: **1** Yield: **96%**



Suppliers (2)

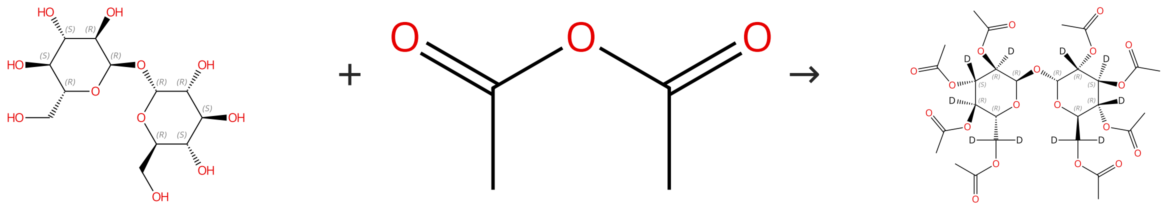
31-116-CAS-4715015	Steps: **1** Yield: **96%**
1.1	**Reagents:** Ethyl acrylate, Cupric acetate, Water- d_2 **Catalysts:** Silver hexafluoroantimonate, Bis(dichloro(η^6-*p*-cymene)ruthenium) **Solvents:** Toluene; 18 h, 100 °C
Experimental Protocols	

Ruthenium(II)-catalyzed cross-dehydrogenative C-H alkenyl ations by triazole assistance

By: Tirler, Carina; et al

Tetrahedron (2015), 71(26-27), 4543-4551.

Scheme 77 (2 Reactions) Steps: **1** Yield: **96%**



Absolute stereochemistry shown, Rotation (+)

Suppliers (74)

Suppliers (90)

Absolute stereochemistry shown, Rotation (+)

31-116-CAS-9690416	Steps: **1** Yield: **96%**
1.1	**Reagents:** Hydrogen **Catalysts:** Ruthenium **Solvents:** Water-d_2; 24 h, 80 °C; 80 °C → rt
1.2	**Reagents:** Water
1.3	**Reagents:** Pyridine; 24 h, rt
Experimental Protocols	

Stereo- and Regioselective Direct Multi-Deuterium-Labeling Methods for Sugars

By: Sawama, Yoshinari; et al

Chemistry - A European Journal (2012), 18(51), 16436-16442.

31-116-CAS-9575984	Steps: **1** Yield: **96%**
1.1	**Reagents:** Hydrogen, Water-d_2 **Catalysts:** Ruthenium, Carbon **Solvents:** Water-d_2; 72 h, 1 atm, 80 °C; 80 °C → rt
1.2	**Reagents:** Pyridine **Solvents:** Pyridine; 24 h, rt
Experimental Protocols	

Method for regio-, chemo- and stereoselective deuterium labeling of sugars based on ruthenium-catalyzed C-H bond activation

By: Fujiwara, Yuta; et al

Chemical Communications (Cambridge, United Kingdom) (2010), 46(27), 4977-4979.

Scheme 78 (2 Reactions) Steps: **1** Yield: **40-96%**

Suppliers (67) Suppliers (25)

31-116-CAS-12256857 Steps: **1** Yield: **96%**

1.1 **Reagents:** Sodium dodecyl sulfate, Water- *d*$_2$
Catalysts: Dichlorotris(triphenylphosphine)ruthenium
Solvents: Water-*d*$_2$; 1 h, 0.34 M Pa, 140 °C

Preparation of cyclohexene-d$_{10}$ by H/D-exchange reaction

By: Ishibashi, Kenichi; et al

Chemistry Letters (2007), 36(6), 724-725.

31-116-CAS-16398401 Steps: **1** Yield: **40%**

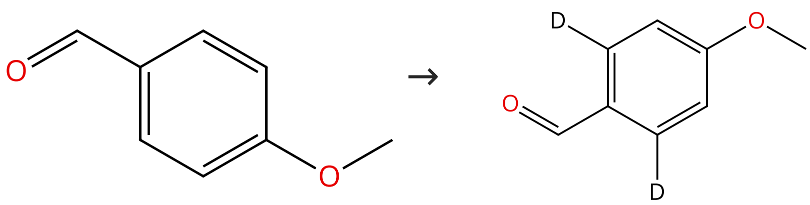
1.1 **Reagents:** Water-*d*$_2$
Catalysts: Sodium dodecyl sulfate, Dichlo rotris(triphenyl phosphine)ruthenium; 60 min, 140 °C

Pd-η^3-C_6H_9 complexes of the Trost modular ligand: high nuclearity columnar aggregation controlled by concentration, solvent and counterion

By: Racys, Daugirdas Tomas; et al

Chemical Science (2015), 6(10), 5793-5801.

Scheme 79 (1 Reaction) Steps: **1** Yield: **96%**



Suppliers (139)

31-116-CAS-24181527 Steps: **1** Yield: **96%**

1.1 **Reagents:** Water-*d*$_2$
Catalysts: 4-Chlorobenzoic acid, Silver hexafluoroantimonate, Bis(dichloro(η^6-*p*-cymene)ruthenium), 2-Methyl-3-(trifluor omethyl)aniline
Solvents: 1,2-Dichloroethane; rt → 100 °C; 16 h, 100 °C

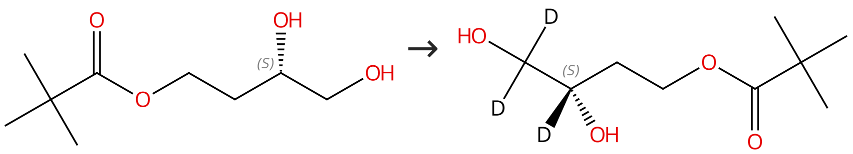
Experimental Protocols

Ruthenium-Catalyzed Deuteration of Aromatic Carbonyl Compounds with a Catalytic Transient Directing Group

By: Kopf, Sara; et al

Chemistry - A European Journal (2021), 27(38), 9768-9773.

Scheme 80 (1 Reaction) Steps: **1** Yield: **96%**



Absolute stereochemistry shown, Rotation (-)

Absolute stereochemistry shown, Rotation (-)

Suppliers (4)

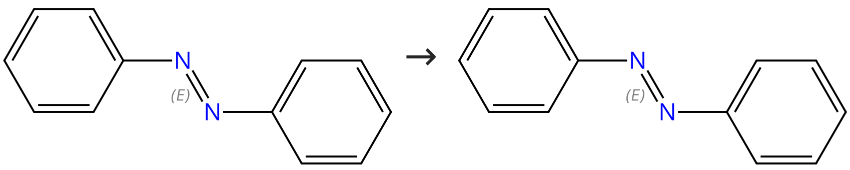
31-614-CAS-32005531	Steps: **1** Yield: **96%**
1.1 **Reagents:** Hydrogen, Water-d_2 **Catalysts:** Ruthenium; 24 h, 80 °C	
Experimental Protocols	

Synthesis of Deuterium-Labeled Vitamin D Metabolites as Internal Standards for LC-MS Analysis

By: Nagata, Akiko; et al

Molecules (2022), 27(8), 2427.

Scheme 81 (1 Reaction) Steps: **1** Yield: **96%**



Double bond geometry shown

Double bond geometry shown

Suppliers (19)

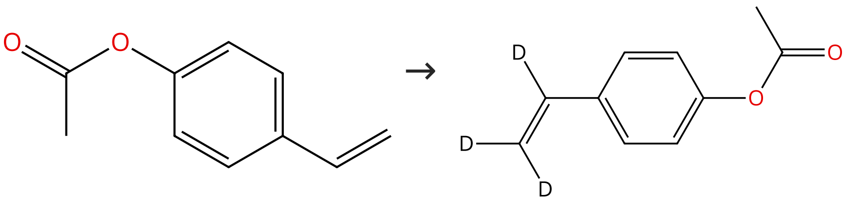
31-614-CAS-27742858	Steps: **1** Yield: **96%**
1.1 **Reagents:** Potassium carbonate **Catalysts:** 2,4,6-Trimethylbenzoic acid, Bis(dichloro(η[6]-*p*-cymene)ruthenium) **Solvents:** 1,4-Dioxane, Water-d_2; 18 h, 120 °C	
Experimental Protocols	

Ruthenium(II)-Catalyzed C-H Arylation of Azoarenes by Carboxylate Assistance

By: Hubrich, Jonathan; et al

ACS Catalysis (2015), 5(7), 4089-4093.

Scheme 82 (1 Reaction) Steps: **1** Yield: **96%**



Suppliers (84)

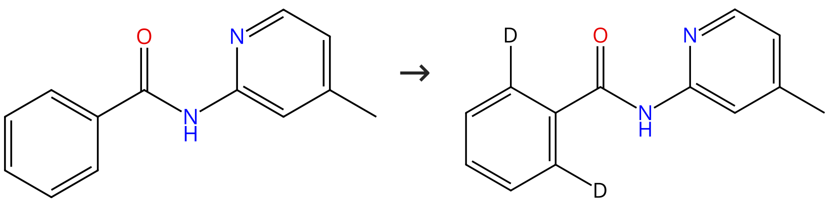
31-614-CAS-38454952	Steps: **1** Yield: **96%**
1.1 **Reagents:** Water-d_2 **Catalysts:** Carbonylchlorotris(triphenylphosphine)ruthenium (1+) **Solvents:** 1,4-Dioxane; 6 h, 110 °C	
Experimental Protocols	

Efficient Synthesis of Ractopamine-D_3 via Epoxide-Opening Strategy

By: Wang, Limin; et al

Asian Journal of Organic Chemistry (2023), 12(11), e202300465.

Scheme 83 (1 Reaction) Steps: **1** Yield: **96%**



Suppliers (25)

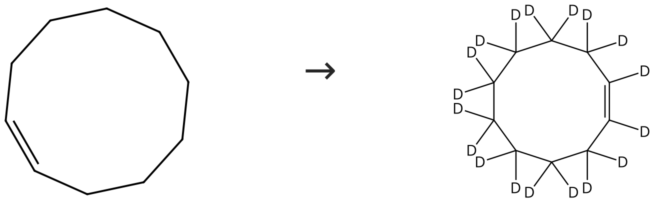
31-116-CAS-22355716	Steps: **1** Yield: **96%**
1.1	**Reagents:** Cupric acetate, Silver hexafluoroantimonate **Catalysts:** Bis(dichloro(η^6-*p*-cymene)ruthenium) **Solvents:** 1,2-Dichloroethane, Water-d_2; 10 h, 120 °C

Ru(II)-Catalyzed Oxidative Olefination of Benzamides: Switchable Aza-Michael and Aza-Wacker Reaction for Synthesis of Isoindolinones

By: Kumar, Manoj; et al

Organic Letters (2020), 22(12), 4620-4626.

Scheme 84 (1 Reaction) Steps: **1** Yield: **96%**



Supplier (1)

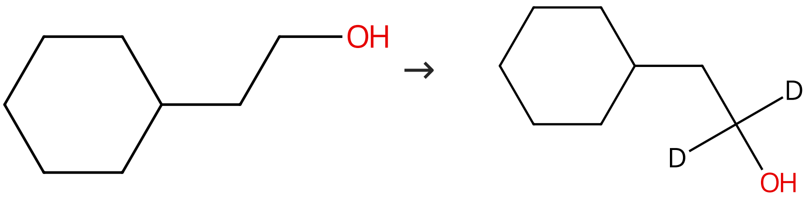
31-116-CAS-15494820	Steps: **1** Yield: **96%**
1.1	**Reagents:** Ethanol, Sodium dodecyl sulfate, Water- d_2 **Catalysts:** Dichlorotris(triphenylphosphine)ruthenium **Solvents:** Water-d_2; 60 min, 0.34 M Pa, 140 °C

Preparation of cyclohexene-d_{10} by H/D-exchange reaction

By: Ishibashi, Kenichi; et al

Chemistry Letters (2007), 36(6), 724-725.

Scheme 85 (1 Reaction) Steps: **1** Yield: **96%**



Suppliers (84)

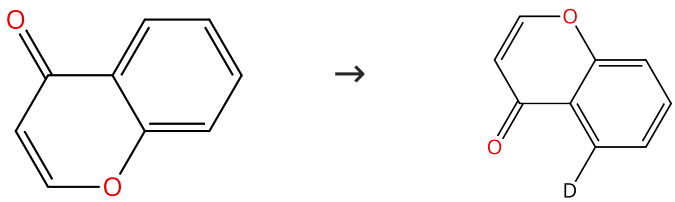
31-116-CAS-1213988	Steps: **1** Yield: **96%**
1.1	**Reagents:** Water-d_2 **Catalysts:** Dichlorobis(triphenylphosphine)ruthenium; 30 min, 10 atm, 150 °C

Ruthenium catalyzed deuterium labeling of α-carbon in primary alcohol and primary/secondary amine in D_2O

By: Takahashi, Masaaki; et al

Chemistry Letters (2005), 34(2), 192-193.

Scheme 86 (2 Reactions) Steps: **1** Yield: **95-96%**



Suppliers (73)

31-116-CAS-22251383 Steps: **1** Yield: **96%**

1.1 **Reagents:** Silver acetate, Water-*d*$_2$
Catalysts: Bis(dichloro(η^6-*p*-cymene)ruthenium), [1,1,1-Trifluoro-*N*-[(trifluoromethyl)sulfonyl-κ*O*]methanesulfonamidato-κ*O*]silver
Solvents: 1,2-Dichloroethane; rt; rt → 120 °C; 1 h, 120 °C

Experimental Protocols

Ruthenium(II)-Catalyzed C-H Activation of Chromones with Maleimides to Synthesize Succinimide/Maleimide-Containing Chromones

By: Zhou, Yan; et al

Journal of Organic Chemistry (2020), 85(14), 9230-9243.

31-614-CAS-34330111 Steps: **1** Yield: **95%**

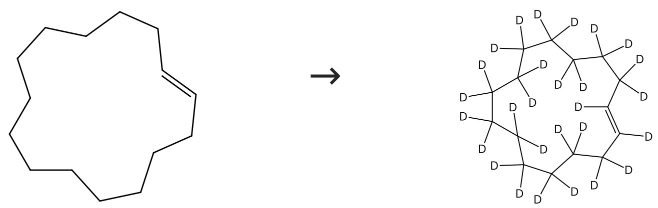
1.1 **Reagents:** Cupric acetate, Cuprous chloride, Water-*d*$_2$, [1,1,1-Trifluoro-*N*-[(trifluoromethyl)sulfonyl-κ*O*]methanesulfonamidato-κ*O*]silver
Catalysts: Bis(dichloro(η^6-*p*-cymene)ruthenium)
Solvents: Chlorobenzene; 24 h, 120 °C

Regioselective peri-C-H selenylation of aromatic compounds with weakly coordinating ketone groups

By: Duan, Bingbing; et al

Chemical Communications (Cambridge, United Kingdom) (2022), 58(82), 11555-11558.

Scheme 87 (1 Reaction) Steps: **1** Yield: **96%**



Suppliers (6)

31-116-CAS-4232007 Steps: **1** Yield: **96%**

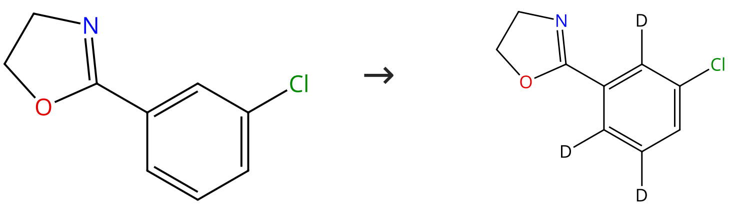
1.1 **Reagents:** Ethanol, Sodium dodecyl sulfate, Water- *d*$_2$
Catalysts: Dichlorotris(triphenylphosphine)ruthenium
Solvents: Water-*d*$_2$; 60 min, 0.34 M Pa, 140 °C

Preparation of cyclohexene-d$_{10}$ by H/D-exchange reaction

By: Ishibashi, Kenichi; et al

Chemistry Letters (2007), 36(6), 724-725.

Scheme 88 (1 Reaction) Steps: **1** Yield: **96%**



Suppliers (4)

31-116-CAS-20984025 Steps: **1** Yield: **96%**

1.1 **Reagents:** Water-*d*$_2$, Potassium hydroxide (K(OD))
Catalysts: Dichlorotris(triphenylphosphine)ruthenium
Solvents: 1,4-Dioxane; 62 h, 80 °C

Experimental Protocols

Mild, Selective Ru-Catalyzed Deuteration Using D_2O as a Deuterium Source

By: Eisele, Pascal; et al

Chemistry - A European Journal (2019), 25(72), 16550-16554.

Scheme 89 (1 Reaction)

Steps: **1** Yield: **96%**

Suppliers (75)

31-116-CAS-3652631

Steps: **1** Yield: **96%**

1.1 **Reagents:** Water-d_2
Catalysts: Triruthenium dodecacarbonyl; 12 h, 140 °C

Experimental Protocols

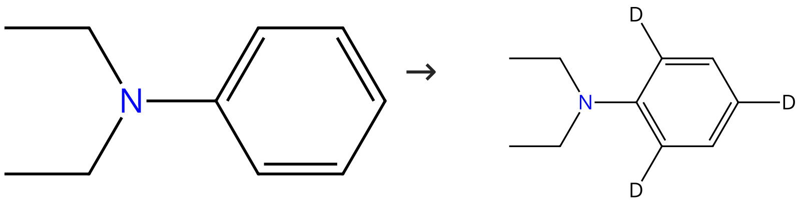
A convenient method for the Ru(0)-catalyzed regioselective deuteration of N-alkyl-substituted anilines

By: Zhan, Miao; et al

Tetrahedron Letters (2014), 55(36), 5070-5073.

Scheme 90 (1 Reaction)

Steps: **1** Yield: **96%**



Suppliers (73)

31-116-CAS-12532165

Steps: **1** Yield: **96%**

1.1 **Reagents:** Water-d_2
Catalysts: Triruthenium dodecacarbonyl; 12 h, 100 °C

Experimental Protocols

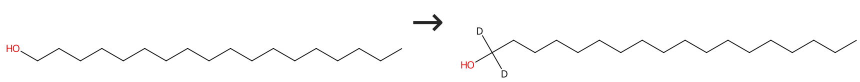
A convenient method for the Ru(0)-catalyzed regioselective deuteration of N-alkyl-substituted anilines

By: Zhan, Miao; et al

Tetrahedron Letters (2014), 55(36), 5070-5073.

Scheme 91 (1 Reaction)

Steps: **1** Yield: **95%**



Suppliers (102)

Suppliers (16)

31-116-CAS-10970032

Steps: **1** Yield: **95%**

1.1 **Reagents:** Hydrogen, Water-d_2
Catalysts: Ruthenium
Solvents: Water-d_2; 24 h, 1 atm, 80 °C

1.2 **Reagents:** Water
Solvents: Diethyl ether; rt

Experimental Protocols

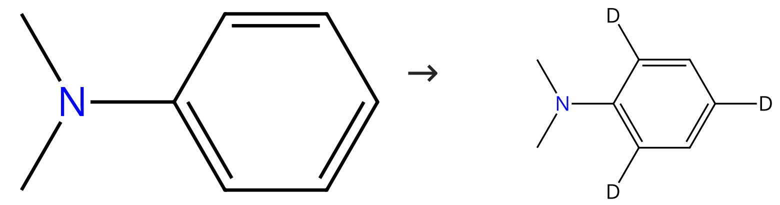
A convenient and effective method for the regioselective deuteration of alcohols

By: Maegawa, Tomohiro; et al

Advanced Synthesis & Catalysis (2008), 350(14+15), 2215-2218.

Scheme 92 (1 Reaction)

Steps: **1** Yield: **95%**



Suppliers (97)

Supplier (1)

31-116-CAS-13273142

Steps: **1** Yield: **95%**

1.1 **Reagents:** Water-d_2
Catalysts: Triruthenium dodecacarbonyl; 12 h, 100 °C

Experimental Protocols

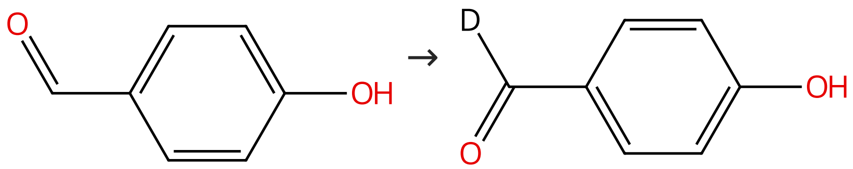
A convenient method for the Ru(0)-catalyzed regioselective deuteration of N-alkyl-substituted anilines

By: Zhan, Miao; et al

Tetrahedron Letters (2014), 55(36), 5070-5073.

Scheme 93 (1 Reaction)

Steps: **1** Yield: **95%**



Suppliers (132)

Suppliers (4)

31-116-CAS-18937440

Steps: **1** Yield: **95%**

1.1 **Reagents:** Water-d_2
Catalysts: Carbonylchlorohydrotris(triphenylphosphine) ruthenium
Solvents: Toluene; rt → 100 °C; 30 min, 100 °C

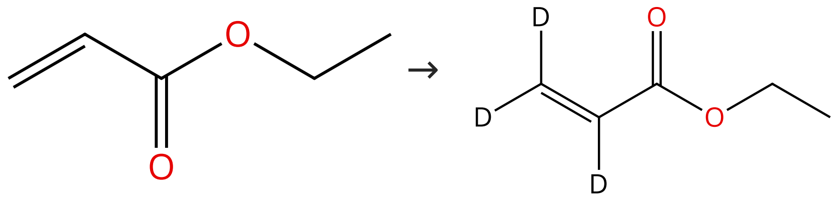
Catalytic Deuteration of Aldehydes with D 2 O

By: Isbrandt, Eric S.; et al

Synlett (2017), 28(20), 2851-2854.

Scheme 94 (2 Reactions)

Steps: **1** Yield: **95%**



Suppliers (76)

31-116-CAS-19573237

Steps: **1** Yield: **95%**

1.1 **Reagents:** Water-d_2
Catalysts: 3-(Trifluoromethyl)benzoic acid, Bis(dichloro(η^6-*p*-cymene)ruthenium), Benzoic acid, 3-(trifluoromethyl)-, potassium salt (1:1); 18 h, rt → 80 °C

Experimental Protocols

Ruthenium(II)biscarboxylate-Catalyzed Hydrogen-Isotope Exchange by Alkene C-H Activation

By: Bechtoldt, Alexander; et al

ChemCatChem (2019), 11(1), 435-438.

31-116-CAS-12773044 Steps: **1**

1.1 **Reagents:** Water-d_2
Catalysts: (*OC*-6-34)-Carbonylchlorohydrotris(triphenyl phosphine)ruthenium
Solvents: 1,4-Dioxane; 16.5 h, 100 °C

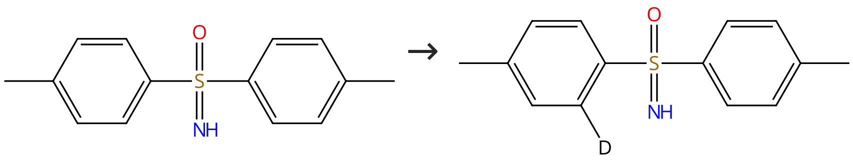
Experimental Protocols

Hydrogen/Deuterium Exchange Reactions of Olefins with Deuterium Oxide Mediated by the Carbonylchlorohydridotris (triphenylphosphine)ruthenium(II) Complex

By: Tse, Sunny Kai San; et al

Advanced Synthesis & Catalysis (2010), 352(9), 1512-1522.

Scheme 95 (1 Reaction) Steps: **1** Yield: **95%**



Suppliers (2)

31-116-CAS-23602766 Steps: **1** Yield: **95%**

1.1 **Reagents:** Water-d_2
Catalysts: Silver hexafluoroantimonate, Bis(dichloro(η^6-*p*-cymene)ruthenium), (1*S*)-2'-[[Bis(1-methylethyl)amino] carbonyl][1,1'-binaphthalene]-2-carboxylic acid
Solvents: 1,2-Dichloroethane; 12 h, 35 °C

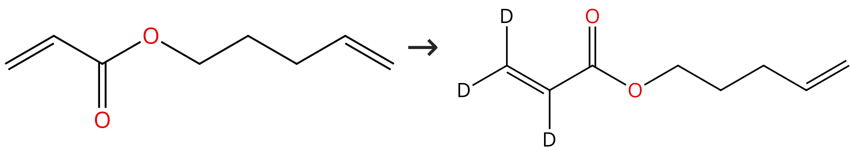
Experimental Protocols

Efficient Synthesis of Sulfur-Stereogenic Sulfoximines via Ru(II) -Catalyzed Enantioselective C-H Functionalization Enabled by Chiral Carboxylic Acid

By: Zhou, Tao; et al

Journal of the American Chemical Society (2021), 143(18), 6810-6816.

Scheme 96 (1 Reaction) Steps: **1** Yield: **95%**



Suppliers (3)

31-116-CAS-19573252 Steps: **1** Yield: **95%**

1.1 **Reagents:** Water-d_2
Catalysts: 3-(Trifluoromethyl)benzoic acid, Bis(dichloro(η^6-*p*-cymene)ruthenium), Benzoic acid, 3-(trifluoromethyl)-, potassium salt (1:1); 18 h, rt → 80 °C

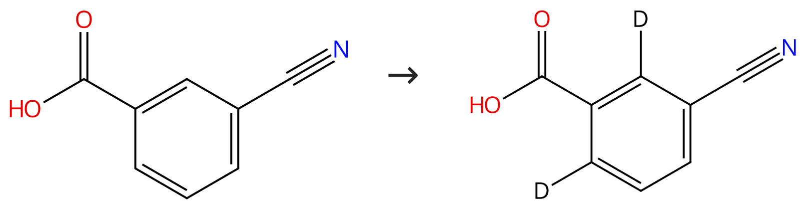
Experimental Protocols

Ruthenium(II)biscarboxylate-Catalyzed Hydrogen-Isotope Exchange by Alkene C-H Activation

By: Bechtoldt, Alexander; et al

ChemCatChem (2019), 11(1), 435-438.

Scheme 97 (1 Reaction) Steps: **1** Yield: **95%**



Suppliers (98)

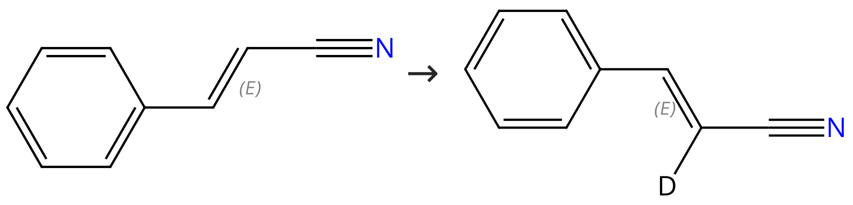
31-116-CAS-20858316	Steps: **1** Yield: **95%**
1.1 **Reagents:** Water-d_2 **Catalysts:** [(1,2,3,4,5,6-η)-1-Methyl-4-(1-methylethyl)benzene](tricyclo[3.3.1.1^{3,7}]decane-1-carboxylato-κ*O*)(tricyclo[3.3.1.1^{3,7}]decane-1-carboxylato-κ*O*,κ*O'*)ruthenium **Solvents:** 1,4-Dioxane; 16 h, 100 °C	
Experimental Protocols	

Ruthenium(II)-Catalyzed Hydrogen Isotope Exchange of Pharmaceutical Drugs by C-H Deuteration and C-H Tritiation

By: Mueller, Valentin; et al

ChemCatChem (2020), 12(1), 100-104.

Scheme 98 (1 Reaction) Steps: **1** Yield: **95%**



Double bond geometry shown

Suppliers (81)

Double bond geometry shown

Supplier (1)

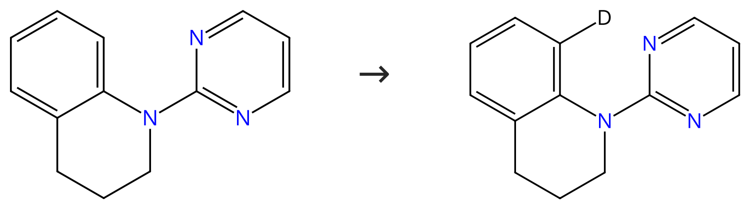
31-614-CAS-24401843	Steps: **1** Yield: **95%**
1.1 **Reagents:** Water-d_2 **Catalysts:** (*SP*-5-52)-[6-[[Bis(1,1-dimethylethyl)phosphino-κ*P*]methylene]-*N*,*N*-diethyl-1,6-dihydro-2-pyridinemethanaminato-κ*N*^{1},κ*N*^{2}]carbonylhydroruthenium **Solvents:** 1,2-Dimethoxyethane; 1 d, rt	
Experimental Protocols	

Selective α-Deuteration of Cinnamonitriles using D_2O as Deuterium Source

By: Guo, Beibei; et al

Advanced Synthesis & Catalysis (2022), 364(1), 179-186.

Scheme 99 (1 Reaction) Steps: **1** Yield: **95%**



Supplier (1)

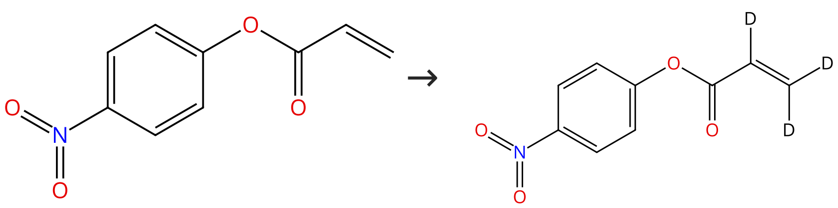
31-116-CAS-19371311	Steps: **1** Yield: **95%**
1.1 **Reagents:** Water-d_2, Tetrafluoroboric acid **Catalysts:** Bis(dichloro(η^6-*p*-cymene)ruthenium) **Solvents:** Acetone, 1,2-Dichloroethane; 7 h, 100 °C	
Experimental Protocols	

Ruthenium(II)-Catalyzed Regioselective C-8 Hydroxylation of 1,2,3,4-Tetrahydroquinolines

By: Chen, Changjun; et al

Organic Letters (2018), 20(21), 6799-6803.

Scheme 100 (1 Reaction) Steps: **1** Yield: **95%**



Suppliers (25)

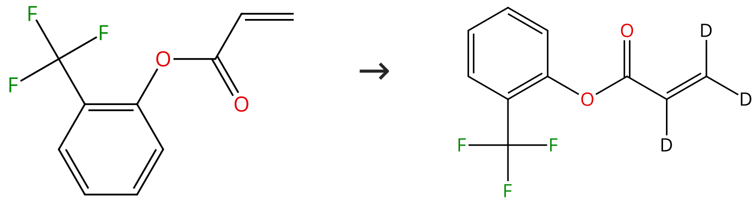
31-116-CAS-19573245	Steps: **1** Yield: **95%**
1.1	**Reagents:** Benzene-d_6, Water-d_2 **Catalysts:** 3-(Trifluoromethyl)benzoic acid, Bis(dichloro(η^6-*p*-cymene)ruthenium), Benzoic acid, 3-(trifluoromethyl)-, potassium salt (1:1); 18 h, rt → 80 °C
Experimental Protocols	

Ruthenium(II)biscarboxylate-Catalyzed Hydrogen-Isotope Exchange by Alkene C-H Activation

By: Bechtoldt, Alexander; et al

ChemCatChem (2019), 11(1), 435-438.

Scheme 101 (1 Reaction) Steps: **1** Yield: **95%**



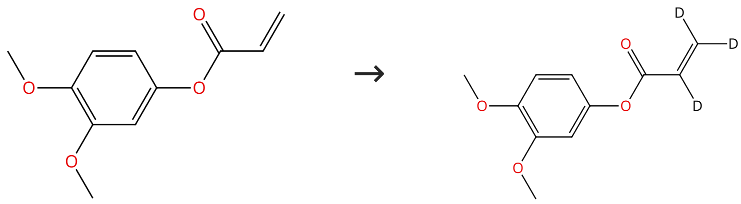
31-116-CAS-19573240	Steps: **1** Yield: **95%**
1.1	**Reagents:** Water-d_2 **Catalysts:** 3-(Trifluoromethyl)benzoic acid, Bis(dichloro(η^6-*p*-cymene)ruthenium), Benzoic acid, 3-(trifluoromethyl)-, potassium salt (1:1); 18 h, rt → 80 °C
Experimental Protocols	

Ruthenium(II)biscarboxylate-Catalyzed Hydrogen-Isotope Exchange by Alkene C-H Activation

By: Bechtoldt, Alexander; et al

ChemCatChem (2019), 11(1), 435-438.

Scheme 102 (1 Reaction) Steps: **1** Yield: **95%**



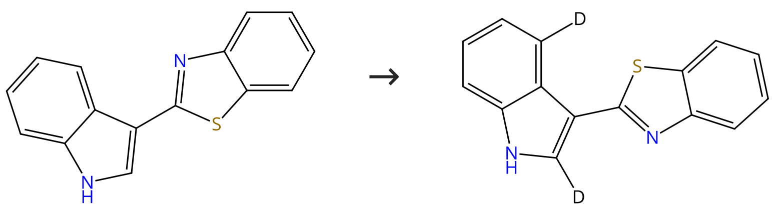
31-116-CAS-19573248	Steps: **1** Yield: **95%**
1.1	**Reagents:** Water-d_2 **Catalysts:** 3-(Trifluoromethyl)benzoic acid, Bis(dichloro(η^6-*p*-cymene)ruthenium), Benzoic acid, 3-(trifluoromethyl)-, potassium salt (1:1); 18 h, rt → 80 °C
Experimental Protocols	

Ruthenium(II)biscarboxylate-Catalyzed Hydrogen-Isotope Exchange by Alkene C-H Activation

By: Bechtoldt, Alexander; et al

ChemCatChem (2019), 11(1), 435-438.

Scheme 103 (1 Reaction) Steps: **1** Yield: **95%**



Suppliers (35)

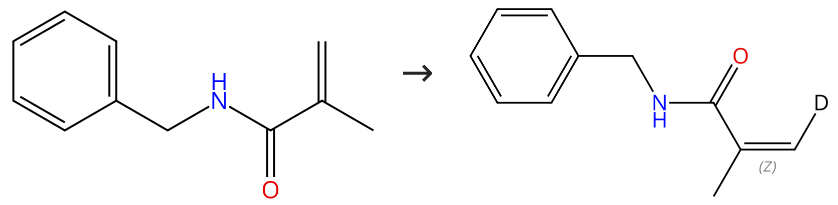
31-116-CAS-18748297	Steps: **1** Yield: **95%**
1.1	**Reagents:** Water-d_2 **Catalysts:** Silver tetrafluoroborate, Bis(dichloro(η^6-*p*-cymene) ruthenium) **Solvents:** 1,2-Dichloroethane, Water-d_2; 2 h, 85 °C
Experimental Protocols	

Ligand-Assisted Heteroaryl C(sp^2)-H Bond Activation by a Cationic Ruthenium(II) Complex for Alkenylation of Hetero arenes with Alkynes Directed by Biorelevant Heterocycles

By: Pipaliya, Bhavin V.; et al

ChemCatChem (2017), 9(22), 4191-4198.

Scheme 104 (1 Reaction) Steps: **1** Yield: **95%**



Suppliers (20)

Double bond geometry shown

31-116-CAS-2266825 Steps: **1** Yield: **95%**

1.1 **Reagents:** Cupric acetate, Acetic acid-*d*
Catalysts: Potassium hexafluorophosphate, Bis(dichloro(η^6-*p*-cymene)ruthenium)
Solvents: 1,4-Dioxane, Acetic acid-*d*, Water-d_2; 1 h, rt → 100 °C

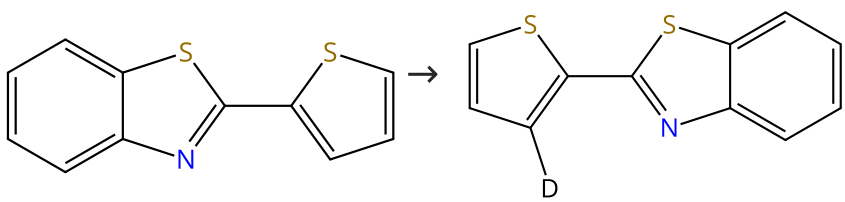
Experimental Protocols

Ruthenium- and rhodium-catalyzed cross-coupling reaction of acrylamides with alkenes: efficient access to (Z,E)-dienamides

By: Zhang, Jian; et al

Chemical Communications (Cambridge, United Kingdom) (2012), 48(91), 11232-11234.

Scheme 105 (1 Reaction) Steps: **1** Yield: **95%**



Suppliers (53)

31-116-CAS-18748294 Steps: **1** Yield: **95%**

1.1 **Reagents:** Water-d_2
Catalysts: Benzoic acid, Silver tetrafluo roborate, Bis(dichloro (η^6-*p*-cymene)ruthenium)
Solvents: 1,2-Dichloroethane, Water-d_2; 2 h, 85 °C

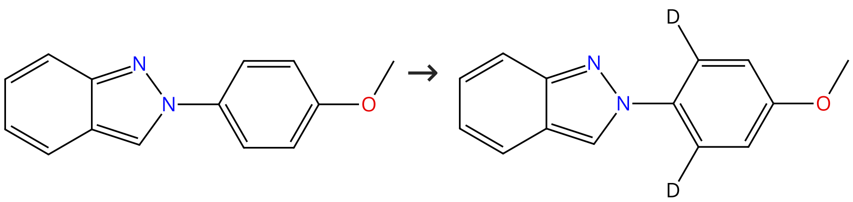
Experimental Protocols

Ligand-Assisted Heteroaryl C(sp^2)-H Bond Activation by a Cationic Ruthenium(II) Complex for Alkenylation of Hetero arenes with Alkynes Directed by Biorel evant Heterocycles

By: Pipaliya, Bhavin V.; et al

ChemCatChem (2017), 9(22), 4191-4198.

Scheme 106 (1 Reaction) Steps: **1** Yield: **95%**



Suppliers (21)

31-614-CAS-34962046 Steps: **1** Yield: **95%**

1.1 **Reagents:** Water-d_2
Catalysts: Silver hexafluoroantimonate, Bis(dichloro(η^6-*p*-cymene)ruthenium)
Solvents: 1,2-Dichloroethane; 4 h, 100 °C

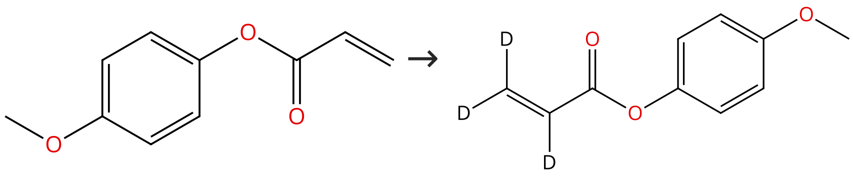
Regiodivergent Cu-Promoted, AcOH-Switchable Distal Versus Proximal Direct Cyanation of 1-Aryl-1H-indazoles and 2-Aryl-2 H-indazoles via Aerobic Oxidative C-H Bond Activation

By: Sharma, Richa; et al

Journal of Organic Chemistry (2022), 87(24), 16188-16203.

Scheme 107 (1 Reaction)

Steps: **1** Yield: **95%**



Suppliers (20)

31-116-CAS-19573247

Steps: **1** Yield: **95%**

1.1 **Reagents:** Water-d_2
Catalysts: 3-(Trifluoromethyl)benzoic acid, Bis(dichloro(η^6-*p*-cymene)ruthenium), Benzoic acid, 3-(trifluoromethyl)-, potassium salt (1:1); 18 h, rt → 80 °C

Experimental Protocols

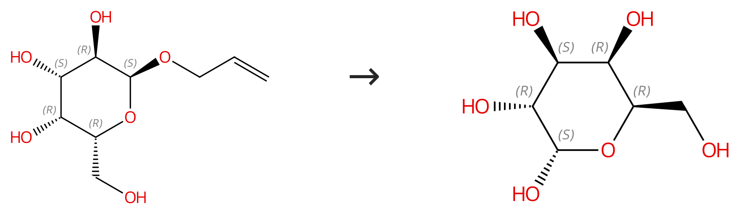
Ruthenium(II)biscarboxylate-Catalyzed Hydrogen-Isotope Exchange by Alkene C-H Activation

By: Bechtoldt, Alexander; et al

ChemCatChem (2019), 11(1), 435-438.

Scheme 108 (1 Reaction)

Steps: **1** Yield: **95%**



Absolute stereochemistry shown, Rotation (+)

Absolute stereochemistry shown

Suppliers (71)

Suppliers (45)

31-006-CAS-18178301

Steps: **1** Yield: **95%**

1.1 **Catalysts:** Ruthenium(2+), hexaaqua-, (*OC*-6-11)-, 4-methylbenzenesulfonate (1:2)
Solvents: Water-d_2; 24 h, 50 °C

Experimental Protocols

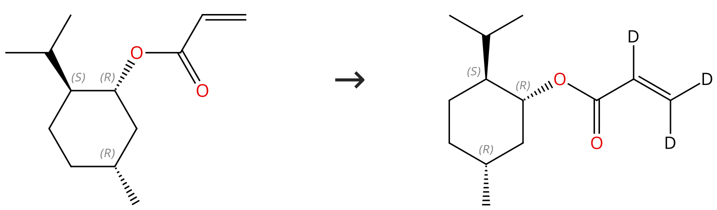
Catalytic isomerization of allyl functionalities in water by hexaaquaruthenium(II) tosylate

By: Kuo, Louis Y.; et al

Inorganica Chimica Acta (2015), 435, 335-339.

Scheme 109 (1 Reaction)

Steps: **1** Yield: **95%**



Absolute stereochemistry shown, Rotation (-)

Absolute stereochemistry shown

Suppliers (17)

31-116-CAS-19573249

Steps: **1** Yield: **95%**

1.1 **Reagents:** Water-d_2
Catalysts: 3-(Trifluoromethyl)benzoic acid, Bis(dichloro(η^6-*p*-cymene)ruthenium), Benzoic acid, 3-(trifluoromethyl)-, potassium salt (1:1); 18 h, rt → 80 °C

Experimental Protocols

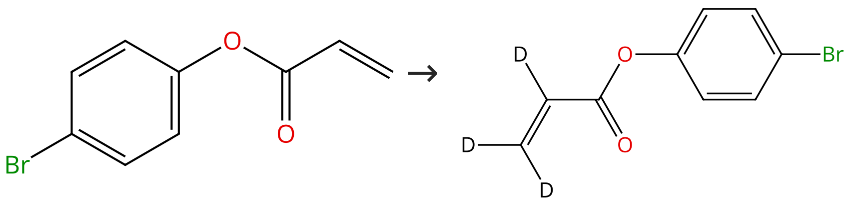
Ruthenium(II)biscarboxylate-Catalyzed Hydrogen-Isotope Exchange by Alkene C-H Activation

By: Bechtoldt, Alexander; et al

ChemCatChem (2019), 11(1), 435-438.

Scheme 110 (1 Reaction)

Steps: **1** Yield: **95%**



Suppliers (25)

31-116-CAS-19573242

Steps: **1** Yield: **95%**

1.1 **Reagents:** Water-d_2
Catalysts: 3-(Trifluoromethyl)benzoic acid, Bis(dichloro(η^6-*p*-cymene)ruthenium), Benzoic acid, 3-(trifluoromethyl)-, potassium salt (1:1); 18 h, rt → 80 °C

Experimental Protocols

Ruthenium(II)biscarboxylate-Catalyzed Hydrogen-Isotope Exchange by Alkene C-H Activation

By: Bechtoldt, Alexander; et al

ChemCatChem (2019), 11(1), 435-438.

Scheme 111 (1 Reaction)

Steps: **1** Yield: **95%**

31-116-CAS-20076178

Steps: **1** Yield: **95%**

1.1 **Reagents:** Potassium carbonate
Catalysts: [(1,2,3,4,5,6-η)-1-Methyl-4-(1-methylethyl)benzene](tricyclo[3.3.1.1^{3,7}]decane-1-carboxylato-κ*O*)(tricyclo[3.3.1.1^{3,7}]decane-1-carboxylato-κ*O*,κ*O'*)ruthenium, Poly(oxy-1,2-ethanediyl), α-[4-[[3,4-dihydro-2,5,7,8-tetramethyl-2-(4,8,12-trimethyltridecyl)-2*H*-1-benzopyran-6-yl]oxy]-1,4-dioxobutyl]-ω-methoxy-
Solvents: Water-d_2; 12 h, 100 °C

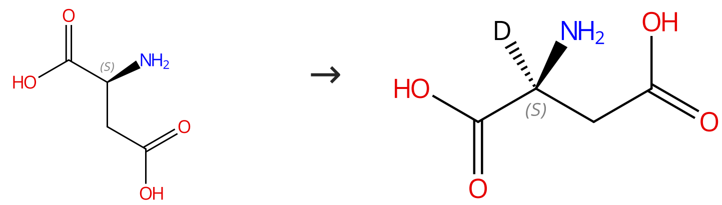
Micellar Catalysis for Ruthenium(II)-Catalyzed C-H Arylation: Weak-Coordination-Enabled C-H Activation in H_2O

By: Yetra, Santhivardhana Reddy; et al

Angewandte Chemie, International Edition (2019), 58(22), 7490-7494.

Scheme 112 (1 Reaction)

Steps: **1** Yield: **95%**



Absolute stereochemistry shown, Rotation (+)

Absolute stereochemistry shown

Suppliers (167)

31-116-CAS-11593057

Steps: **1** Yield: **95%**

1.1 **Reagents:** Deuterium
Catalysts: Ruthenium
Solvents: Water-d_2; 36 h, 2 bar, 55 °C

Experimental Protocols

Enantiospecific C-H activation using ruthenium nanocatalysts

By: Taglang, Celine; et al

Angewandte Chemie, International Edition (2015), 54(36), 10474-10477.

Scheme 113 (2 Reactions)

Steps: **1** Yield: **95%**

Suppliers (108)

31-116-CAS-20858309

Steps: **1** Yield: **95%**

1.1 **Reagents:** Water-d_2
Catalysts: [(1,2,3,4,5,6-η)-1-Methyl-4-(1-methylethyl)benzene](tricyclo[3.3.1.1^{3,7}]decane-1-carboxylato-κ*O*)(tricyclo[3.3.1.1^{3,7}]decane-1-carboxylato-κ*O*,κ*O*′)ruthenium
Solvents: 1,4-Dioxane; 16 h, 100 °C

Experimental Protocols

Ruthenium(II)-Catalyzed Hydrogen Isotope Exchange of Pharmaceutical Drugs by C-H Deuteration and C-H Tritiation

By: Mueller, Valentin; et al

ChemCatChem (2020), 12(1), 100-104.

31-116-CAS-19098187

Steps: **1**

1.1 **Solvents:** Dichloroethane; 5 - 10 min, rt

1.2 **Reagents:** Potassium acetate, Water-d_2
Catalysts: Cupric acetate, Bis(dichloro(η^6-*p*-cymene)ruthenium); rt → 85 °C; 24 h, 85 °C; 85 °C → rt

Experimental Protocols

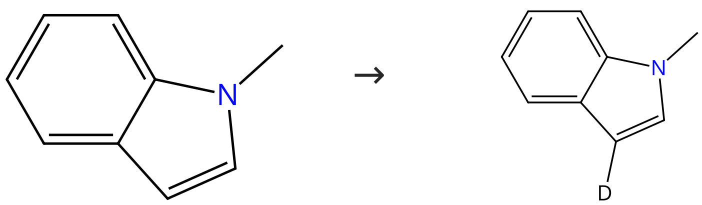
Ruthenium-Catalyzed C-H Functionalization of Benzoic Acids with Allyl Alcohols: A Controlled Reactivity Switch between C-H Alkenylation and C-H Alkylation Pathways

By: Kumar, Gangam Srikanth; et al

Organic Letters (2018), 20(16), 4934-4937.

Scheme 114 (1 Reaction)

Steps: **1** Yield: **95%**



Suppliers (107)

Suppliers (2)

31-116-CAS-14251266

Steps: **1** Yield: **95%**

1.1 **Reagents:** Water-d_2
Catalysts: Dichlorotris(triphenylphosphine)ruthenium, Silver hexafluoroantimonate
Solvents: Dichloromethane; 1 h, rt

Experimental Protocols

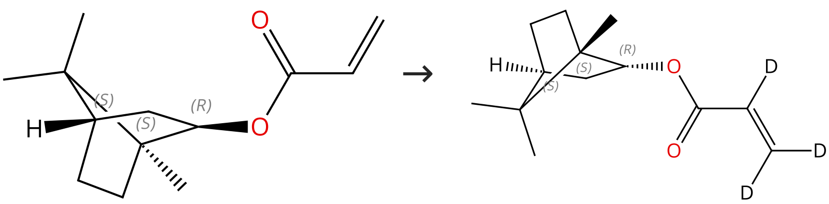
Ruthenium-catalyzed direct C3 alkylation of indoles with α, β-unsaturated ketones

By: Li, Shuai-Shuai; et al

Organic & Biomolecular Chemistry (2015), 13(4), 1254-1263.

Scheme 115 (1 Reaction)

Steps: **1** Yield: **95%**



Absolute stereochemistry shown

Absolute stereochemistry shown

Suppliers (3)

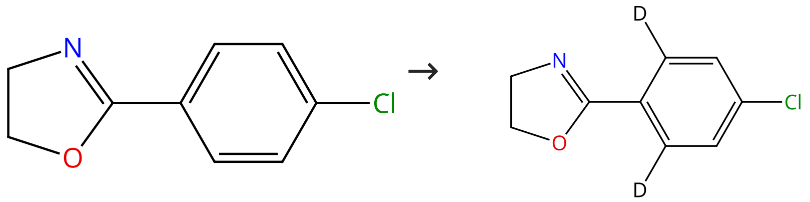
31-116-CAS-19573250	Steps: **1** Yield: **95%**
1.1	**Reagents:** Water-d_2 **Catalysts:** 3-(Trifluoromethyl)benzoic acid, Bis(dichloro(η^6-*p*-cymene)ruthenium), Benzoic acid, 3-(trifluoromethyl)-, potassium salt (1:1); 18 h, rt → 80 °C
Experimental Protocols	

Ruthenium(II)biscarboxylate-Catalyzed Hydrogen-Isotope Exchange by Alkene C-H Activation

By: Bechtoldt, Alexander; et al

ChemCatChem (2019), 11(1), 435-438.

Scheme 116 (1 Reaction) Steps: **1** Yield: **95%**



Suppliers (13)

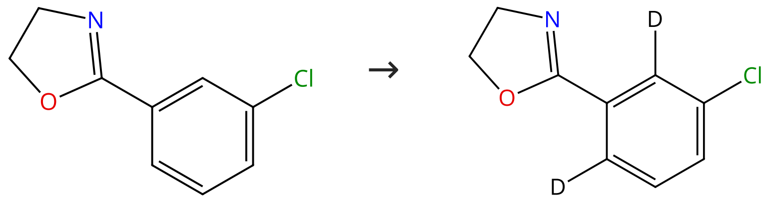
31-116-CAS-20984022	Steps: **1** Yield: **95%**
1.1	**Reagents:** Water-d_2, Potassium hydroxide (K(OD)) **Catalysts:** Dichlorotris(triphenylphosphine)ruthenium **Solvents:** 1,4-Dioxane; 16 h, 80 °C
Experimental Protocols	

Mild, Selective Ru-Catalyzed Deuteration Using D_2O as a Deuterium Source

By: Eisele, Pascal; et al

Chemistry - A European Journal (2019), 25(72), 16550-16554.

Scheme 117 (1 Reaction) Steps: **1** Yield: **95%**



Suppliers (4)

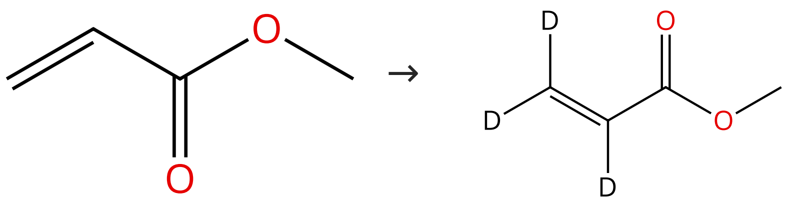
31-116-CAS-20984024	Steps: **1** Yield: **95%**
1.1	**Reagents:** Water-d_2, Potassium hydroxide (K(OD)) **Catalysts:** Dichlorotris(triphenylphosphine)ruthenium **Solvents:** 1,4-Dioxane; 16 h, 80 °C
Experimental Protocols	

Mild, Selective Ru-Catalyzed Deuteration Using D_2O as a Deuterium Source

By: Eisele, Pascal; et al

Chemistry - A European Journal (2019), 25(72), 16550-16554.

Scheme 118 (1 Reaction) Steps: **1** Yield: **95%**



Suppliers (66) Suppliers (5)

31-116-CAS-19573236 Steps: **1** Yield: **95%**

1.1 **Reagents:** Water-d_2
Catalysts: 3-(Trifluoromethyl)benzoic acid, Bis(dichloro(η[6]-*p*-cymene)ruthenium), Benzoic acid, 3-(trifluoromethyl)-, potassium salt (1:1); 18 h, rt → 80 °C

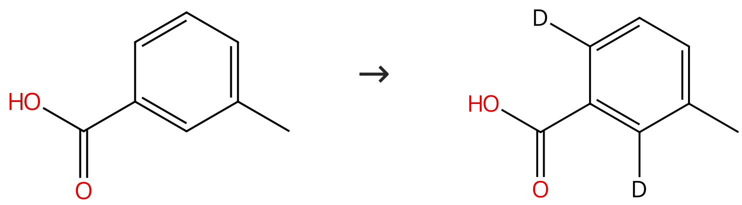
Experimental Protocols

Ruthenium(II)biscarboxylate-Catalyzed Hydrogen-Isotope Exchange by Alkene C-H Activation

By: Bechtoldt, Alexander; et al

ChemCatChem (2019), 11(1), 435-438.

Scheme 119 (3 Reactions) Steps: **1** Yield: **95%**



Suppliers (92)

31-614-CAS-29141976 Steps: **1** Yield: **95%**

1.1 **Reagents:** Water-d_2
Catalysts: [(1,2,3,4,5,6-η)-1-Methyl-4-(1-methylethyl)benzene](tricyclo[3.3.1.1^{3,7}]decane-1-carboxylato-κ*O*)(tricyclo[3.3.1.1^{3,7}]decane-1-carboxylato-κ*O*,κ*O'*)ruthenium
Solvents: 1,4-Dioxane; 16 h, 100 °C

Experimental Protocols

Ruthenium(II)-Catalyzed Hydrogen Isotope Exchange of Pharmaceutical Drugs by C-H Deuteration and C-H Tritiation

By: Mueller, Valentin; et al

ChemCatChem (2020), 12(1), 100-104.

31-614-CAS-42385085 Steps: **1**

1.1 **Reagents:** Water-d_2
Catalysts: Bis(dichloro(η[6]-*p*-cymene)ruthenium)
Solvents: 1,4-Dioxane; 16 h, 100 °C

Experimental Protocols

Ru-Catalyzed Redox-Neutral Coupling of N-Chlorobenzamides with Unsymmetrical Alkynes in Water

By: Saha, Sharajit; et al

Journal of Organic Chemistry (2024), 89(22), 16850-16864.

31-614-CAS-37729688 Steps: **1**

1.1 **Reagents:** Water-d_2
Catalysts: Bis(dichloro(η[6]-*p*-cymene)ruthenium)
Solvents: 1,4-Dioxane; 16 h, 100 °C

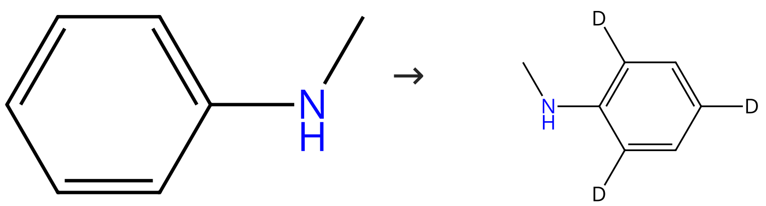
Experimental Protocols

Redox-Neutral Site-Selective C-H Allylation and Iodolacto nization of Benzoic Acids Using Morita- Baylis-Hillman Adducts in Water

By: Bhattacharyya, Hemanga; et al

Organic Letters (2023), 25(37), 6830-6834.

Scheme 120 (1 Reaction) Steps: **1** Yield: **94%**



Suppliers (79)

Supplier (1)

31-116-CAS-5810802 Steps: **1** Yield: **94%**

1.1 **Reagents:** Water-d_2
Catalysts: Triruthenium dodecacarbonyl; 12 h, 120 °C

Experimental Protocols

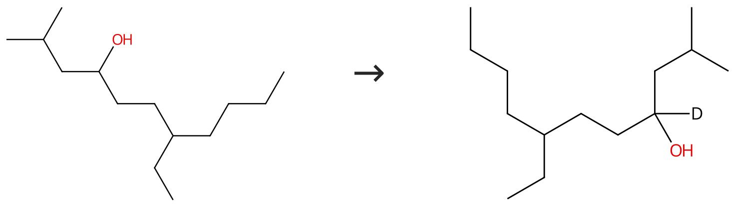
A convenient method for the Ru(0)-catalyzed regioselective deuteration of N-alkyl-substituted anilines

By: Zhan, Miao; et al

Tetrahedron Letters (2014), 55(36), 5070-5073.

Scheme 121 (1 Reaction)

Steps: **1** Yield: **94%**



Suppliers (55)

31-116-CAS-13719088

Steps: **1** Yield: **94%**

1.1 **Reagents:** Hydrogen, Water-d_2
Catalysts: Ruthenium
Solvents: Water-d_2; 3 h, 1 atm, 50 °C

1.2 **Reagents:** Water
Solvents: Diethyl ether; rt

Experimental Protocols

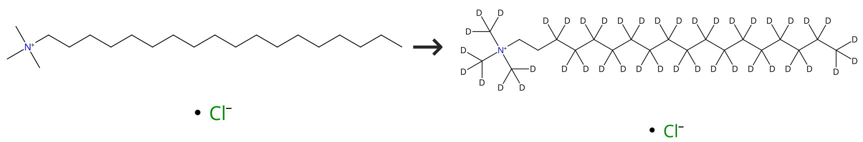
A convenient and effective method for the regiose lective deuteration of alcohols

By: Maegawa, Tomohiro; et al

Advanced Synthesis & Catalysis (2008), 350(14+15), 2215-2218.

Scheme 122 (1 Reaction)

Steps: **1** Yield: **94%**



Suppliers (76)

31-614-CAS-40361329

Steps: **1** Yield: **94%**

1.1 **Reagents:** Water-d_2
Catalysts: Platinum, Ruthenium
Solvents: Isopropanol; 24 h, 120 °C

Experimental Protocols

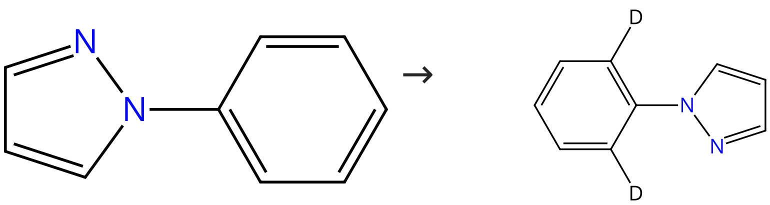
Unprecedented Regioselective Deuterium-Incorporation of Alkyltrimethylammonium Chlorides and Raman Analysis

By: Sawama, Yoshinari; et al

Asian Journal of Organic Chemistry (2023), 12(3), e202200710.

Scheme 123 (2 Reactions)

Steps: **1** Yield: **94%**



Suppliers (90)

31-614-CAS-39940594

Steps: **1** Yield: **94%**

1.1 **Reagents:** Potassium acetate, Water-d_2
Catalysts: Ruthenium(2+), aquapentakis(2,2-dimethylpropane nitrile)-, (*OC*-6-22)-, tetrafluoroborate(1-) (1:2)
Solvents: Tetrahydrofuran; 24 h, 40 °C

Experimental Protocols

An air- and moisture-stable ruthenium precatalyst for diverse reactivity

By: McArthur, Gillian; et al

Nature Chemistry (2024), 16(7), 1141-1150.

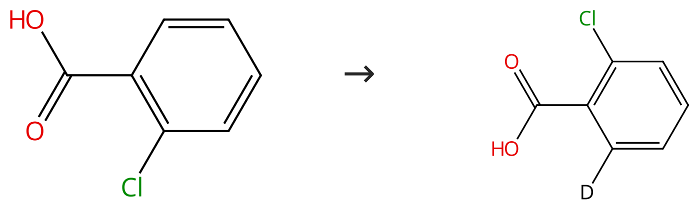
31-116-CAS-8188785	Steps: **1**
1.1	**Reagents:** Water-*d*2 **Catalysts:** Stereoisomer of dihydro[(1,2,3,3a,7a-η)-1-phenyl-1*H*-inden-1-yl](triethylsilyl)(triphenylphosphine)ruthenium **Solvents:** Toluene; 16 h, 110 atm
Experimental Protocols	

Regioselective ruthenium catalysed H-D exchange using D_2O as the deuterium source

By: Piola, Lorenzo; et al

Organic & Biomolecular Chemistry (2014), 12(43), 8683-8688.

Scheme 124 (1 Reaction) Steps: **1** Yield: **94%**



Suppliers (107) Suppliers (7)

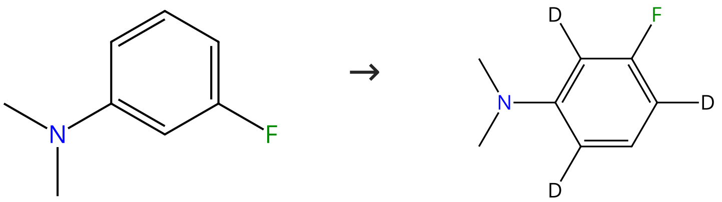
31-116-CAS-20858310	Steps: **1** Yield: **94%**
1.1	**Reagents:** Water-*d*2 **Catalysts:** [(1,2,3,4,5,6-η)-1-Methyl-4-(1-methylethyl)benzene](tricyclo[3.3.1.1^{3,7}]decane-1-carboxylato-κ*O*)(tricyclo[3.3.1.1^{3,7}]decane-1-carboxylato-κ*O*,κ*O'*)ruthenium **Solvents:** 1,4-Dioxane; 16 h, 100 °C
Experimental Protocols	

Ruthenium(II)-Catalyzed Hydrogen Isotope Exchange of Pharmaceutical Drugs by C-H Deuteration and C-H Tritiation

By: Mueller, Valentin; et al

ChemCatChem (2020), 12(1), 100-104.

Scheme 125 (1 Reaction) Steps: **1** Yield: **94%**



Suppliers (59)

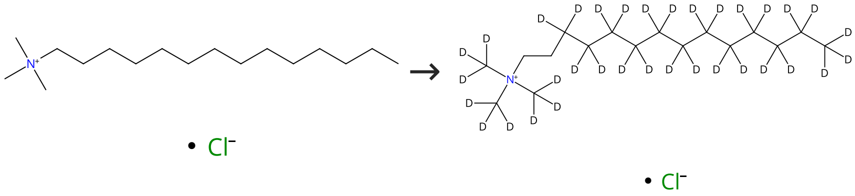
31-116-CAS-1487983	Steps: **1** Yield: **94%**
1.1	**Reagents:** Water-*d*2 **Catalysts:** Triruthenium dodecacarbonyl; 12 h, 100 °C
Experimental Protocols	

A convenient method for the Ru(0)-catalyzed regioselective deuteration of N-alkyl-substituted anilines

By: Zhan, Miao; et al

Tetrahedron Letters (2014), 55(36), 5070-5073.

Scheme 126 (1 Reaction) Steps: **1** Yield: **94%**



Suppliers (74)

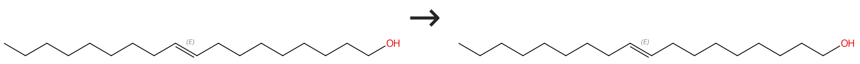
31-614-CAS-40361325	Steps: **1** Yield: **94%**
1.1 **Reagents:** Water-d_2 **Catalysts:** Platinum, Ruthenium **Solvents:** Isopropanol; 24 h, 120 °C	
Experimental Protocols	

Unprecedented Regioselective Deuterium-Incorporation of Alkyltrimethylammonium Chlorides and Raman Analysis

By: Sawama, Yoshinari; et al

Asian Journal of Organic Chemistry (2023), 12(3), e202200710.

Scheme 127 (1 Reaction) Steps: **1** Yield: **94%**



Double bond geometry shown

Double bond geometry shown

Suppliers (54)

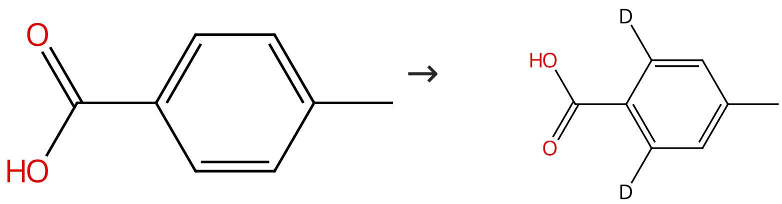
31-614-CAS-26390338	Steps: **1** Yield: **94%**
1.1 **Reagents:** Sodium hydroxide, Water-d_2 **Catalysts:** Ruthenium, [6-[[bis(1,1-dimethylethyl)phosphino-κ*P*]methyl]-2,2'-bipyridine-κN^1,κ$N^{1'}$]carbonylchlorohydro-, (*OC*-6-64)-; 24 h, 120 °C	
Experimental Protocols	

Simple and Efficient Catalytic Reaction for the Selective Deuteration of Alcohols

By: Khaskin, Eugene; et al

ACS Catalysis (2013), 3(3), 448-452.

Scheme 128 (1 Reaction) Steps: **1** Yield: **94%**



Suppliers (103)

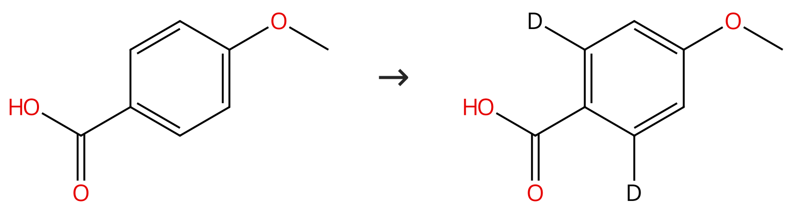
31-614-CAS-27793701	Steps: **1** Yield: **94%**
1.1 **Reagents:** Water-d_2 **Catalysts:** [(1,2,3,4,5,6-η)-1-Methyl-4-(1-methylethyl)benzene](tricyclo[3.3.1.1^{3,7}]decane-1-carboxylato-κ*O*)(tricyclo[3.3.1.1^{3,7}]decane-1-carboxylato-κ*O*,κ*O'*)ruthenium **Solvents:** 1,4-Dioxane; 16 h, 100 °C	
Experimental Protocols	

Ruthenium(II)-Catalyzed Hydrogen Isotope Exchange of Pharmaceutical Drugs by C-H Deuteration and C-H Tritiation

By: Mueller, Valentin; et al

ChemCatChem (2020), 12(1), 100-104.

Scheme 129 (3 Reactions) Steps: **1** Yield: **93%**



Suppliers (116)

Supplier (1)

31-116-CAS-20858306 Steps: **1** Yield: **93%**

1.1 **Reagents:** Water-d_2
Catalysts: [(1,2,3,4,5,6-η)-1-Methyl-4-(1-methylethyl)benzene](tricyclo[3.3.1.1^{3,7}]decane-1-carboxylato-κ*O*)(tricyclo[3.3.1.1^{3,7}]decane-1-carboxylato-κ*O*,κ*O'*)ruthenium
Solvents: 1,4-Dioxane; 16 h, 100 °C

Experimental Protocols

Ruthenium(II)-Catalyzed Hydrogen Isotope Exchange of Pharmaceutical Drugs by C-H Deuteration and C-H Tritiation

By: Mueller, Valentin; et al

ChemCatChem (2020), 12(1), 100-104.

31-614-CAS-36485413 Steps: **1**

1.1 **Reagents:** Water-d_2
Catalysts: [(1,2,3,4,5,6-η)-1-Methyl-4-(1-methylethyl)benzene](tricyclo[3.3.1.1^{3,7}]decane-1-carboxylato-κ*O*)(tricyclo[3.3.1.1^{3,7}]decane-1-carboxylato-κ*O*,κ*O'*)ruthenium
Solvents: 1,4-Dioxane; 16 h, 100 °C

Experimental Protocols

Cascade C-H Activation/Annulation of Sulfoxonium Ylides with Vinyl Cyclopropanes: Access to Cyclopropane-Fused α-Tetralones

By: Saha, Sharajit; et al

Organic Letters (2023), 25(19), 3352-3357.

31-614-CAS-38395501 Steps: **1**

1.1 **Reagents:** Water-d_2
Catalysts: [(1,2,3,4,5,6-η)-1-Methyl-4-(1-methylethyl)benzene](tricyclo[3.3.1.1^{3,7}]decane-1-carboxylato-κ*O*)(tricyclo[3.3.1.1^{3,7}]decane-1-carboxylato-κ*O*,κ*O'*)ruthenium
Solvents: 1,4-Dioxane; 16 h, 100 °C

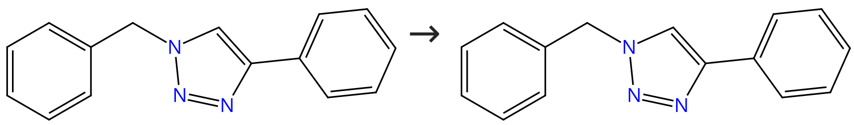
Experimental Protocols

Expedient C-H allylation of sulfoxonium ylides: merging C-H and C-C/C-het bond activation

By: Saha, Sharajit; et al

Chemical Communications (Cambridge, United Kingdom) (2023), 59(95), 14173-14176.

Scheme 130 (1 Reaction) Steps: **1** Yield: **93%**



Suppliers (38)

31-614-CAS-25240559 Steps: **1** Yield: **93%**

1.1 **Reagents:** Water-d_2
Catalysts: Cupric acetate, Silver hexafluoroantimonate, Bis(dichloro(η^6-*p*-cymene)ruthenium)
Solvents: Toluene; 60 min, 100 °C

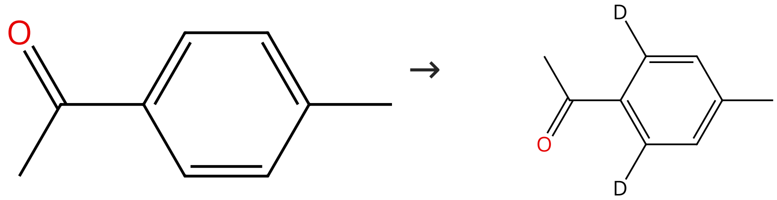
Experimental Protocols

Ruthenium-Catalyzed Alkenylation of Arenes with Alkynes or Alkenes by 1,2,3-Triazole-Directed C-H Activation

By: Li, Xing Guang; et al

European Journal of Organic Chemistry (2014), 2014(35), 7878-7888.

Scheme 131 (1 Reaction) Steps: **1** Yield: **93%**



Suppliers (109)

31-116-CAS-20984002 Steps: **1** Yield: **93%**

1.1 **Reagents:** Zinc, Water-d_2
Catalysts: Cuprous iodide, Dichlorotris(triphenylphosphine) ruthenium
Solvents: 1,4-Dioxane; 16 h, 80 °C

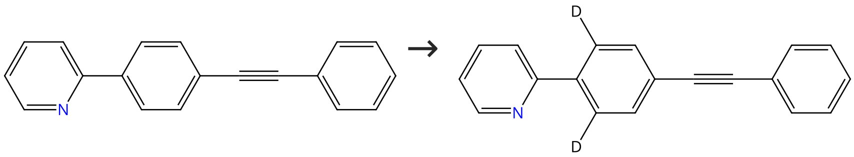
Experimental Protocols

Mild, Selective Ru-Catalyzed Deuteration Using D_2O as a Deuterium Source

By: Eisele, Pascal; et al

Chemistry - A European Journal (2019), 25(72), 16550-16554.

Scheme 132 (1 Reaction) Steps: **1** Yield: **93%**



Suppliers (2)

31-116-CAS-20984029 Steps: **1** Yield: **93%**

1.1 **Reagents:** Water-d_2, Potassium hydroxide (K(OD))
Catalysts: Dichlorotris(triphenylphosphine)ruthenium
Solvents: 1,4-Dioxane; 62 h, 80 °C

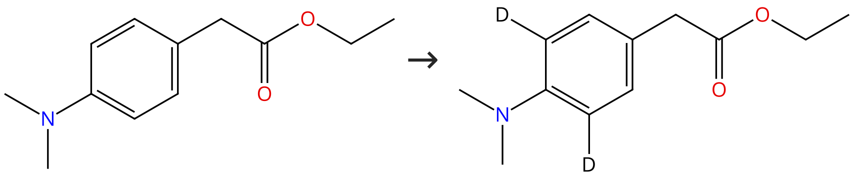
Experimental Protocols

Mild, Selective Ru-Catalyzed Deuteration Using D_2O as a Deuterium Source

By: Eisele, Pascal; et al

Chemistry - A European Journal (2019), 25(72), 16550-16554.

Scheme 133 (1 Reaction) Steps: **1** Yield: **93%**



Suppliers (15)

31-116-CAS-5522007 Steps: **1** Yield: **93%**

1.1 **Reagents:** Water-d_2
Catalysts: Triruthenium dodecacarbonyl
Solvents: Toluene; 12 h, 100 °C

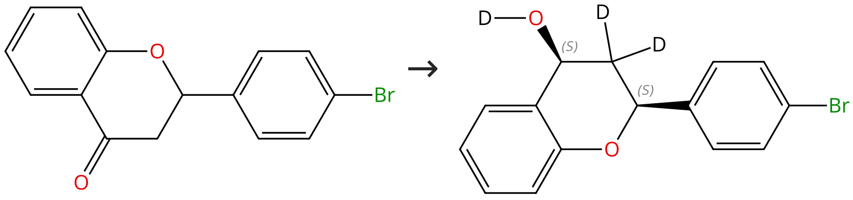
Experimental Protocols

A convenient method for the Ru(0)-catalyzed regioselective deuteration of N-alkyl-substituted anilines

By: Zhan, Miao; et al

Tetrahedron Letters (2014), 55(36), 5070-5073.

Scheme 134 (1 Reaction) Steps: **1** Yield: **93%**



Absolute stereochemistry shown

Suppliers (4)

31-614-CAS-37448826 Steps: **1** Yield: **93%**

1.1 **Reagents:** Sodium formate, Methanol-d_4
Catalysts: Ruthenium (complexes with trimethylbenzene, Cl and copolymer of EGDMA-NIPMAM-viny...), 2973383-97-8 (ruthenium complexes with trimethylbenzene and Cl)
Solvents: Water-d_2; 18 h, 40 °C

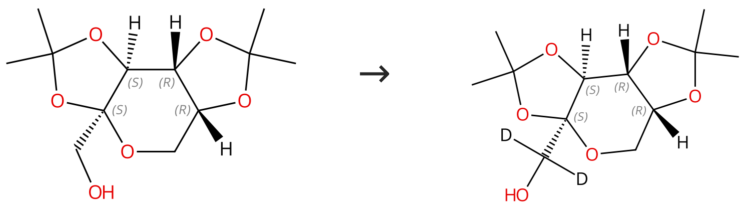
Experimental Protocols

Harmonization of an incompatible aqueous aldol condensation/oxa-Michael addition/reduction cascade process over a core-shell-structured thermoresponsive catalyst

By: Su, Yu; et al

Green Chemistry (2023), 25(17), 6859-6868.

Scheme 135 (1 Reaction) Steps: **1** Yield: **93%**



Absolute stereochemistry shown, Rotation (-)

Absolute stereochemistry shown

Suppliers (83)

31-116-CAS-5089852 Steps: **1** Yield: **93%**

1.1 **Reagents:** Sodium hydroxide, Hydrogen
Catalysts: Ruthenium
Solvents: Water-d_2; 80 °C; 80 °C → rt

1.2 **Reagents:** Water

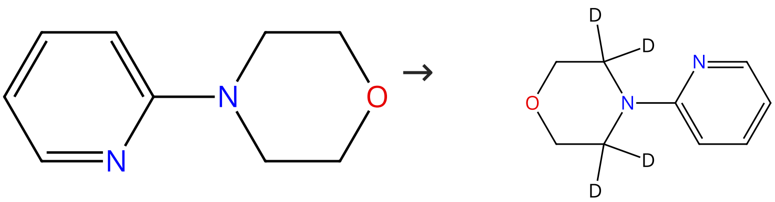
Experimental Protocols

Stereo- and Regioselective Direct Multi-Deuterium-Labeling Methods for Sugars

By: Sawama, Yoshinari; et al

Chemistry - A European Journal (2012), 18(51), 16436-16442.

Scheme 136 (1 Reaction) Steps: **1** Yield: **93%**



Suppliers (57)

31-116-CAS-20984027 Steps: **1** Yield: **93%**

1.1 **Reagents:** Zinc, Water-d_2
Catalysts: Cuprous iodide, Dichlorotris(triphenylphosphine) ruthenium
Solvents: 1,4-Dioxane; 16 h, 80 °C

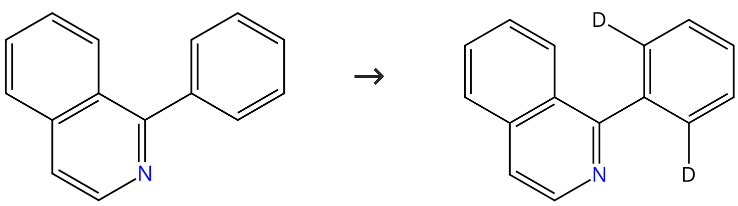
Experimental Protocols

Mild, Selective Ru-Catalyzed Deuteration Using D_2O as a Deuterium Source

By: Eisele, Pascal; et al

Chemistry - A European Journal (2019), 25(72), 16550-16554.

Scheme 137 (1 Reaction) Steps: **1** Yield: **93%**



Suppliers (70)

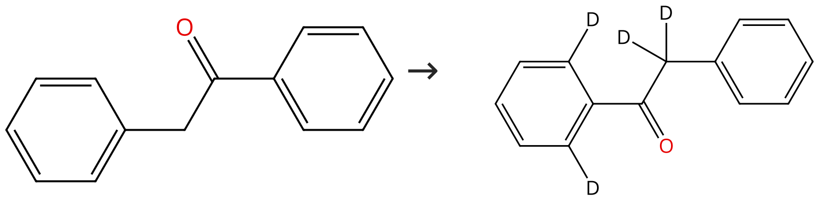
31-614-CAS-39940591	Steps: **1** Yield: **93%**
1.1 **Reagents:** Potassium acetate, Water-d_2 **Catalysts:** Ruthenium(2+), aquapentakis(2,2-dimethylpropanenitrile)-, (*OC*-6-22)-, tetrafluoroborate(1-) (1:2) **Solvents:** Tetrahydrofuran; 24 h, 40 °C	
Experimental Protocols	

An air- and moisture-stable ruthenium precatalyst for diverse reactivity

By: McArthur, Gillian; et al

Nature Chemistry (2024), 16(7), 1141-1150.

Scheme 138 (2 Reactions) Steps: **1** Yield: **93%**



Suppliers (103)

31-116-CAS-24181850	Steps: **1** Yield: **93%**
1.1 **Reagents:** Water-d_2 **Catalysts:** 4-Chlorobenzoic acid, Silver hexafluoroantimonate, Bis(dichloro(η[6]-*p*-cymene)ruthenium), 2-Methyl-3-(trifluoromethyl)aniline **Solvents:** 1,2-Dichloroethane; rt → 120 °C; 16 h, 120 °C	
Experimental Protocols	

Ruthenium-Catalyzed Deuteration of Aromatic Carbonyl Compounds with a Catalytic Transient Directing Group

By: Kopf, Sara; et al

Chemistry - A European Journal (2021), 27(38), 9768-9773.

31-116-CAS-5735081	Steps: **1**
1.1 **Reagents:** Water-d_2 **Catalysts:** Stereoisomer of dihydro[(1,2,3,3a,7a-η)-1-phenyl-1*H*-inden-1-yl](triethylsilyl)(triphenylphosphine)ruthenium **Solvents:** Toluene; 16 h, 110 atm	
Experimental Protocols	

Regioselective ruthenium catalysed H-D exchange using D_2O as the deuterium source

By: Piola, Lorenzo; et al

Organic & Biomolecular Chemistry (2014), 12(43), 8683-8688.

Scheme 139 (1 Reaction) Steps: **1** Yield: **93%**

Suppliers (56)

31-116-CAS-10403182	Steps: **1** Yield: **93%**
1.1 **Reagents:** Water-d_2 **Catalysts:** Triruthenium dodecacarbonyl; 12 h, 100 °C	
Experimental Protocols	

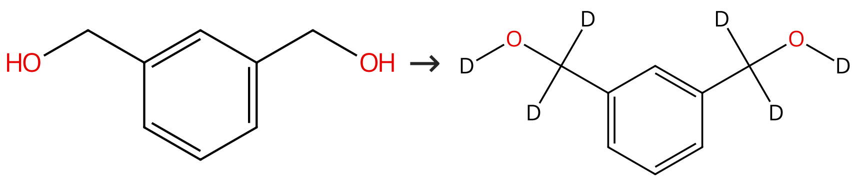
A convenient method for the Ru(0)-catalyzed regioselective deuteration of N-alkyl-substituted anilines

By: Zhan, Miao; et al

Tetrahedron Letters (2014), 55(36), 5070-5073.

Scheme 140 (1 Reaction)

Steps: 1 Yield: 93%



Suppliers (87)

31-116-CAS-1903814

Steps: 1 Yield: 93%

1.1 **Reagents:** Sodium hydroxide, Water-*d*$_2$
Catalysts: Ruthenium, [6-[[bis(1,1-dimethylethyl)phosphino-κ*P*]methyl]-2,2'-bipyridine-κ*N*^{1},κ*N*$^{1'}$]carbonylchlorohydro-, (*OC*-6-64)-; 24 h, 120 °C

Experimental Protocols

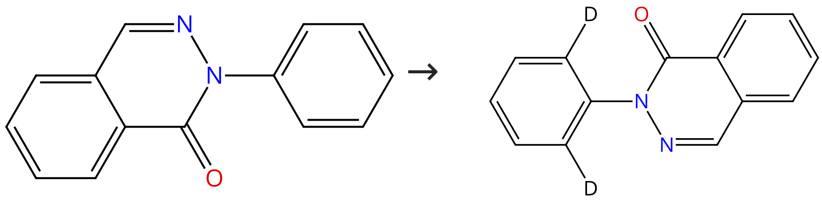
Simple and Efficient Catalytic Reaction for the Selective Deuteration of Alcohols

By: Khaskin, Eugene; et al

ACS Catalysis (2013), 3(3), 448-452.

Scheme 141 (3 Reactions)

Steps: 1 Yield: 91-93%



Suppliers (50)

31-614-CAS-39084797

Steps: 1 Yield: 93%

1.1 **Reagents:** Pivalic acid, 1-Adamantanecarboxylic acid, Water-*d*$_2$, Silver hexafluoroantimonate
Catalysts: Bis(dichloro(η^6-*p*-cymene)ruthenium)
Solvents: 1,1,1,3,3,3-Hexafluoro-2-propanol; 12 h, 90 °C

Experimental Protocols

Vinylene Carbonate as Latent Formylmethyl Surrogate: The Expediency of Ruthenium(II) Catalysis in Accessing Arylacetaldehydes, Arylacetates and Acetals

By: Thalakottukara, Dolly David; et al

European Journal of Organic Chemistry (2024), 27(5), e202300847.

31-614-CAS-36010603

Steps: 1 Yield: 91%

1.1 **Reagents:** Cupric acetate, Water-*d*$_2$
Catalysts: Silver hexafluoroantimonate, Bis(dichloro(η^6-*p*-cymene)ruthenium)
Solvents: 1,2-Dichloroethane; 12 h, 120 °C

Ruthenium(II)-catalyzed oxidative dehydrogenation and hydroarylation of maleimides with phthalazinones - insights into additive-controlled product selectivity

By: Ramkumar, Alagumalai; et al

Organic & Biomolecular Chemistry (2023), 21(13), 2695-2699.

31-614-CAS-37451982

Steps: 1

1.1 **Reagents:** Sodium acetate, Water-*d*$_2$
Catalysts: Silver hexafluoroantimonate, Bis(dichloro(η^6-*p*-cymene)ruthenium)
Solvents: 2-Methyltetrahydrofuran; 24 h, 120 °C

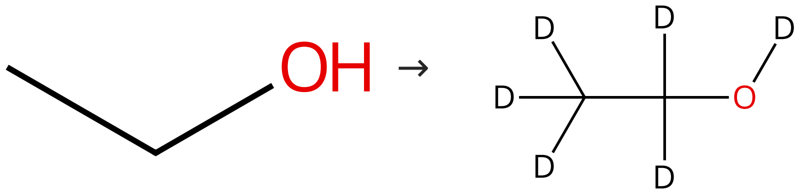
Experimental Protocols

Sustainable Ru(II)-Catalyzed ortho -C(sp^2)-H Hydroxyalkylation of Phthalazinones Using Ethyl Glyoxalate: Access to α,α'-Arylcarboxy sec -Alcohols

By: Ramkumar, Alagumalai; et al

Synthesis (2023), 55(21), 3610-3616.

Scheme 142 (2 Reactions) Steps: **1** Yield: **93%**

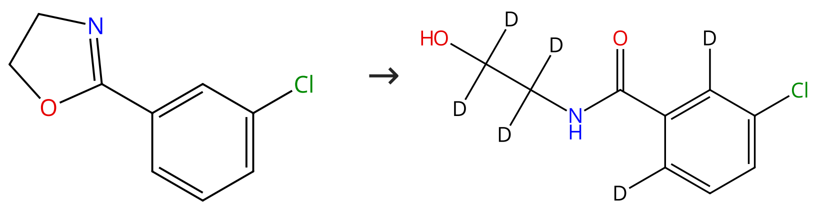


Suppliers (582) Suppliers (66)

31-116-CAS-13156219 Steps: **1** Yield: **93%**	**Simple and Efficient Catalytic Reaction for the Selective Deuteration of Alcohols**
1.1 **Reagents:** Sodium hydroxide, Water-d_2 **Catalysts:** Ruthenium, [6-[[bis(1,1-dimethylethyl)phosphino-κ*P*]methyl]-2,2'-bipyridine-κ*N*[1],κ*N*[1']]carbonylchlorohydro-, (*OC*-6-64)-; 40 h, 120 °C	By: Khaskin, Eugene; et al ACS Catalysis (2013), 3(3), 448-452.
Experimental Protocols	

31-116-CAS-15679734 Steps: **1**	**Efficient deuterium labelling of alcohols in deuterated water catalyzed by ruthenium pincer complexes**
1.1 **Reagents:** Sodium hydroxide, Water-d_2 **Catalysts:** (*OC*-6-52)-Carbonylchloro[2-(diphenylphosphino-κ*P*)-*N*-[2-(diphenylphosphino-κ*P*)ethyl]ethanamine-κ*N*]hydroruthenium; 24 h, 120 °C	By: Zhang, Lei; et al Catalysis Communications (2016), 84, 67-70.
Experimental Protocols	

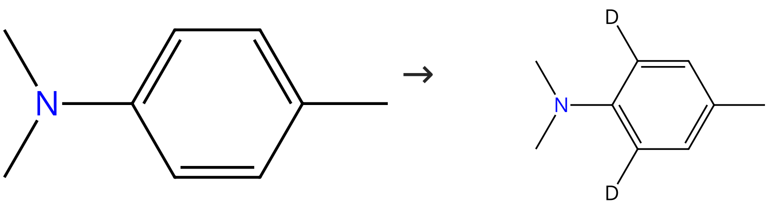
Scheme 143 (1 Reaction) Steps: **1** Yield: **93%**



Suppliers (4)

31-116-CAS-20984023 Steps: **1** Yield: **93%**	**Mild, Selective Ru-Catalyzed Deuteration Using D_2O as a Deuterium Source**
1.1 **Reagents:** Zinc, Water-d_2 **Catalysts:** Cuprous iodide, Dichlorotris(triphenylphosphine) ruthenium **Solvents:** 1,4-Dioxane; 16 h, 80 °C	By: Eisele, Pascal; et al Chemistry - A European Journal (2019), 25(72), 16550-16554.
Experimental Protocols	

Scheme 144 (1 Reaction) Steps: **1** Yield: **93%**



Suppliers (77)

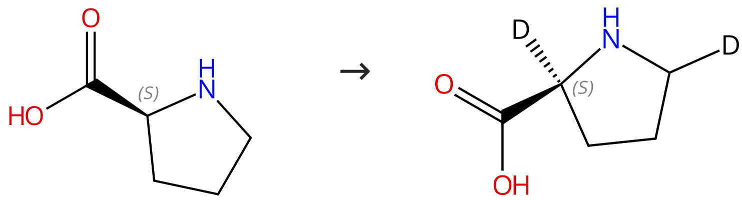
31-116-CAS-8262116	Steps: **1** Yield: **93%**
1.1	**Reagents:** Water-d_2 **Catalysts:** Triruthenium dodecacarbonyl; 12 h, 100 °C
Experimental Protocols	

A convenient method for the Ru(0)-catalyzed regioselective deuteration of N-alkyl-substituted anilines

By: Zhan, Miao; et al

Tetrahedron Letters (2014), 55(36), 5070-5073.

Scheme 145 (1 Reaction) Steps: **1** Yield: **92%**



Absolute stereochemistry shown, Rotation (-)

Absolute stereochemistry shown

Suppliers (170)

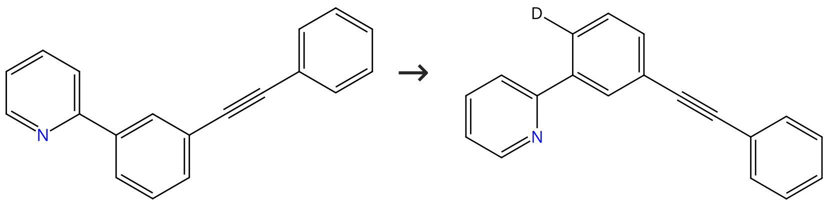
31-116-CAS-2790211	Steps: **1** Yield: **92%**
1.1	**Reagents:** Deuterium **Catalysts:** Ruthenium **Solvents:** Water-d_2; 36 h, 2 bar, 55 °C
Experimental Protocols	

Enantiospecific C-H activation using ruthenium nanocatalysts

By: Taglang, Celine; et al

Angewandte Chemie, International Edition (2015), 54(36), 10474-10477.

Scheme 146 (1 Reaction) Steps: **1** Yield: **92%**



Supplier (1)

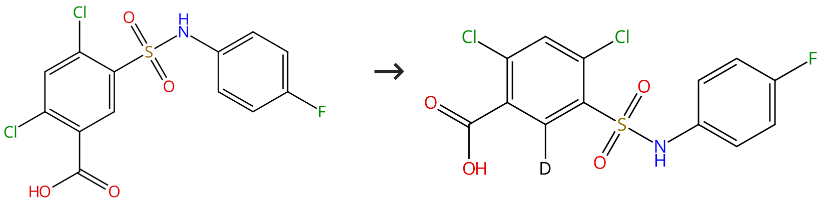
31-116-CAS-20984033	Steps: **1** Yield: **92%**
1.1	**Reagents:** Water-d_2, Potassium hydroxide (K(OD)) **Catalysts:** Dichlorotris(triphenylphosphine)ruthenium **Solvents:** 1,4-Dioxane; 62 h, 80 °C
Experimental Protocols	

Mild, Selective Ru-Catalyzed Deuteration Using D_2O as a Deuterium Source

By: Eisele, Pascal; et al

Chemistry - A European Journal (2019), 25(72), 16550-16554.

Scheme 147 (1 Reaction) Steps: **1** Yield: **92%**



Suppliers (27)

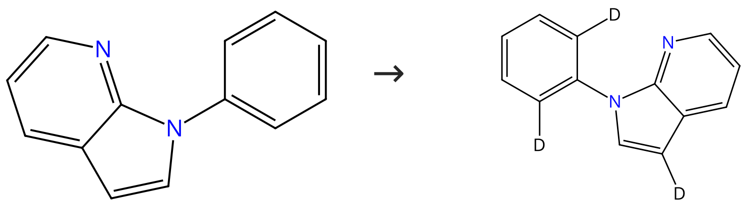
31-116-CAS-20858327	Steps: **1** Yield: **92%**
1.1	**Reagents:** Water-d_2 **Catalysts:** [(1,2,3,4,5,6-η)-1-Methyl-4-(1-methylethyl)benzene](tricyclo[3.3.1.1^{3,7}]decane-1-carboxylato-κ*O*)(tricyclo[3.3.1.1^{3,7}]decane-1-carboxylato-κ*O*,κ*O'*)ruthenium **Solvents:** 1,4-Dioxane; 16 h, 100 °C
Experimental Protocols	

Ruthenium(II)-Catalyzed Hydrogen Isotope Exchange of Pharmaceutical Drugs by C-H Deuteration and C-H Tritiation

By: Mueller, Valentin; et al

ChemCatChem (2020), 12(1), 100-104.

Scheme 148 (1 Reaction) Steps: **1** Yield: **92%**



Suppliers (6)

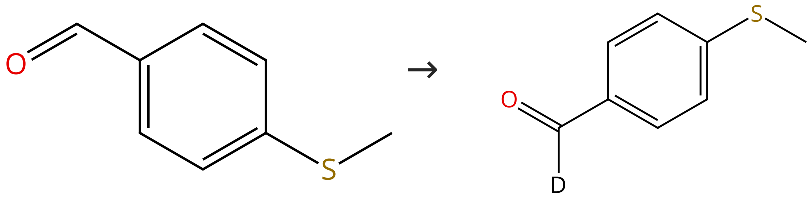
31-116-CAS-20858440	Steps: **1** Yield: **92%**
1.1	**Reagents:** Silver carbonate, Water-d_2 **Catalysts:** BINOL, Silver hexafluoroantimonate, Bis(dichloro(η^6-*p*-cymene)ruthenium) **Solvents:** Toluene; 15 h, 100 °C
Experimental Protocols	

BINOL accelerated Ru(II)-catalyzed regioselective C-H functionalization of arenes with disulfides and diselenides

By: Bag, Raghunath; et al

Journal of Chemical Sciences (Berlin, Germany) (2019), 131(12), 115pp..

Scheme 149 (1 Reaction) Steps: **1** Yield: **92%**



Suppliers (88)

31-116-CAS-18937435	Steps: **1** Yield: **92%**
1.1	**Reagents:** Water-d_2 **Catalysts:** Carbonylchlorohydrotris(triphenylphosphine)ruthenium **Solvents:** Toluene; rt → 100 °C; 30 min, 100 °C

Catalytic Deuteration of Aldehydes with D 2 O

By: Isbrandt, Eric S.; et al

Synlett (2017), 28(20), 2851-2854.

Scheme 150 (1 Reaction) Steps: **1** Yield: **92%**

Suppliers (98)

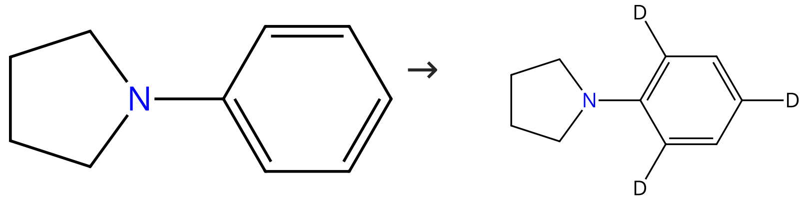
31-116-CAS-18937439	Steps: **1** Yield: **92%**
1.1	**Reagents:** Water-d_2 **Catalysts:** Carbonylchlorohydrotris(triphenylphosphine) ruthenium **Solvents:** Toluene; rt → 100 °C; 30 min, 100 °C

Catalytic Deuteration of Aldehydes with D 2 O

By: Isbrandt, Eric S.; et al

Synlett (2017), 28(20), 2851-2854.

Scheme 151 (1 Reaction) Steps: **1** Yield: **92%**



Suppliers (70)

Supplier (1)

31-116-CAS-14662191	Steps: **1** Yield: **92%**
1.1	**Reagents:** Water-d_2 **Catalysts:** Triruthenium dodecacarbonyl; 12 h, 120 °C

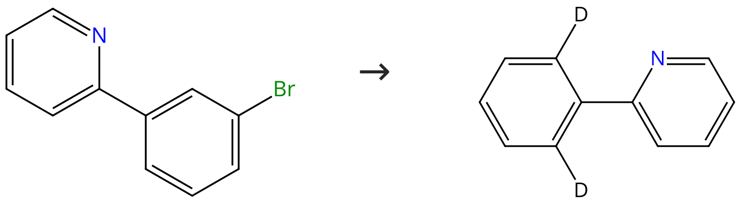
Experimental Protocols

A convenient method for the Ru(0)-catalyzed regioselective deuteration of N-alkyl-substituted anilines

By: Zhan, Miao; et al

Tetrahedron Letters (2014), 55(36), 5070-5073.

Scheme 152 (1 Reaction) Steps: **1** Yield: **92%**



Suppliers (73)

Supplier (1)

31-113-CAS-414749	Steps: **1** Yield: **92%**
1.1	**Reagents:** 2,4,6-Trimethylbenzoic acid, Potassium carbonate **Catalysts:** Bis(dichloro(η^6-*p*-cymene)ruthenium) **Solvents:** Dimethylacetamide, Water-d_2; 10 h, 100 °C
1.2	**Solvents:** Water; 1 °C

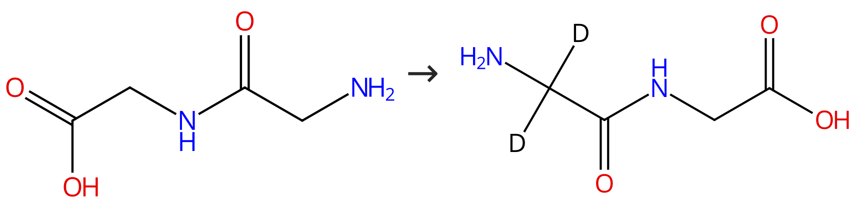
Experimental Protocols

Directed meta-Selective Bromination of Arenes with Ruthenium Catalysts

By: Yu, Qingzhen; et al

Angewandte Chemie, International Edition (2015), 54(50), 15284-15288.

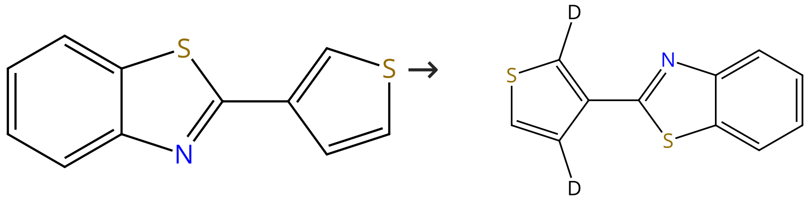
Scheme 153 (1 Reaction) Steps: **1** Yield: **92%**



Suppliers (120)

31-116-CAS-17957986	Steps: **1** Yield: **92%**	**Development and Scale-Up of Stereoretentive α-Deuteration of Amines**
1.1	**Reagents:** Potassium carbonate, Hydrogen, Water- d_2 **Catalysts:** Ruthenium; 72 h, 70 °C; 70 °C → rt	By: Michelotti, Alessia; et al
1.2	**Reagents:** Dowex 50W-X8; pH 5 - 6, rt	Organic Process Research & Development (2017), 21(11), 1741-1744.
Experimental Protocols		

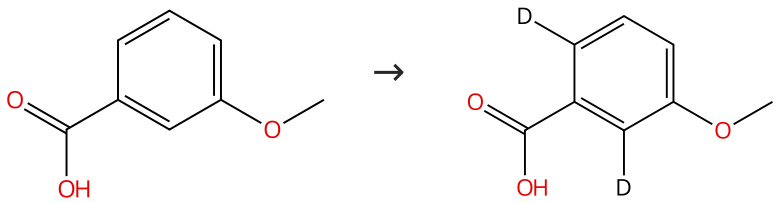
Scheme 154 (1 Reaction) Steps: **1** Yield: **92%**



Suppliers (12)

31-116-CAS-18748295	Steps: **1** Yield: **92%**	**Ligand-Assisted Heteroaryl C(sp^2)-H Bond Activation by a Cationic Ruthenium(II) Complex for Alkenylation of Hetero arenes with Alkynes Directed by Biorelevant Heterocycles**
1.1	**Reagents:** Water-d_2 **Catalysts:** Silver tetrafluoroborate, Bis(dichloro(η^6-*p*-cymene) ruthenium) **Solvents:** 1,2-Dichloroethane, Water-d_2; 2 h, 85 °C	By: Pipaliya, Bhavin V.; et al
Experimental Protocols		ChemCatChem (2017), 9(22), 4191-4198.

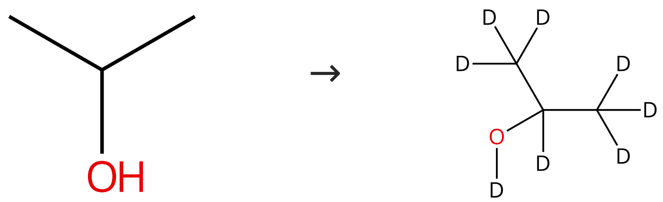
Scheme 155 (1 Reaction) Steps: **1** Yield: **92%**



Suppliers (96)

31-116-CAS-20858313	Steps: **1** Yield: **92%**	**Ruthenium(II)-Catalyzed Hydrogen Isotope Exchange of Pharmaceutical Drugs by C-H Deuteration and C-H Tritiation**
1.1	**Reagents:** Water-d_2 **Catalysts:** [(1,2,3,4,5,6-η)-1-Methyl-4-(1-methylethyl)benzene](tricyclo[3.3.1.1^{3,7}]decane-1-carboxylato-κ*O*)(tricyclo[3.3.1.1^{3,7}]decane-1-carboxylato-κ*O*,κ*O*')ruthenium **Solvents:** 1,4-Dioxane; 16 h, 100 °C	By: Mueller, Valentin; et al
Experimental Protocols		ChemCatChem (2020), 12(1), 100-104.

Scheme 156 (2 Reactions) Steps: **1** Yield: **92%**



Suppliers (387) Suppliers (49)

31-116-CAS-10423671	Steps: **1** Yield: **92%**
1.1	**Reagents:** Sodium hydroxide, Water-*d*$_2$ **Catalysts:** Ruthenium, [6-[[bis(1,1-dimethylethyl)phosphino-κ*P*]methyl]-2,2'-bipyridine-κ*N*^{1},κ*N*$^{1'}$]carbonylchlorohydro-, (*OC*-6-64)-; 40 h, 50 °C
Experimental Protocols	

Simple and Efficient Catalytic Reaction for the Selective Deuteration of Alcohols

By: Khaskin, Eugene; et al

ACS Catalysis (2013), 3(3), 448-452.

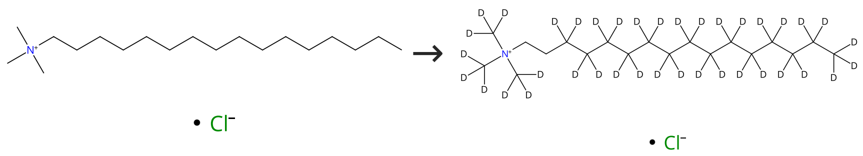
31-116-CAS-7520695	Steps: **1**
1.1	**Reagents:** Potassium *tert*-butoxide **Catalysts:** (*OC*-6-52)-Carbonylchloro[2-(diphenylphosphino-κ*P*)-*N*-[2-(diphenylphosphino-κ*P*)ethyl]ethanamine-κ*N*]hydroruthenium **Solvents:** Water-*d*$_2$; 9 h, 80 °C
Experimental Protocols	

Ruthenium Catalyzed Selective α- and α,β-Deuteration of Alcohols Using D_2O

By: Chatterjee, Basujit; et al

Organic Letters (2015), 17(19), 4794-4797.

Scheme 157 (1 Reaction) Steps: **1** Yield: **91%**



Suppliers (102)

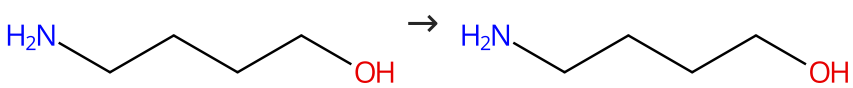
31-614-CAS-40361328	Steps: **1** Yield: **91%**
1.1	**Reagents:** Water-*d*$_2$ **Catalysts:** Platinum, Ruthenium **Solvents:** Isopropanol; 24 h, 120 °C
Experimental Protocols	

Unprecedented Regioselective Deuterium-Incorporation of Alkyltrimethylammonium Chlorides and Raman Analysis

By: Sawama, Yoshinari; et al

Asian Journal of Organic Chemistry (2023), 12(3), e202200710.

Scheme 158 (1 Reaction) Steps: **1** Yield: **91%**



Suppliers (98)

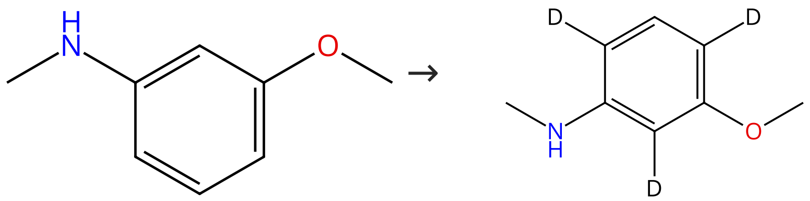
31-614-CAS-26700620	Steps: **1** Yield: **91%**
1.1	**Reagents:** Sodium hydroxide, Water-*d*$_2$ **Catalysts:** Ruthenium, [6-[[bis(1,1-dimethylethyl)phosphino-κ*P*]methyl]-2,2'-bipyridine-κ*N*^{1},κ*N*$^{1'}$]carbonylchlorohydro-, (*OC*-6-64)-; 24 h, 120 °C
Experimental Protocols	

Simple and Efficient Catalytic Reaction for the Selective Deuteration of Alcohols

By: Khaskin, Eugene; et al

ACS Catalysis (2013), 3(3), 448-452.

Scheme 159 (1 Reaction) Steps: **1** Yield: **91%**



Suppliers (65)

31-116-CAS-10070945 Steps: **1** Yield: **91%**

1.1 **Reagents:** Water-d_2
Catalysts: Triruthenium dodecacarbonyl; 12 h, 120 °C

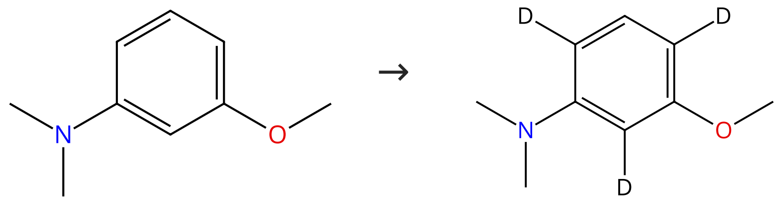
Experimental Protocols

A convenient method for the Ru(0)-catalyzed regioselective deuteration of N-alkyl-substituted anilines

By: Zhan, Miao; et al

Tetrahedron Letters (2014), 55(36), 5070-5073.

Scheme 160 (1 Reaction) Steps: **1** Yield: **91%**



Suppliers (71)

31-116-CAS-1256697 Steps: **1** Yield: **91%**

1.1 **Reagents:** Water-d_2
Catalysts: Triruthenium dodecacarbonyl; 12 h, 100 °C

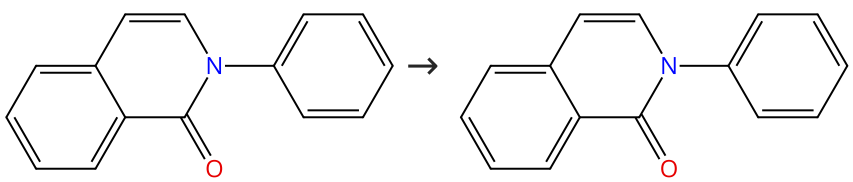
Experimental Protocols

A convenient method for the Ru(0)-catalyzed regioselective deuteration of N-alkyl-substituted anilines

By: Zhan, Miao; et al

Tetrahedron Letters (2014), 55(36), 5070-5073.

Scheme 161 (1 Reaction) Steps: **1** Yield: **91%**



Supplier (1)

31-614-CAS-41688243 Steps: **1** Yield: **91%**

1.1 **Reagents:** Pivalic acid, Water-d_2
Catalysts: 1-Adamantanecarboxylic acid, Silver hexafluoroantimonate, Bis(dichloro(η^6-*p*-cymene)ruthenium)
Solvents: 1,1,1,3,3,3-Hexafluoro-2-propanol; 12 h, 90 °C

Experimental Protocols

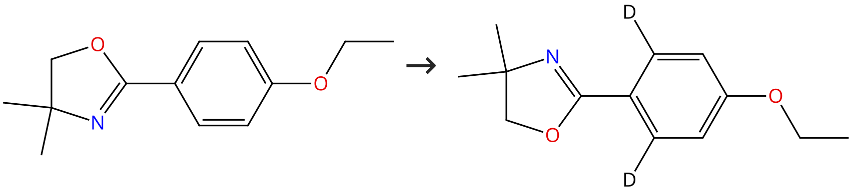
Engaging vinylene carbonate in ruthenium-catalyzed regioselective C-4 methylenation and C-8 formylmethylation of isoquinolinones

By: Thalakottukara, Dolly David; et al

Chemical Communications (Cambridge, United Kingdom) (2024), 60(75), 10358-10361.

Scheme 162 (1 Reaction)

Steps: **1** Yield: **91%**



Suppliers (9)

31-614-CAS-36669494

Steps: **1** Yield: **91%**

1.1 **Reagents:** Potassium acetate, Water-d_2
Catalysts: Dichloro[(1,2,5,6-η)-1,5-cyclooctadiene]ruthenium
Solvents: Toluene; 20 h, 120 °C

Experimental Protocols

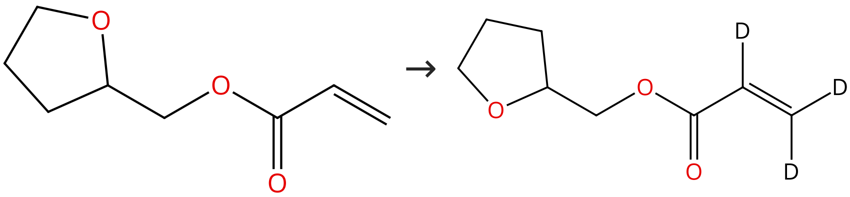
Simple and Efficient Aromatic C-H Oxazolination

By: Shi, Qiu; et al

Precision Chemistry (2023), 1(5), 316-325.

Scheme 163 (1 Reaction)

Steps: **1** Yield: **91%**



Suppliers (65)

31-116-CAS-19573238

Steps: **1** Yield: **91%**

1.1 **Reagents:** Water-d_2
Catalysts: 3-(Trifluoromethyl)benzoic acid, Bis(dichloro(η^6-*p*-cymene)ruthenium), Benzoic acid, 3-(trifluoromethyl)-, potassium salt (1:1); 18 h, rt → 80 °C

Experimental Protocols

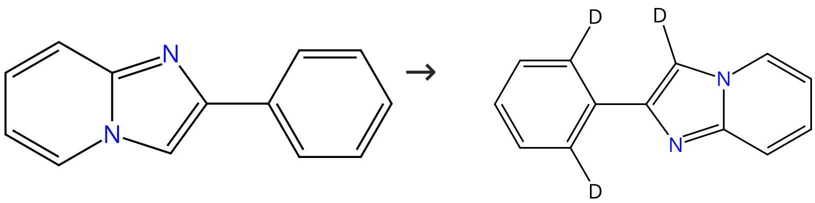
Ruthenium(II)biscarboxylate-Catalyzed Hydrogen-Isotope Exchange by Alkene C-H Activation

By: Bechtoldt, Alexander; et al

ChemCatChem (2019), 11(1), 435-438.

Scheme 164 (1 Reaction)

Steps: **1** Yield: **91%**



Suppliers (83)

31-614-CAS-37486569

Steps: **1** Yield: **91%**

1.1 **Reagents:** Acetic acid, Water-d_2
Catalysts: Bis(dichloro(η^6-*p*-cymene)ruthenium)
Solvents: 1,1,1,3,3,3-Hexafluoro-2-propanol; 12 h, 80 °C

Experimental Protocols

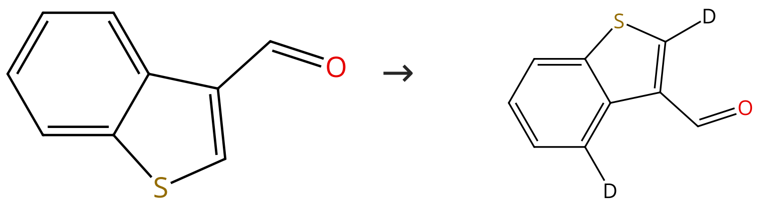
Synthesis of Substituted Pyrido[1,2-a]benzimidazoles by Ruthenium-Catalyzed C-H Bond Activation and Tandem Cycliz ation of 2-Arylimidazo[1,2-a]pyridines with Iodonium Ylides

By: Yan, Kelu; et al

European Journal of Organic Chemistry (2023), 26(34), e202300684.

Scheme 165 (1 Reaction)

Steps: **1** Yield: **91%**



Suppliers (81)

31-116-CAS-24182152

Steps: **1** Yield: **91%**

1.1 **Reagents:** Water-d_2
Catalysts: 4-Chlorobenzoic acid, Silver hexafluoroantimonate, Bis(dichloro(η[6]-*p*-cymene)ruthenium), 2-Methyl-3-(trifluoromethyl)aniline
Solvents: 1,2-Dichloroethane; rt → 100 °C; 16 h, 100 °C

Experimental Protocols

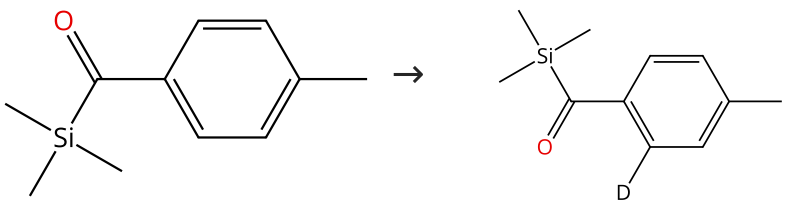
Ruthenium-Catalyzed Deuteration of Aromatic Carbonyl Compounds with a Catalytic Transient Directing Group

By: Kopf, Sara; et al

Chemistry - A European Journal (2021), 27(38), 9768-9773.

Scheme 166 (1 Reaction)

Steps: **1** Yield: **91%**



Suppliers (4)

31-116-CAS-19855788

Steps: **1** Yield: **91%**

1.1 **Reagents:** Cupric acetate, Water-d_2
Catalysts: Silver hexafluoroantimonate, Bis(dichloro(η[6]-*p*-cymene)ruthenium)
Solvents: 1,2-Dichloroethane; 3 h, rt → 60 °C

Experimental Protocols

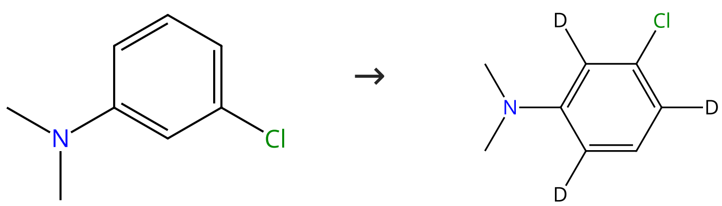
Acylsilane directed aromatic C-H alkenylations by ruthenium catalysis

By: Lu, Xiunan; et al

Chemical Communications (Cambridge, United Kingdom) (2019), 55(6), 826-829.

Scheme 167 (1 Reaction)

Steps: **1** Yield: **91%**



Suppliers (59)

31-116-CAS-14939287

Steps: **1** Yield: **91%**

1.1 **Reagents:** Water-d_2
Catalysts: Triruthenium dodecacarbonyl; 12 h, 100 °C

Experimental Protocols

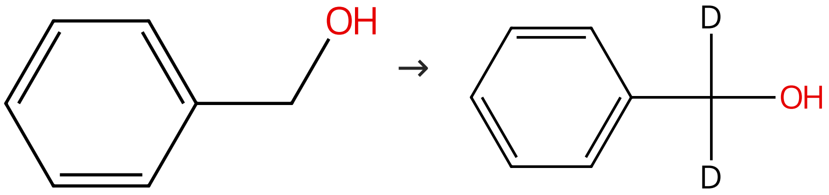
A convenient method for the Ru(0)-catalyzed regioselective deuteration of N-alkyl-substituted anilines

By: Zhan, Miao; et al

Tetrahedron Letters (2014), 55(36), 5070-5073.

Scheme 168 (7 Reactions)

Steps: **1** Yield: **62-90%**



Suppliers (161)

Suppliers (39)

31-116-CAS-3340917

Steps: **1** Yield: **90%**

1.1 **Reagents:** Water-d_2
Catalysts: Dichlorobis(triphenylphosphine)ruthenium; 30 min, 10 atm, 150 °C

Ruthenium catalyzed deuterium labeling of α-carbon in primary alcohol and primary/secondary amine in D_2O

By: Takahashi, Masaaki; et al

Chemistry Letters (2005), 34(2), 192-193.

31-614-CAS-40820303

Steps: **1** Yield: **62%**

1.1 **Reagents:** Potassium hydroxide, Water-d_2
Catalysts: (*OC*-6-14)-Dichloro(2-pyridinemethanamine-κN^1, κN^2)bis(triphenylphosphine)ruthenium; 3.5 h, 80 °C

Experimental Protocols

Cobalt-catalyzed chemoselective alkenylation and alkylation of C(sp^3)-H bond in methyl heteroarenes

By: Zhu, Baoying; et al

Journal of Catalysis (2024), 435, 115569.

31-614-CAS-42146483

Steps: **1**

1.1 **Reagents:** Water-d_2
Catalysts: Potassium *tert*-butoxide, (*OC*-6-52)-Carbonylchloro [2-(diphenylphosphino-κ*P*)-*N*-[2-(diphenylphosphino-κ*P*)ethyl] ethanamine-κ*N*]hydroruthenium; 4 h, 60 °C

Experimental Protocols

Well-defined cobalt(II)-catalyzed synthesis of perimidine derivatives via acceptorless dehydrogenative annulation

By: Pal, Debjyoti; et al

Organic & Biomolecular Chemistry (2024), 22(43), 8602-8607.

31-614-CAS-32527849

Steps: **1**

1.1 **Reagents:** Potassium *tert*-butoxide, Water-d_2
Catalysts: (*OC*-6-52)-Carbonylchloro[2-(diphenylphosphino-κ*P*) -*N*-[2-(diphenylphosphino-κ*P*)ethyl]ethanamine-κ*N*]hydrorut henium; 8 h, 80 °C

Experimental Protocols

Well-Defined Ni-SNS Complex Catalyzed Borrowing Hydroge native α-Alkylation of Ketones and Dehydrog enative Synthesis of Quinolines

By: Sharma, Rahul; et al

Advanced Synthesis & Catalysis (2022), 364(14), 2429-2437.

31-116-CAS-23540972

Steps: **1**

1.1 **Reagents:** Potassium hydroxide, Water-d_2
Catalysts: (*OC*-6-52)-Carbonylchloro[2-(diphenylphosphino-κ*P*) -*N*-[2-(diphenylphosphino-κ*P*)ethyl]ethanamine-κ*N*]hydrorut henium; 18 h, 130 °C

Experimental Protocols

Nickel-Catalyzed Guerbet Type Reaction: C-Alkylation of Secondary Alcohols via Double (de)Hydrogenation

By: Babu, Reshma; et al

Organic Letters (2021), 23(9), 3320-3325.

31-116-CAS-22012145

Steps: **1**

1.1 **Reagents:** Potassium hydroxide
Catalysts: (*OC*-6-14)-Dichloro(2-pyridinemethanamine-κN^1, κN^2)bis(triphenylphosphine)ruthenium
Solvents: Water-d_2; 5.5 h, 80 °C

Experimental Protocols

Photocatalytic Coproduction of Deoxybenzoin and H_2 through Tandem Redox Reactions

By: Luo, Nengchao; et al

ACS Catalysis (2020), 10(1), 762-769.

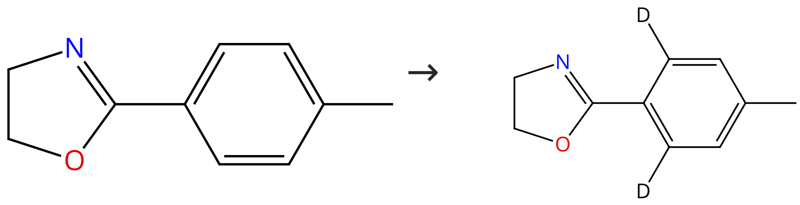
31-116-CAS-15885559	Steps: **1**
1.1	**Reagents:** Sodium hydroxide **Catalysts:** (*OC*-6-52)-Carbonylchloro[2-(diphenylphosphino-κ*P*)-*N*-[2-(diphenylphosphino-κ*P*)ethyl]ethanamine-κ*N*]hydroruthenium **Solvents:** Water-d_2; 24 h, 80 °C

Catalytic Ester Metathesis Reaction and Its Application to Transfer Hydrogenation of Esters

By: Dubey, Abhishek; et al

ACS Catalysis (2016), 6(6), 3998-4002.

Scheme 169 (1 Reaction) Steps: **1** Yield: **90%**



Suppliers (11)

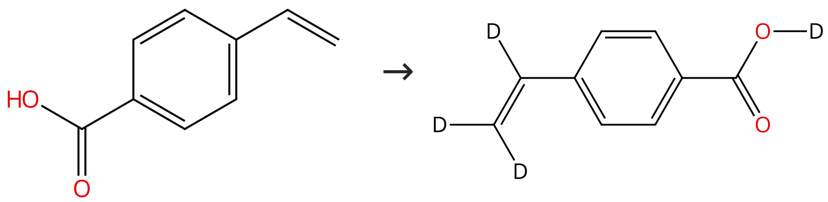
31-116-CAS-20984020	Steps: **1** Yield: **90%**
1.1	**Reagents:** Water-d_2, Potassium hydroxide (K(OD)) **Catalysts:** Dichlorotris(triphenylphosphine)ruthenium **Solvents:** 1,4-Dioxane; 16 h, 80 °C
Experimental Protocols	

Mild, Selective Ru-Catalyzed Deuteration Using D_2O as a Deuterium Source

By: Eisele, Pascal; et al

Chemistry - A European Journal (2019), 25(72), 16550-16554.

Scheme 170 (1 Reaction) Steps: **1** Yield: **90%**



Suppliers (100)

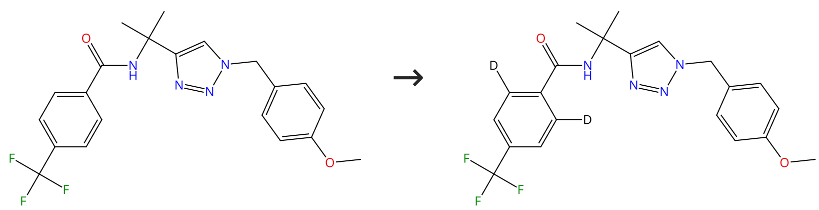
31-116-CAS-6384137	Steps: **1** Yield: **90%**
1.1	**Reagents:** Water-d_2 **Catalysts:** (*OC*-6-34)-Carbonylchlorohydrotris(triphenylphosphine)ruthenium **Solvents:** 1,4-Dioxane; 3.5 h, 100 °C
Experimental Protocols	

Hydrogen/Deuterium Exchange Reactions of Olefins with Deuterium Oxide Mediated by the Carbonylchlorohydridotris(triphenylphosphine)ruthenium(II) Complex

By: Tse, Sunny Kai San; et al

Advanced Synthesis & Catalysis (2010), 352(9), 1512-1522.

Scheme 171 (1 Reaction) Steps: **1** Yield: **90%**



31-116-CAS-3558417	Steps: **1** Yield: **90%**
1.1	**Reagents:** Sodium carbonate, Water-d_2 **Catalysts:** Dichlorotris(triphenylphosphine)ruthenium **Solvents:** *o*-Xylene; 22 h, 120 °C

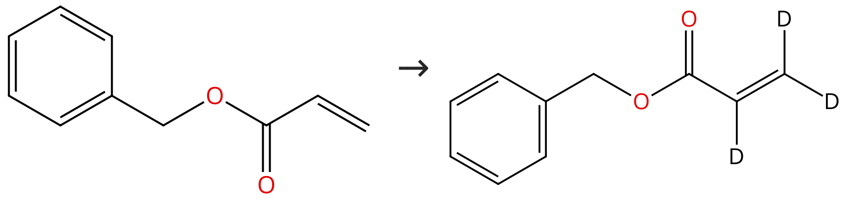
Triazole-assisted ruthenium-catalyzed C-H arylation of aromatic amides

By: Al Mamari, Hamad H.; et al

Chemistry - A European Journal (2014), 20(31), 9739-9743.

Scheme 172 (4 Reactions)

Steps: **1** Yield: **64-90%**



Suppliers (75)

31-116-CAS-19573235

Steps: **1** Yield: **90%**

1.1 **Reagents:** Water-d_2
Catalysts: 3-(Trifluoromethyl)benzoic acid, Bis(dichloro(η^6-*p*-cymene)ruthenium), Benzoic acid, 3-(trifluoromethyl)-, potassium salt (1:1); 18 h, rt → 80 °C

Experimental Protocols

Ruthenium(II)biscarboxylate-Catalyzed Hydrogen-Isotope Exchange by Alkene C-H Activation

By: Bechtoldt, Alexander; et al

ChemCatChem (2019), 11(1), 435-438.

31-116-CAS-22359824

Steps: **1** Yield: **87%**

1.1 **Reagents:** Water-d_2
Catalysts: 3-(Trifluoromethyl)benzoic acid, Bis(dichloro(η^6-*p*-cymene)ruthenium), Benzoic acid, 3-(trifluoromethyl)-, potassium salt (1:1); 18 h, 80 °C

Experimental Protocols

Rh^{III}-Catalyzed Double Dehydrogenative Coupling of Free 1-Naphthylamines with α,β-Unsaturated Esters

By: Rej, Supriya; et al

Chemistry - A European Journal (2020), 26(49), 11093-11098.

31-614-CAS-39061148

Steps: **1** Yield: **85%**

1.1 **Reagents:** Water-d_2
Catalysts: 3-(Trifluoromethyl)benzoic acid, Bis(dichloro(η^6-*p*-cymene)ruthenium), Benzoic acid, 3-(trifluoromethyl)-, potassium salt (1:1); 18 h, 80 °C

Experimental Protocols

Synthesis of Ferrocene 1,3-Derivatives by Distal C-H Activation

By: Gupta, Princi; et al

Angewandte Chemie, International Edition (2023), 62(34), e202305278.

31-614-CAS-25131960

Steps: **1** Yield: **64%**

1.1 **Reagents:** 3-(Trifluoromethyl)benzoic acid, Water-d_2, Benzoic acid, 3-(trifluoromethyl)-, potassium salt (1:1)
Catalysts: Bis(dichloro(η^6-*p*-cymene)ruthenium); 24 h, 80 °C

Experimental Protocols

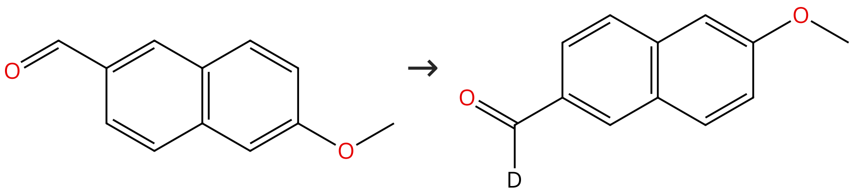
Allene C(sp^2)-H Activation and Alkenylation Catalyzed by Palladium

By: Schreib, Benedikt S.; et al

Journal of the American Chemical Society (2021), 143(51), 21705-21712.

Scheme 173 (1 Reaction)

Steps: **1** Yield: **90%**



Suppliers (86)

31-116-CAS-18937432

Steps: **1** Yield: **90%**

1.1 **Reagents:** Water-d_2
Catalysts: Carbonylchlorohydrotris(triphenylphosphine) ruthenium
Solvents: Toluene; rt → 100 °C; 30 min, 100 °C

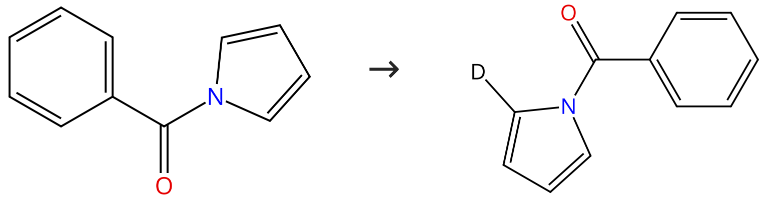
Catalytic Deuteration of Aldehydes with D 2 O

By: Isbrandt, Eric S.; et al

Synlett (2017), 28(20), 2851-2854.

Scheme 174 (1 Reaction)

Steps: **1** Yield: **90%**



Suppliers (30)

31-116-CAS-21535376

Steps: **1** Yield: **90%**

1.1 **Reagents:** Cupric acetate, Water-d_2
Catalysts: Silver hexafluoroantimonate, Bis(dichloro(η^6-*p*-cymene)ruthenium)
Solvents: Toluene; 24 h, rt → 110 °C

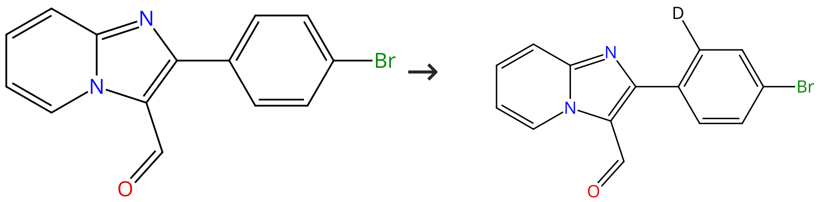
Direct oxidative coupling of N-acyl pyrroles with alkenes by ruthenium(II)-catalyzed regioselective C2-alkenylation

By: Chen, Weiqiang; et al

Organic & Biomolecular Chemistry (2020), 18(3), 500-513.

Scheme 175 (1 Reaction)

Steps: **1** Yield: **90%**



Suppliers (20)

31-614-CAS-33902447

Steps: **1** Yield: **90%**

1.1 **Reagents:** Cupric acetate, Water-d_2
Catalysts: Bis(dichloro(η^6-*p*-cymene)ruthenium)
Solvents: 1,2-Dichloroethane; 4 h, 130 °C

Experimental Protocols

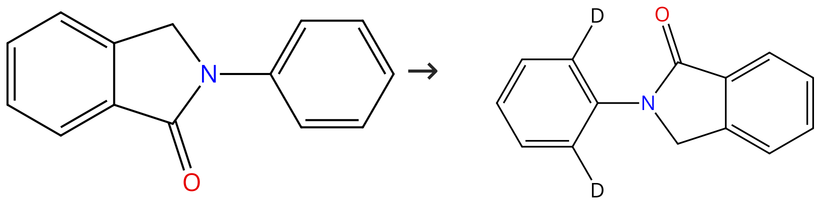
Ruthenium(II)-catalysed regioselective C-2'-alkenylation of 2-phenylimidazo[1,2-a]pyridine-3-carbaldehydes

By: Jahan, Kousar; et al

Tetrahedron (2022), 122, 132956.

Scheme 176 (2 Reactions)

Steps: **1** Yield: **89-90%**



Suppliers (57)

31-116-CAS-20460597

Steps: **1** Yield: **90%**

1.1 **Reagents:** Cupric acetate, Water-d_2
Catalysts: Silver hexafluoroantimonate, Bis(dichloro(η^6-*p*-cymene)ruthenium)
Solvents: 2-Methyltetrahydrofuran; 15 h, rt → 100 °C

Site-selective Ru-catalyzed C-H bond alkenylation with biologically relevant isoindolinones: a case of catalyst performance controlled by subtle stereo-electronic effects of the weak directing group

By: Yuan, Yu-Chao; et al

Catalysis Science & Technology (2019), 9(17), 4711-4717.

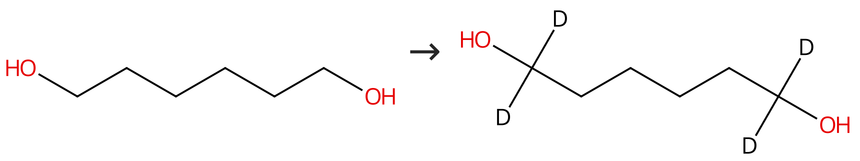
31-116-CAS-20432016	Steps: **1** Yield: **89%**
1.1	**Reagents:** Silver carbonate, Water-d_2 **Catalysts:** Silver hexafluoroantimonate, Bis(dichloro(η^6-*p*-cymene)ruthenium) **Solvents:** 1,2-Dichloroethane; 24 h, 110 °C

Ruthenium(II)-catalysed selective C(sp^2)-H bond benzoxylation of biologically appealing N-arylisoindolinones

By: Yuan, Yu-Chao; et al

Organic & Biomolecular Chemistry (2019), 17(32), 7517-7525.

Scheme 177 (1 Reaction) Steps: **1** Yield: **90%**



Suppliers (95) Suppliers (25)

31-116-CAS-4541562	Steps: **1** Yield: **90%**
1.1	**Reagents:** Hydrogen, Water-d_2 **Catalysts:** Ruthenium **Solvents:** Water-d_2; 24 h, 1 atm, 80 °C
1.2	**Reagents:** Water **Solvents:** Diethyl ether; rt

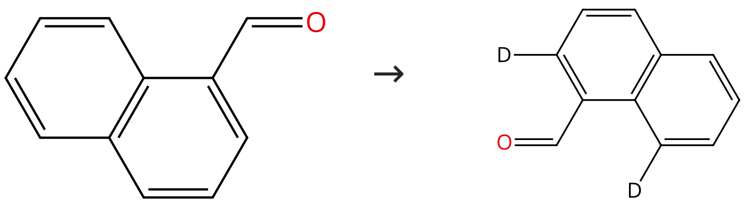
Experimental Protocols

A convenient and effective method for the regiose lective deuteration of alcohols

By: Maegawa, Tomohiro; et al

Advanced Synthesis & Catalysis (2008), 350(14+15), 2215-2218.

Scheme 178 (1 Reaction) Steps: **1** Yield: **90%**



Suppliers (92)

31-116-CAS-24181718	Steps: **1** Yield: **90%**
1.1	**Reagents:** Water-d_2 **Catalysts:** 4-Chlorobenzoic acid, Silver hexafluoroantimonate, Bis(dichloro(η^6-*p*-cymene)ruthenium), 2-Methyl-3-(trifluor omethyl)aniline **Solvents:** 1,2-Dichloroethane; rt → 100 °C; 16 h, 100 °C

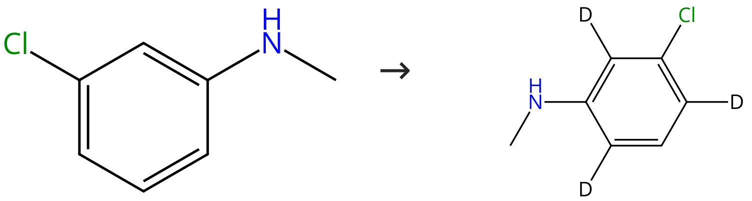
Experimental Protocols

Ruthenium-Catalyzed Deuteration of Aromatic Carbonyl Compounds with a Catalytic Transient Directing Group

By: Kopf, Sara; et al

Chemistry - A European Journal (2021), 27(38), 9768-9773.

Scheme 179 (1 Reaction) Steps: **1** Yield: **90%**



Suppliers (76)

31-116-CAS-12201450 Steps: **1** Yield: **90%**

1.1 **Reagents:** Water-*d*$_2$
Catalysts: Triruthenium dodecacarbonyl; 12 h, 120 °C

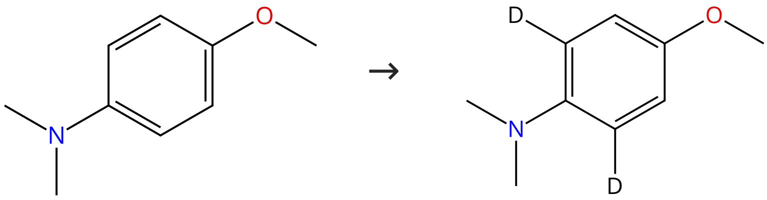
Experimental Protocols

A convenient method for the Ru(0)-catalyzed regioselective deuteration of N-alkyl-substituted anilines

By: Zhan, Miao; et al

Tetrahedron Letters (2014), 55(36), 5070-5073.

Scheme 180 (1 Reaction) Steps: **1** Yield: **90%**



Suppliers (60)

31-116-CAS-3379462 Steps: **1** Yield: **90%**

1.1 **Reagents:** Water-*d*$_2$
Catalysts: Triruthenium dodecacarbonyl
Solvents: Toluene; 12 h, 100 °C

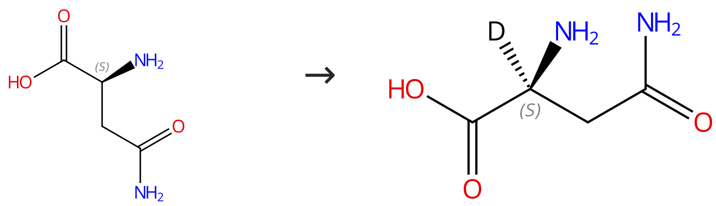
Experimental Protocols

A convenient method for the Ru(0)-catalyzed regioselective deuteration of N-alkyl-substituted anilines

By: Zhan, Miao; et al

Tetrahedron Letters (2014), 55(36), 5070-5073.

Scheme 181 (1 Reaction) Steps: **1** Yield: **90%**



Absolute stereochemistry shown   Absolute stereochemistry shown

Suppliers (129)

31-116-CAS-4926242 Steps: **1** Yield: **90%**

1.1 **Reagents:** Deuterium
Catalysts: Ruthenium
Solvents: Water-*d*$_2$; 36 h, 2 bar, 55 °C

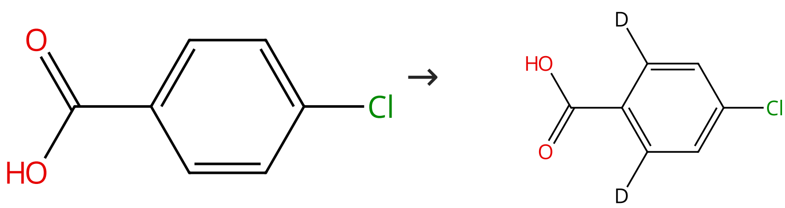
Experimental Protocols

Enantiospecific C-H activation using ruthenium nanocatalysts

By: Taglang, Celine; et al

Angewandte Chemie, International Edition (2015), 54(36), 10474-10477.

Scheme 182 (1 Reaction) Steps: **1** Yield: **90%**



Suppliers (111)

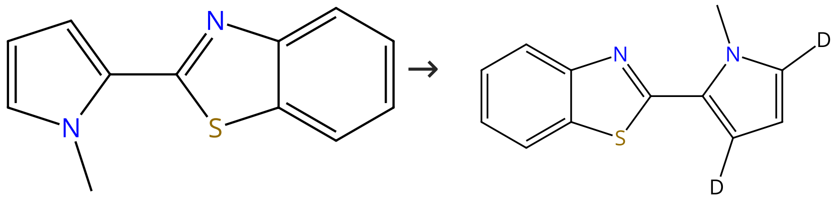
31-116-CAS-20858307	Steps: **1** Yield: **90%**
1.1	**Reagents:** Water-d_2 **Catalysts:** [(1,2,3,4,5,6-η)-1-Methyl-4-(1-methylethyl)benzene](tricyclo[3.3.1.1^{3,7}]decane-1-carboxylato-κ*O*)(tricyclo[3.3.1.1^{3,7}]decane-1-carboxylato-κ*O*,κ*O'*)ruthenium **Solvents:** 1,4-Dioxane; 16 h, 100 °C
Experimental Protocols	

Ruthenium(II)-Catalyzed Hydrogen Isotope Exchange of Pharmaceutical Drugs by C-H Deuteration and C-H Tritiation

By: Mueller, Valentin; et al

ChemCatChem (2020), 12(1), 100-104.

Scheme 183 (1 Reaction) Steps: **1** Yield: **90%**



Suppliers (6)

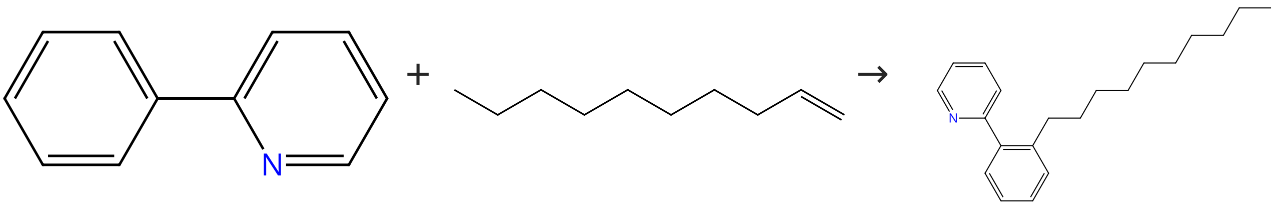
31-116-CAS-18748296	Steps: **1** Yield: **90%**
1.1	**Reagents:** Water-d_2 **Catalysts:** Silver tetrafluoroborate, Bis(dichloro(η^6-*p*-cymene)ruthenium) **Solvents:** 1,2-Dichloroethane, Water-d_2; 2 h, 85 °C
Experimental Protocols	

Ligand-Assisted Heteroaryl C(sp^2)-H Bond Activation by a Cationic Ruthenium(II) Complex for Alkenylation of Hetero arenes with Alkynes Directed by Biorelevant Heterocycles

By: Pipaliya, Bhavin V.; et al

ChemCatChem (2017), 9(22), 4191-4198.

Scheme 184 (1 Reaction) Steps: **1** Yield: **89%**



Suppliers (94) Suppliers (76)

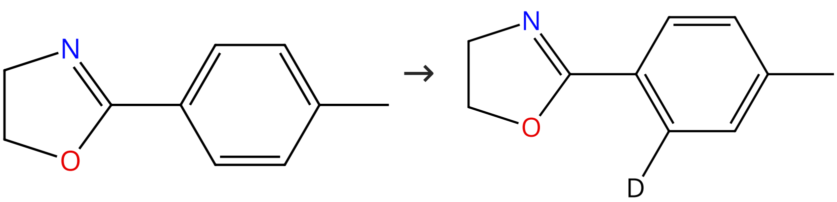
31-614-CAS-28832698	Steps: **1** Yield: **89%**
1.1	**Catalysts:** Bis(dichloro(η^6-*p*-cymene)ruthenium), Benzoic acid, 2,4,6-trimethyl-, potassium salt (1:1) **Solvents:** Water-d_2; 18 h, 100 °C

Carboxylate-assisted ruthenium(II)-catalyzed hydroarylations of unactivated alkenes through C-H cleavage

By: Schinkel, Marvin; et al

Angewandte Chemie, International Edition (2013), 52(14), 3977-3980.

Scheme 185 (1 Reaction) Steps: **1** Yield: **89%**



Suppliers (11)

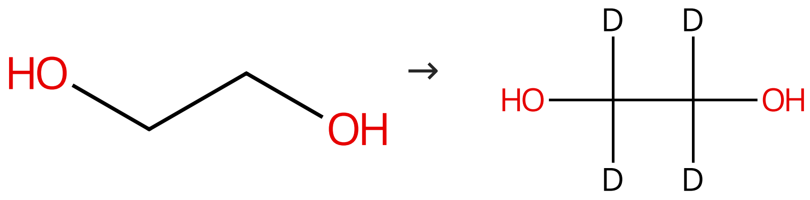
31-116-CAS-11016206	Steps: **1** Yield: **89%**
1.1	**Reagents:** Potassium carbonate, Water-d_2 **Catalysts:** Ruthenium, [(1,2,3,4,5,6-η)-1-methyl-4-(1-methylethyl)benzene]bis(trifluoromethanesulfonato-κ*O*)- **Solvents:** Toluene; 48 h, 130 °C
Experimental Protocols	

Oxazolinyl-Assisted C-H Amidation by Cobalt(III) Catalysis

By: Mei, Ruhuai; et al

ACS Catalysis (2016), 6(2), 793-797.

Scheme 186 (1 Reaction) Steps: **1** Yield: **89%**



Suppliers (179) Suppliers (42)

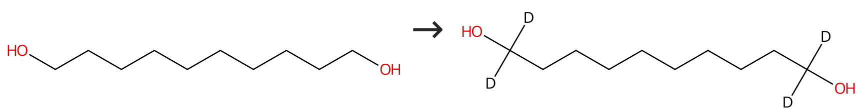
31-116-CAS-8515120	Steps: **1** Yield: **89%**
1.1	**Reagents:** Hydrogen, Water-d_2 **Catalysts:** Ruthenium **Solvents:** Water-d_2; 24 h, 1 atm, 80 °C
1.2	**Reagents:** Water **Solvents:** Diethyl ether; rt
Experimental Protocols	

A convenient and effective method for the regiose lective deuteration of alcohols

By: Maegawa, Tomohiro; et al

Advanced Synthesis & Catalysis (2008), 350(14+15), 2215-2218.

Scheme 187 (1 Reaction) Steps: **1** Yield: **89%**



Suppliers (83)

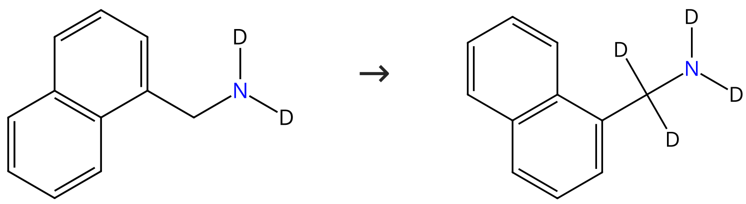
31-116-CAS-1793815	Steps: **1** Yield: **89%**
1.1	**Reagents:** Hydrogen, Water-d_2 **Catalysts:** Ruthenium **Solvents:** Water-d_2; 24 h, 1 atm, 80 °C
1.2	**Reagents:** Water **Solvents:** Diethyl ether; rt
Experimental Protocols	

A convenient and effective method for the regiose lective deuteration of alcohols

By: Maegawa, Tomohiro; et al

Advanced Synthesis & Catalysis (2008), 350(14+15), 2215-2218.

Scheme 188 (1 Reaction) Steps: **1** Yield: **89%**



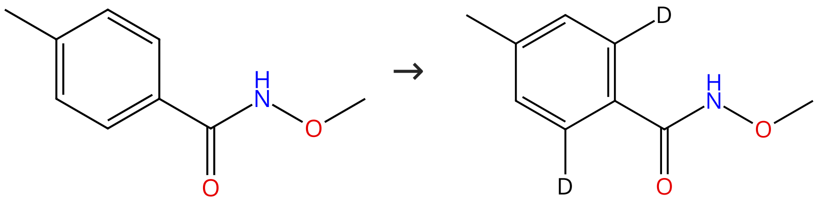
31-116-CAS-16606075	Steps: **1** Yield: **89%**
1.1	**Catalysts:** Ruthenium, μ-chlorodichloro-μ-hydrobis[(1,2,3,4,5,6-η)-1-methyl-4-(1-methylethyl)benzene]di-, (*Ru-Ru*) **Solvents:** 1,4-Dioxane, Water-d_2; 24 h, 135 °C
Experimental Protocols	

Selective α-Deuteration of Amines and Amino Acids Using D_2O

By: Chatterjee, Basujit; et al

Organic Letters (2016), 18(22), 5892-5895.

Scheme 189 (1 Reaction) Steps: **1** Yield: **89%**



Suppliers (22)

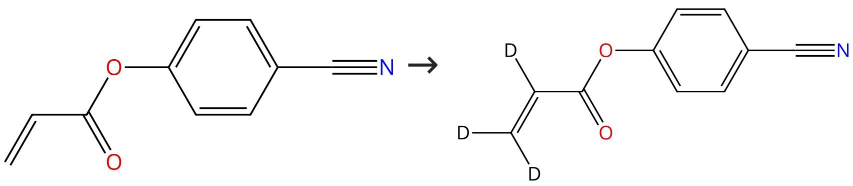
31-614-CAS-34633192	Steps: **1** Yield: **89%**
1.1	**Reagents:** Sodium acetate, Water-d_2 **Catalysts:** Bis(dichloro(η^6-*p*-cymene)ruthenium) **Solvents:** 1,1,1,3,3,3-Hexafluoro-2-propanol; 4 h, 60 °C
Experimental Protocols	

Ruthenium(II)-Catalyzed (4+2) Annulative Difunctionalization of Non-conjugated Alkenyl Amides with Hydroxamic Acid Esters

By: Kumar Giri, Chandan; et al

Chemistry - An Asian Journal (2022), 17(23), e202200861.

Scheme 190 (1 Reaction) Steps: **1** Yield: **89%**



Suppliers (9)

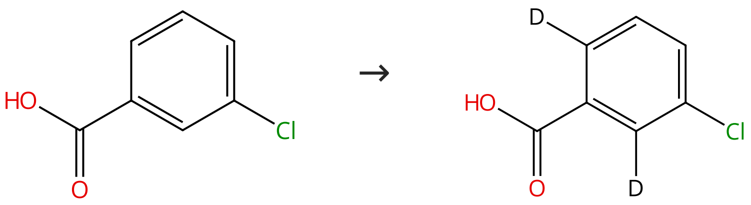
31-116-CAS-19573244	Steps: **1** Yield: **89%**
1.1	**Reagents:** Benzene-d_6, Water-d_2 **Catalysts:** 3-(Trifluoromethyl)benzoic acid, Bis(dichloro(η^6-*p*-cymene)ruthenium), Benzoic acid, 3-(trifluoromethyl)-, potassium salt (1:1); 18 h, rt → 80 °C
Experimental Protocols	

Ruthenium(II)biscarboxylate-Catalyzed Hydrogen-Isotope Exchange by Alkene C-H Activation

By: Bechtoldt, Alexander; et al

ChemCatChem (2019), 11(1), 435-438.

Scheme 191 (1 Reaction) Steps: **1** Yield: **89%**



Suppliers (95)

31-116-CAS-20858314 Steps: **1** Yield: **89%**

1.1 **Reagents:** Water-*d*$_2$
Catalysts: [(1,2,3,4,5,6-η)-1-Methyl-4-(1-methylethyl)benzene](tricyclo[3.3.1.1^{3,7}]decane-1-carboxylato-κ*O*)(tricyclo[3.3.1.1^{3,7}]decane-1-carboxylato-κ*O*,κ*O'*)ruthenium
Solvents: 1,4-Dioxane; 16 h, 100 °C

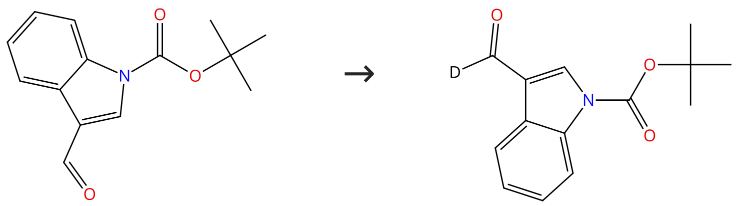
Experimental Protocols

Ruthenium(II)-Catalyzed Hydrogen Isotope Exchange of Pharmaceutical Drugs by C-H Deuteration and C-H Tritiation

By: Mueller, Valentin; et al

ChemCatChem (2020), 12(1), 100-104.

Scheme 192 (1 Reaction) Steps: **1** Yield: **89%**



Suppliers (82)

31-116-CAS-18937437 Steps: **1** Yield: **89%**

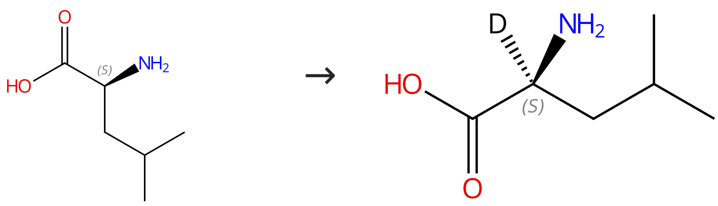
1.1 **Reagents:** Water-*d*$_2$
Catalysts: Carbonylchlorohydrotris(triphenylphosphine)ruthenium
Solvents: Toluene; rt → 100 °C; 30 min, 100 °C

Catalytic Deuteration of Aldehydes with D 2 O

By: Isbrandt, Eric S.; et al

Synlett (2017), 28(20), 2851-2854.

Scheme 193 (2 Reactions) Steps: **1** Yield: **65-89%**



Absolute stereochemistry shown, Rotation (+)

Suppliers (195)

Absolute stereochemistry shown

Suppliers (18)

31-116-CAS-17957978 Steps: **1** Yield: **89%**

1.1 **Reagents:** Sodium hydroxide, Hydrogen, Water- *d*$_2$
Catalysts: Ruthenium; 72 h, 70 °C; 70 °C → rt

1.2 **Reagents:** Dowex 50W-X8; pH 5 - 6, rt

Experimental Protocols

Development and Scale-Up of Stereoretentive α-Deuteration of Amines

By: Michelotti, Alessia; et al

Organic Process Research & Development (2017), 21(11), 1741-1744.

31-116-CAS-14054302 Steps: **1** Yield: **65%**

1.1 **Reagents:** Deuterium
Catalysts: Ruthenium
Solvents: Water-*d*$_2$; 36 h, 2 bar, 55 °C

Experimental Protocols

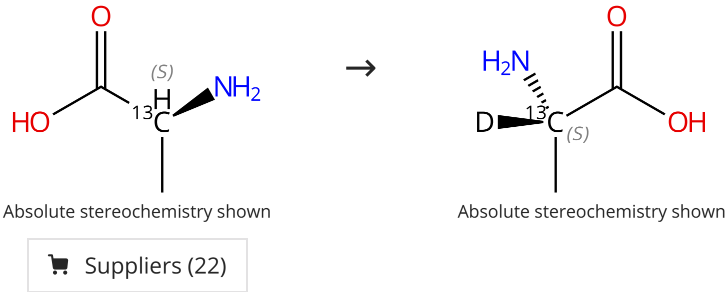
Enantiospecific C-H activation using ruthenium nanocatalysts

By: Taglang, Celine; et al

Angewandte Chemie, International Edition (2015), 54(36), 10474-10477.

Scheme 194 (1 Reaction)

Steps: **1** Yield: **89%**



31-116-CAS-20215006

Steps: **1** Yield: **89%**

1.1 **Reagents:** Hydrogen, Water-d_2
Catalysts: Ruthenium carbide; 16 h, 1 atm, 80 °C

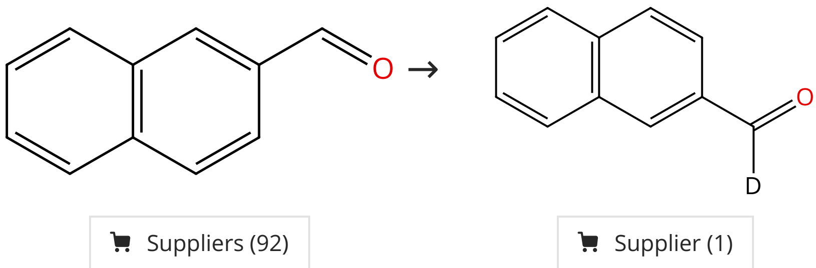
Late-stage deuteration of ^{13}C-enriched substrates for T_1 prolongation in hyperpolarized ^{13}C MRI

By: Taglang, Celine; et al

Chemical Communications (Cambridge, United Kingdom) (2018), 54(41), 5233-5236.

Scheme 195 (1 Reaction)

Steps: **1** Yield: **89%**



31-116-CAS-18937430

Steps: **1** Yield: **89%**

1.1 **Reagents:** Water-d_2
Catalysts: Carbonylchlorohydrotris(triphenylphosphine) ruthenium
Solvents: Toluene; rt → 100 °C; 30 min, 100 °C

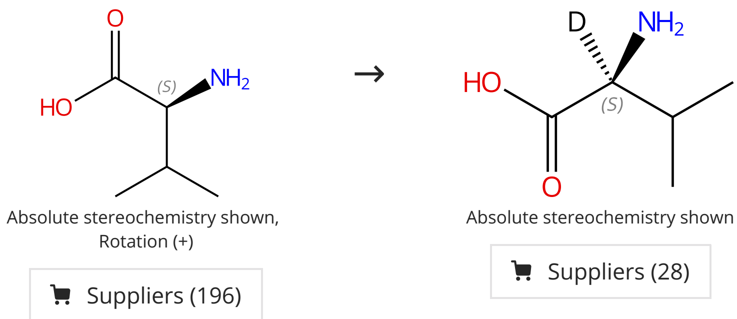
Catalytic Deuteration of Aldehydes with D 2 O

By: Isbrandt, Eric S.; et al

Synlett (2017), 28(20), 2851-2854.

Scheme 196 (2 Reactions)

Steps: **1** Yield: **65-89%**



31-116-CAS-11924235

Steps: **1** Yield: **89%**

1.1 **Reagents:** Deuterium
Catalysts: Ruthenium
Solvents: Water-d_2; 36 h, 2 bar, 55 °C

Experimental Protocols

Enantiospecific C-H activation using ruthenium nanocatalysts

By: Taglang, Celine; et al

Angewandte Chemie, International Edition (2015), 54(36), 10474-10477.

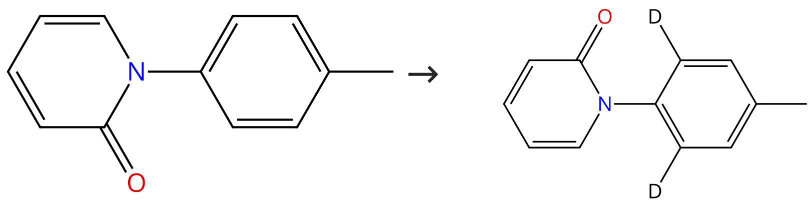
31-116-CAS-17957979	Steps: **1** Yield: **65%**
1.1	**Reagents:** Sodium hydroxide, Hydrogen, Water- d_2 **Catalysts:** Ruthenium; 24 h, 70 °C; 70 °C → rt
1.2	**Reagents:** Dowex 50W-X8; pH 5 - 6, rt
Experimental Protocols	

Development and Scale-Up of Stereoretentive α-Deuteration of Amines

By: Michelotti, Alessia; et al

Organic Process Research & Development (2017), 21(11), 1741-1744.

Scheme 197 (1 Reaction) Steps: **1** Yield: **88%**



Suppliers (10)

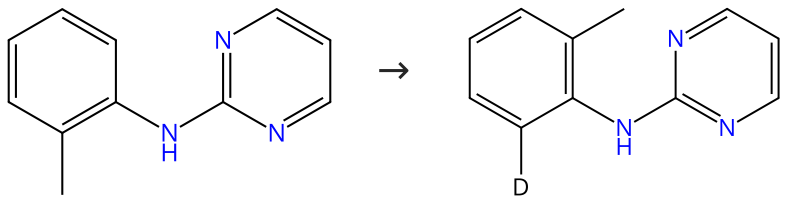
31-614-CAS-38942622	Steps: **1** Yield: **88%**
1.1	**Reagents:** Copper diacetate monohydrate, Water-d_2 **Catalysts:** Bis(dichloro(η^6-*p*-cymene)ruthenium), [1,1,1-Trifluoro-*N*-[(trifluoromethyl)sulfonyl-κ*O*]methanesulfonamidato-κ*O*]silver **Solvents:** 1,4-Dioxane; 16 h, 110 °C
Experimental Protocols	

Biorelevant Weakly Coordinating Directing Group Assisted C-H Alkenylation with Cyclopropanols via Sequential C-H/C-C Activation

By: Paul, Tripti; et al

Organic Letters (2023), 25(50), 8975-8980.

Scheme 198 (2 Reactions) Steps: **1** Yield: **88%**



Suppliers (8)

31-116-CAS-19225357	Steps: **1** Yield: **88%**
1.1	**Reagents:** Water-d_2, 2-Propan-*1,1,1,2,3,3,3-d$_7$*-ol-*d* **Catalysts:** Sodium acetate, Potassium hexafluorophosphate, Bis(dichloro(η^6-*p*-cymene)ruthenium); 2 h, rt
Experimental Protocols	

Ruthenium-Catalyzed Electrochemical Dehydrogenative Alkyne Annulation

By: Xu, Fan; et al

ACS Catalysis (2018), 8(5), 3820-3824.

31-116-CAS-8840215	Steps: **1**
1.1	**Reagents:** Cupric acetate, (*SP*-5-41)-[1,3-Bis(2,4,6-trimethylphenyl)-2-imidazolidinylidene]dichloro[[2-(1-methylethoxy-κ*O*)phenyl]methylene-κ*C*]ruthenium **Catalysts:** Ruthenium(1+), tri-μ-chlorobis[(1,2,3,4,5,6-η)-1-methyl-4-(1-methylethyl)benzene]di-, hexafluorophosphate(1-) (1:1) **Solvents:** Water-d_2; 22 h, 100 °C
Experimental Protocols	

Cationic Ruthenium(II) Catalysts for Oxidative C-H/N-H Bond Functionalizations of Anilines with Removable Directing Group: Synthesis of Indoles in Water

By: Ackermann, Lutz; et al

Organic Letters (2012), 14(3), 764-767.

Scheme 199 (1 Reaction)

Steps: **1** Yield: **88%**

31-614-CAS-24623187

Steps: **1** Yield: **88%**

1.1 **Reagents:** Copper diacetate monohydrate, Water-d_2
Catalysts: Silver hexafluoroantimonate, Bis(dichloro(η^6-*p*-cymene)ruthenium)
Solvents: 1,2-Dichloroethane; 24 h, 120 °C

Experimental Protocols

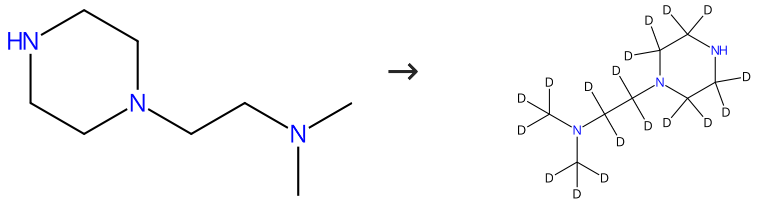
Ruthenium(II)-Catalyzed Highly Chemo- and Regiose lective Oxidative C6 Alkenylation of Indole-7-carboxamides

By: Jadhav, Pankaj P.; et al

Organic Letters (2021), 23(22), 8673-8677.

Scheme 200 (1 Reaction)

Steps: **1** Yield: **88%**



Suppliers (67)

31-116-CAS-17957991

Steps: **1** Yield: **88%**

1.1 **Reagents:** Hydrogen, Water-d_2
Catalysts: Ruthenium; 24 h, 70 °C; 70 °C → rt

1.2 **Reagents:** Dowex 50W-X8; pH 5 - 6, rt

Experimental Protocols

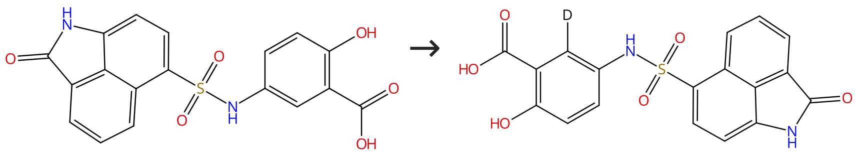
Development and Scale-Up of Stereoretentive α-Deuteration of Amines

By: Michelotti, Alessia; et al

Organic Process Research & Development (2017), 21(11), 1741-1744.

Scheme 201 (1 Reaction)

Steps: **1** Yield: **88%**



Suppliers (5)

31-116-CAS-20858328

Steps: **1** Yield: **88%**

1.1 **Reagents:** Water-d_2
Catalysts: [(1,2,3,4,5,6-η)-1-Methyl-4-(1-methylethyl)benzene](tricyclo[3.3.1.1^{3,7}]decane-1-carboxylato-κ*O*)(tricyclo[3.3.1.1^{3,7}]decane-1-carboxylato-κ*O*,κ*O'*)ruthenium
Solvents: 1,4-Dioxane; 16 h, 100 °C

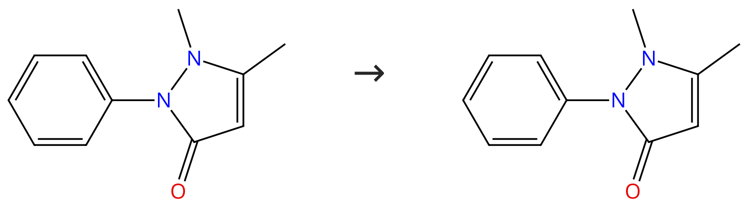
Experimental Protocols

Ruthenium(II)-Catalyzed Hydrogen Isotope Exchange of Pharmaceutical Drugs by C-H Deuteration and C-H Tritiation

By: Mueller, Valentin; et al

ChemCatChem (2020), 12(1), 100-104.

Scheme 202 (1 Reaction)
Steps: **1** Yield: **88%**



Suppliers (99)

31-614-CAS-26783945
Steps: **1** Yield: **88%**

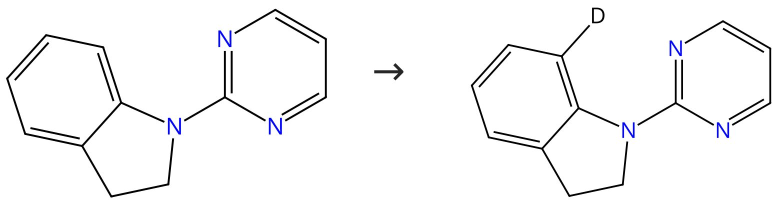
1.1 **Catalysts:** Copper diacetate monohydrate, Silver hexaflu oroantimonate, Bis(dichloro(η^6-*p*-cymene)ruthenium)
Solvents: 2-Methyl-2-butanol, Water-*d*$_2$; 5 min, rt; 16 h, 120 °C
1.2 **Reagents:** Ammonia, Ammonium chloride
Solvents: Water; rt

Late-Stage Diversification of Non-Steroidal Anti-Inflammatory Drugs by Transition Metal-Catalyzed C-H Alkenylations, Thiola tions and Selenylations

By: Ma, Wenbo; et al

Advanced Synthesis & Catalysis (2017), 359(6), 966-973.

Scheme 203 (3 Reactions)
Steps: **1** Yield: **86-87%**



Suppliers (10)

31-116-CAS-19209366
Steps: **1** Yield: **87%**

1.1 **Reagents:** Silver carbonate, Water-*d*$_2$
Catalysts: Silver hexafluoroantimonate, Bis(dichloro(η^6-*p*-cymene)ruthenium)
Solvents: Dichloromethane; 16 h, 100 °C

Ru(II)-Catalyzed C7-acyloxylation of indolines with carboxylic acids

By: De, Pinaki Bhusan; et al

Organic & Biomolecular Chemistry (2018), 16(32), 5889-5898.

31-116-CAS-21503582
Steps: **1** Yield: **86%**

1.1 **Reagents:** Water-*d*$_2$
Catalysts: Sodium acetate, Bis(dichloro(η^6-*p*-cymene) ruthenium), [1,1,1-Trifluoro-*N*-[(trifluoromethyl)sulfonyl-κ*O*] methanesulfonamidato-κ*O*]silver
Solvents: Dichloromethane; 12 h, 60 °C

Ruthenium(II)-Catalyzed Regioselective Ortho C-H Allenylation of Electron-Rich Aniline and Phenol Derivatives

By: Chen, Yanni; et al

Journal of Organic Chemistry (2020), 85(4), 2048-2058.

31-116-CAS-20134508
Steps: **1**

1.1 **Reagents:** Water-*d*$_2$
Catalysts: Sodium acetate, Copper(II) triflate, Bis(dichloro(η^6-*p*-cymene)ruthenium)
Solvents: Dichloromethane; 12 h, 60 °C

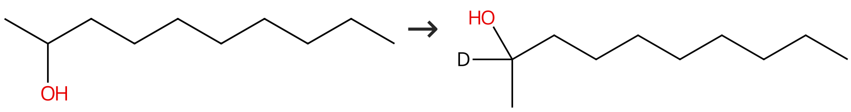
Ru(II)-catalyzed regioselective C-7 hydroxymethylation of indolines with formaldehyde

By: Chen, Yanni; et al

Tetrahedron Letters (2019), 60(22), 1481-1486.

Scheme 204 (1 Reaction)

Steps: **1** Yield: **87%**



Suppliers (57)

31-116-CAS-5056551

Steps: **1** Yield: **87%**

1.1 **Reagents:** Hydrogen, Water-*d*$_2$
Catalysts: Ruthenium
Solvents: Water-*d*$_2$; 3 h, 1 atm, 50 °C

1.2 **Reagents:** Water
Solvents: Diethyl ether; rt

Experimental Protocols

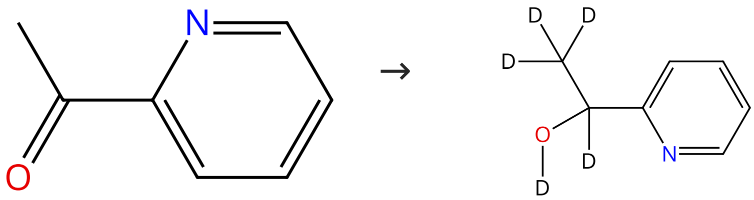
A convenient and effective method for the regioselective deuteration of alcohols

By: Maegawa, Tomohiro; et al

Advanced Synthesis & Catalysis (2008), 350(14+15), 2215-2218.

Scheme 205 (1 Reaction)

Steps: **1** Yield: **87%**



Suppliers (105)

31-614-CAS-37222124

Steps: **1** Yield: **87%**

1.1 **Reagents:** Methanol-*d*$_4$, Potassium hydroxide, Water-*d*$_2$
Catalysts: Carbonylchloro[2-(diphenylphosphino-κ*P*)-*N*-[2-(diphenylphosphino-κ*P*)ethyl]ethanamine-κ*N*]hydroruthenium; 12 h, 120 °C

Experimental Protocols

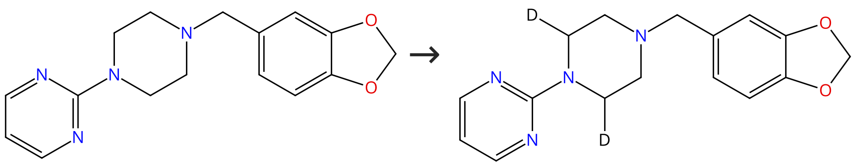
General and selective homogeneous Ru-catalyzed transfer hydrogenation, deuteration, and methylation of functional compounds using methanol

By: Subaramanian, Murugan; et al

Journal of Catalysis (2023), 425, 386-405.

Scheme 206 (1 Reaction)

Steps: **1** Yield: **87%**



Suppliers (72)

31-116-CAS-20984034

Steps: **1** Yield: **87%**

1.1 **Reagents:** Zinc, Water-*d*$_2$
Catalysts: Cuprous iodide, Dichlorotris(triphenylphosphine)ruthenium
Solvents: 1,4-Dioxane; 62 h, 80 °C

Experimental Protocols

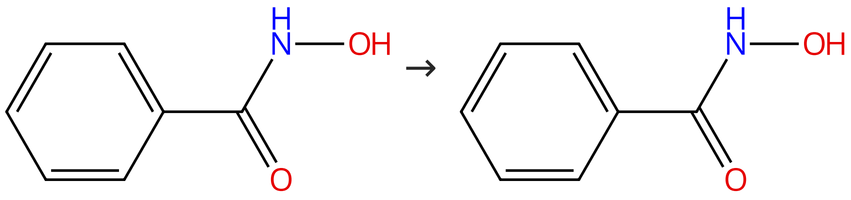
Mild, Selective Ru-Catalyzed Deuteration Using D_2O as a Deuterium Source

By: Eisele, Pascal; et al

Chemistry - A European Journal (2019), 25(72), 16550-16554.

Scheme 207 (1 Reaction)

Steps: **1** Yield: **87%**



Suppliers (76)

31-614-CAS-27187157

Steps: **1** Yield: **87%**

1.1 **Reagents:** Benzoic acid, 3-(trifluoromethyl)-, potassium salt (1:1)
Catalysts: Bis(dichloro(η^6-*p*-cymene)ruthenium)
Solvents: Water-d_2; 18 h, 100 °C

Experimental Protocols

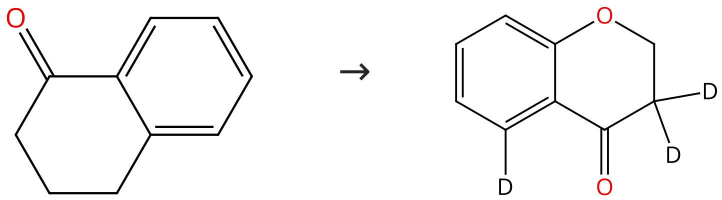
Dehydrative C-H/N-OH Functionalizations in H_2O by Ruthenium(II) Catalysis: Subtle Effect of Carboxylate Ligands and Mechanistic Insight

By: Yang, Fanzhi; et al

Journal of Organic Chemistry (2014), 79(24), 12070-12082.

Scheme 208 (1 Reaction)

Steps: **1** Yield: **87%**



Suppliers (101)

31-614-CAS-24175225

Steps: **1** Yield: **87%**

1.1 **Reagents:** Water-d_2
Catalysts: 4-Chlorobenzoic acid, Silver hexafluoroantimonate, Bis(dichloro(η^6-*p*-cymene)ruthenium), 2-Methyl-3-(trifluoromethyl)aniline
Solvents: 1,2-Dichloroethane; rt → 120 °C; 16 h, 120 °C

Experimental Protocols

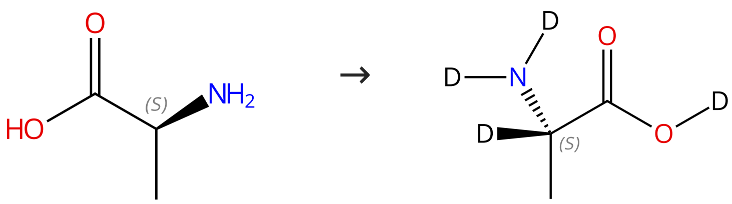
Ruthenium-Catalyzed Deuteration of Aromatic Carbonyl Compounds with a Catalytic Transient Directing Group

By: Kopf, Sara; et al

Chemistry - A European Journal (2021), 27(38), 9768-9773.

Scheme 209 (1 Reaction)

Steps: **1** Yield: **87%**



Absolute stereochemistry shown, Rotation (+)

Absolute stereochemistry shown

Suppliers (195)

31-116-CAS-16030365

Steps: **1** Yield: **87%**

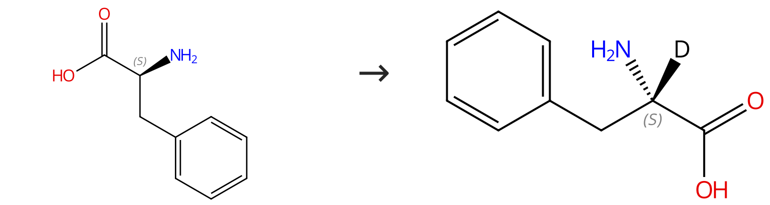
1.1 **Reagents:** Water-d_2
Catalysts: Ruthenium; 5 h, pH 7 - 12, 75 °C

Stereoretentive H/D Exchange via an Electroactivated Heterogeneous Catalyst at sp^3 C-H Sites Bearing Amines or Alcohols

By: Bhatia, Souful; et al

European Journal of Organic Chemistry (2016), 2016(24), 4230-4235.

Scheme 210 (1 Reaction) Steps: **1** Yield: **87%**



Absolute stereochemistry shown, Rotation (-)

Suppliers (206)

Absolute stereochemistry shown, Rotation (-)

Suppliers (3)

31-116-CAS-17957987 Steps: **1** Yield: **87%**

1.1 **Reagents:** Sodium hydroxide, Hydrogen, Water- *d*$_2$
Catalysts: Ruthenium; 72 h, 70 °C; 70 °C → rt

1.2 **Reagents:** Dowex 50W-X8; pH 5 - 6, rt

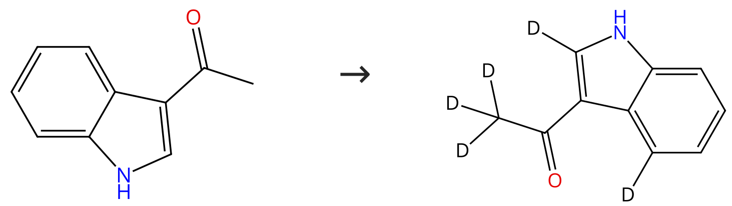
Experimental Protocols

Development and Scale-Up of Stereoretentive α-Deuteration of Amines

By: Michelotti, Alessia; et al

Organic Process Research & Development (2017), 21(11), 1741-1744.

Scheme 211 (1 Reaction) Steps: **1** Yield: **87%**



Suppliers (102)

31-116-CAS-24181792 Steps: **1** Yield: **87%**

1.1 **Reagents:** Water-*d*$_2$
Catalysts: 4-Chlorobenzoic acid, Silver hexafluoroantimonate, Bis(dichloro(η^6-*p*-cymene)ruthenium), 2-Methyl-3-(trifluoromethyl)aniline
Solvents: 1,2-Dichloroethane; rt → 120 °C; 16 h, 120 °C

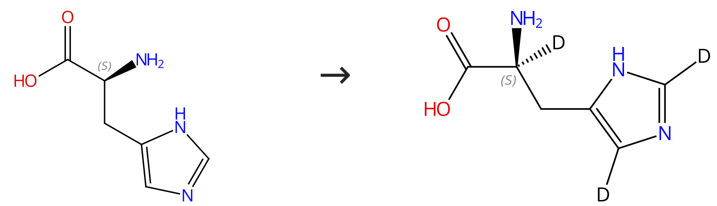
Experimental Protocols

Ruthenium-Catalyzed Deuteration of Aromatic Carbonyl Compounds with a Catalytic Transient Directing Group

By: Kopf, Sara; et al

Chemistry - A European Journal (2021), 27(38), 9768-9773.

Scheme 212 (1 Reaction) Steps: **1** Yield: **87%**



Absolute stereochemistry shown, Rotation (-)

Suppliers (159)

Absolute stereochemistry shown

31-116-CAS-9463343 Steps: **1** Yield: **87%**

1.1 **Reagents:** Deuterium
Catalysts: Ruthenium
Solvents: Water-*d*$_2$; 36 h, 2 bar, 55 °C

Experimental Protocols

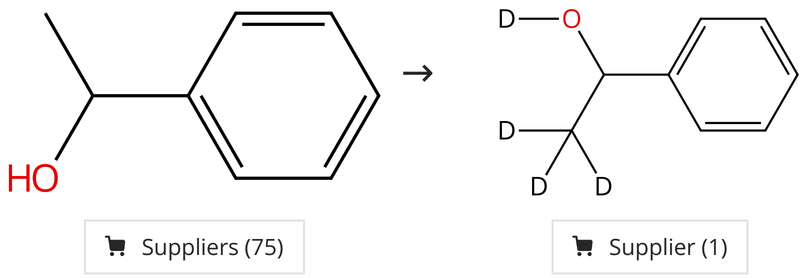
Enantiospecific C-H activation using ruthenium nanocatalysts

By: Taglang, Celine; et al

Angewandte Chemie, International Edition (2015), 54(36), 10474-10477.

Scheme 213 (2 Reactions)

Steps: **1** Yield: **72-87%**



31-116-CAS-1708705

Steps: **1** Yield: **87%**

1.1 **Reagents:** Water-d_2
Catalysts: Potassium hydroxide, Ruthenium(1+), [2-(amino-κ*N*)ethanol-κ*O*]chloro[(1,2,3,4,5,6-η)-1-methyl-4-(1-methylethyl)benzene]-, chloride, compd. with [2-(amino-κ*N*)ethanolato-κ*O*]chloro[(1,2,3,4,5,6-η)-1-methyl-4-(1-methylethyl)benzene]ruthenium (1:1:1); 8 h, 80 °C

Experimental Protocols

Ruthenium-Catalyzed Regioselective Deuteration of Alcohols at the β-Carbon Position with Deuterium Oxide

By: Tse, Sunny Kai San; et al

Chemistry - A European Journal (2011), 17(49), 13918-13925, S13918/1-S13918/12.

31-116-CAS-15101198

Steps: **1** Yield: **72%**

1.1 **Reagents:** Water-d_2
Catalysts: Ethanolamine, Potassium hydroxide, Bis(dichloro(η^6-*p*-cymene)ruthenium); 5.5 h, 80 °C

Experimental Protocols

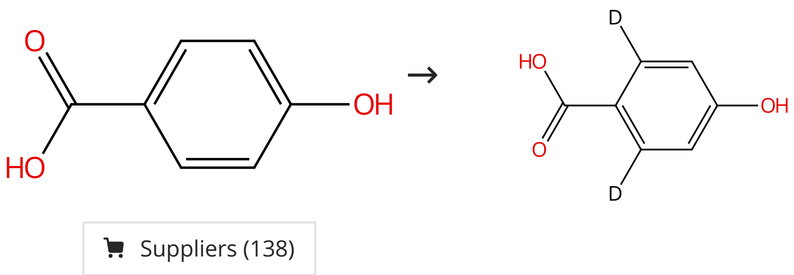
Ruthenium-Catalyzed Regioselective Deuteration of Alcohols at the β-Carbon Position with Deuterium Oxide

By: Tse, Sunny Kai San; et al

Chemistry - A European Journal (2011), 17(49), 13918-13925, S13918/1-S13918/12.

Scheme 214 (1 Reaction)

Steps: **1** Yield: **87%**



31-116-CAS-20858317

Steps: **1** Yield: **87%**

1.1 **Reagents:** Water-d_2
Catalysts: [(1,2,3,4,5,6-η)-1-Methyl-4-(1-methylethyl)benzene](tricyclo[3.3.1.1^{3,7}]decane-1-carboxylato-κ*O*)(tricyclo[3.3.1.1^{3,7}]decane-1-carboxylato-κ*O*,κ*O'*)ruthenium
Solvents: 1,4-Dioxane; 16 h, 100 °C

Experimental Protocols

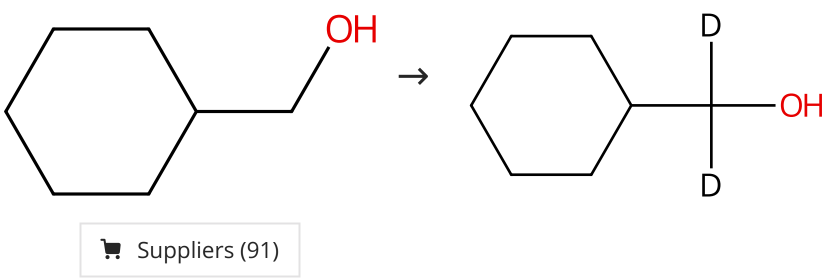
Ruthenium(II)-Catalyzed Hydrogen Isotope Exchange of Pharmaceutical Drugs by C-H Deuteration and C-H Tritiation

By: Mueller, Valentin; et al

ChemCatChem (2020), 12(1), 100-104.

Scheme 215 (1 Reaction)

Steps: **1** Yield: **86%**



31-116-CAS-6383492 Steps: **1** Yield: **86%**

1.1 **Reagents:** Hydrogen, Water-d_2
Catalysts: Ruthenium
Solvents: Water-d_2; 24 h, 1 atm, 80 °C

1.2 **Reagents:** Water
Solvents: Diethyl ether; rt

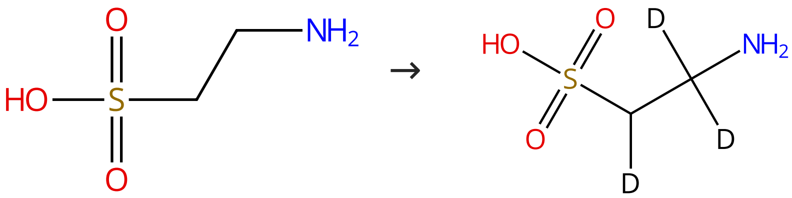
Experimental Protocols

A convenient and effective method for the regioselective deuteration of alcohols

By: Maegawa, Tomohiro; et al

Advanced Synthesis & Catalysis (2008), 350(14+15), 2215-2218.

Scheme 216 (1 Reaction) Steps: **1** Yield: **86%**



Suppliers (137)

31-116-CAS-19176033 Steps: **1** Yield: **86%**

1.1 **Reagents:** Hydrogen, Water-d_2
Catalysts: Ruthenium; 24 h, rt → 80 °C

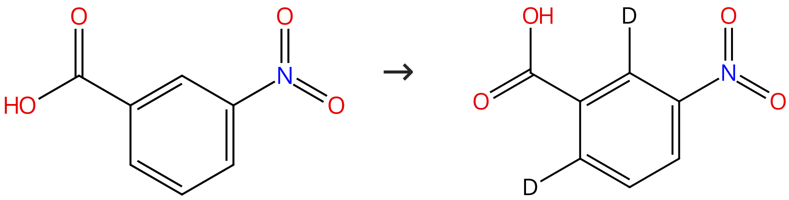
Experimental Protocols

Synthesis of obeticholic acid, a farnesoid X receptor agonist, and its major metabolites labeled with deuterium

By: Gai, Kuo; et al

Journal of Labelled Compounds and Radiopharmaceuticals (2018), 61(10), 799-804.

Scheme 217 (1 Reaction) Steps: **1** Yield: **86%**



Suppliers (102)

31-116-CAS-20858315 Steps: **1** Yield: **86%**

1.1 **Reagents:** Water-d_2
Catalysts: [(1,2,3,4,5,6-η)-1-Methyl-4-(1-methylethyl)benzene](tricyclo[3.3.1.1^{3,7}]decane-1-carboxylato-κ*O*)(tricyclo[3.3.1.1^{3,7}]decane-1-carboxylato-κ*O*,κ*O'*)ruthenium
Solvents: 1,4-Dioxane; 16 h, 100 °C

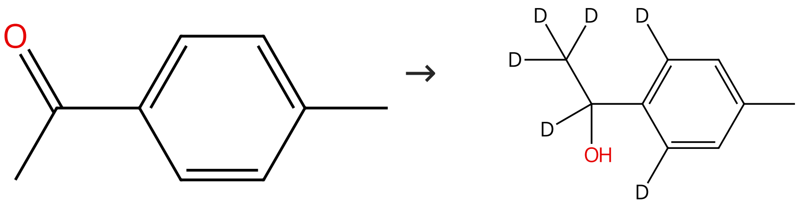
Experimental Protocols

Ruthenium(II)-Catalyzed Hydrogen Isotope Exchange of Pharmaceutical Drugs by C-H Deuteration and C-H Tritiation

By: Mueller, Valentin; et al

ChemCatChem (2020), 12(1), 100-104.

Scheme 218 (2 Reactions) Steps: **1** Yield: **86%**



Suppliers (109)

31-116-CAS-20984004	Steps: **1** Yield: **86%**
1.1	**Reagents:** Zinc, Water-*d*$_2$, Potassium hydroxide (K(OD)) **Catalysts:** Dichlorotris(triphenylphosphine)ruthenium **Solvents:** 1,4-Dioxane; 62 h, 80 °C
Experimental Protocols	

Mild, Selective Ru-Catalyzed Deuteration Using D_2O as a Deuterium Source

By: Eisele, Pascal; et al

Chemistry - A European Journal (2019), 25(72), 16550-16554.

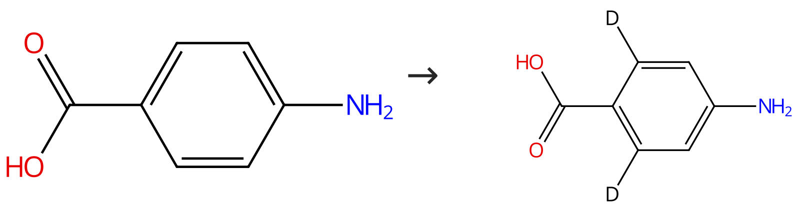
31-116-CAS-20984048	Steps: **1**
1.1	**Reagents:** Zinc, Water-*d*$_2$, Potassium hydroxide (K(OD)) **Catalysts:** (Dihydrogen-κ*H*,κ*H'*)dihydrotris(triphenylphosphine) ruthenium **Solvents:** 1,4-Dioxane; 62 h, 80 °C
Experimental Protocols	

Mild, Selective Ru-Catalyzed Deuteration Using D_2O as a Deuterium Source

By: Eisele, Pascal; et al

Chemistry - A European Journal (2019), 25(72), 16550-16554.

Scheme 219 (1 Reaction) Steps: **1** Yield: **86%**



Suppliers (137) Suppliers (12)

31-116-CAS-20858318	Steps: **1** Yield: **86%**
1.1	**Reagents:** Water-*d*$_2$ **Catalysts:** [(1,2,3,4,5,6-η)-1-Methyl-4-(1-methylethyl)benzene](tricyclo[3.3.1.1^{3,7}]decane-1-carboxylato-κ*O*)(tricyclo[3.3.1.1^{3,7}]decane-1-carboxylato-κ*O*,κ*O'*)ruthenium **Solvents:** 1,4-Dioxane; 16 h, 100 °C
Experimental Protocols	

Ruthenium(II)-Catalyzed Hydrogen Isotope Exchange of Pharmaceutical Drugs by C-H Deuteration and C-H Tritiation

By: Mueller, Valentin; et al

ChemCatChem (2020), 12(1), 100-104.

Scheme 220 (1 Reaction) Steps: **1** Yield: **86%**

Suppliers (45)

31-116-CAS-2105794	Steps: **1** Yield: **86%**
1.1	**Reagents:** Ethanol, Sodium dodecyl sulfate, Water- *d*$_2$ **Catalysts:** Dichlorotris(triphenylphosphine)ruthenium **Solvents:** Water-*d*$_2$; 60 min, 0.34 M Pa, 140 °C

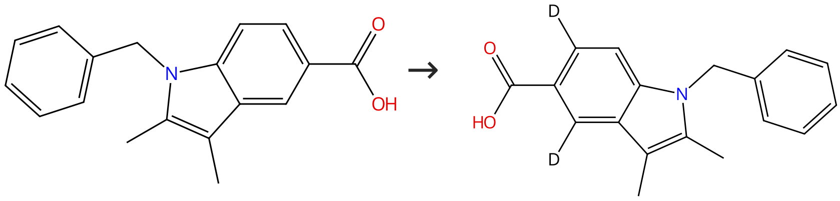
Preparation of cyclohexene-d_{10} by H/D-exchange reaction

By: Ishibashi, Kenichi; et al

Chemistry Letters (2007), 36(6), 724-725.

Scheme 221 (1 Reaction)

Steps: **1** Yield: **86%**



Suppliers (43)

31-116-CAS-20858319

Steps: **1** Yield: **86%**

1.1 **Reagents:** Water-d_2
Catalysts: [(1,2,3,4,5,6-η)-1-Methyl-4-(1-methylethyl)benzene](tricyclo[3.3.1.1^{3,7}]decane-1-carboxylato-κ*O*)(tricyclo[3.3.1.1^{3,7}]decane-1-carboxylato-κ*O*,κ*O'*)ruthenium
Solvents: 1,4-Dioxane; 16 h, 100 °C

Experimental Protocols

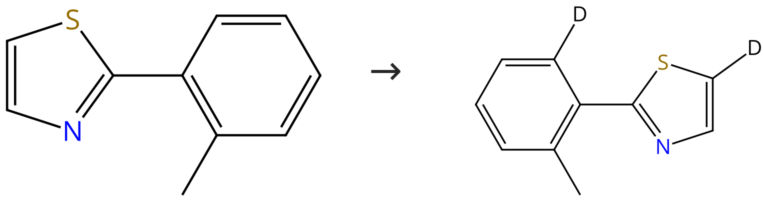
Ruthenium(II)-Catalyzed Hydrogen Isotope Exchange of Pharmaceutical Drugs by C-H Deuteration and C-H Tritiation

By: Mueller, Valentin; et al

ChemCatChem (2020), 12(1), 100-104.

Scheme 222 (2 Reactions)

Steps: **1** Yield: **85-86%**



Suppliers (21)

31-614-CAS-41279978

Steps: **1** Yield: **86%**

1.1 **Reagents:** Potassium carbonate, Water-d_2
Catalysts: 1-Adamantanecarboxylic acid, Bis(dichloro(η^6-*p*-cymene)ruthenium)
Solvents: Toluene; 24 h, 120 °C

Experimental Protocols

Regiodivergent Metal-Catalyzed Oxidative Alkynylation of 2-Arylthiazoles with Terminal Alkynes under Air Conditions

By: Zhou, Pengfei; et al

Journal of Organic Chemistry (2024), 89(15), 10953-10964.

31-614-CAS-40744652

Steps: **1** Yield: **85%**

1.1 **Reagents:** Potassium carbonate, 1-Adamantanecarboxylic acid, Water-d_2
Catalysts: Bis(dichloro(η^6-*p*-cymene)ruthenium)
Solvents: Toluene; 24 h, 120 °C

Experimental Protocols

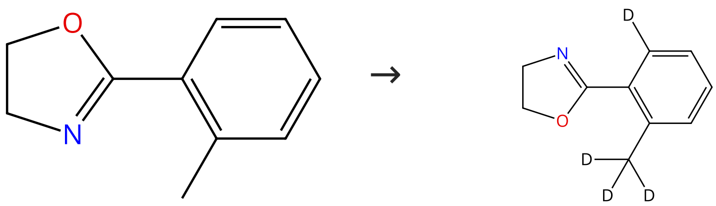
Regiodivergent C-H alkynylation of 2-arylthiazoles switched by Ru^{II} and Pd^{II} catalysis

By: Zhou, Pengfei; et al

Chemical Communications (Cambridge, United Kingdom) (2024), 60(52), 6679-6682.

Scheme 223 (1 Reaction)

Steps: **1** Yield: **86%**



Suppliers (9)

31-116-CAS-16156649 Steps: **1** Yield: **86%**

1.1 **Reagents:** Potassium carbonate, Water-*d*2
Catalysts: [(1,2,3,4,5,6-η)-1-Methyl-4-(1-methylethyl)benzene](2,4,6-trimethylbenzoato-κ*O*)(2,4,6-trimethylbenzoato-κ*O*,κ*O*')ruthenium
Solvents: Toluene; 96 h, 140 °C

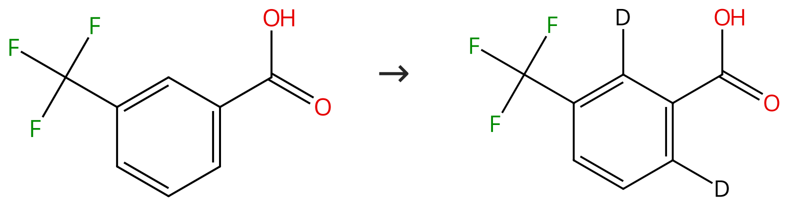
Experimental Protocols

Cobalt-Catalyzed C-H Functionalizations by Imidate Assistance with Aryl and Alkyl Chlorides

By: Mei, Ruhuai; et al

Advanced Synthesis & Catalysis (2016), 358(15), 2443-2448.

Scheme 224 (1 Reaction) Steps: **1** Yield: **86%**



Suppliers (96)

31-116-CAS-20142114 Steps: **1** Yield: **86%**

1.1 **Reagents:** Sodium acetate, Water-*d*2
Catalysts: Ruthenium(1+), tris(acetonitrile)[(1,2,3,4,5-η)-1,2,3,4,5-pentamethyl-2,4-cyclopentadien-1-yl]-, (*OC*-6-11)-hexafluoroantimonate(1-); 16 h, 90 °C; cooled

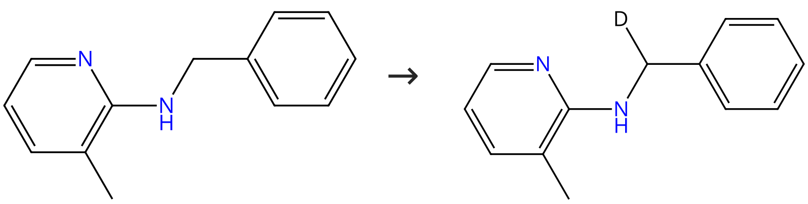
1.2 **Reagents:** Hydrochloric acid
Solvents: Water

77Carbon Dioxide-Mediated C(sp^2)-H Arylation of Primary and Secondary Benzylamines

By: Kapoor, Mohit; et al

Journal of the American Chemical Society (2019), 141(19), 7980-7989.

Scheme 225 (1 Reaction) Steps: **1** Yield: **86%**



Suppliers (11)

31-116-CAS-14563648 Steps: **1** Yield: **86%**

1.1 **Reagents:** Sodium carbonate, Water-*d*2
Catalysts: [(1,2,3,4,5,6-η)-1-Methyl-4-(1-methylethyl)benzene](2,4,6-trimethylbenzoato-κ*O*)(2,4,6-trimethylbenzoato-κ*O*,κ*O*')ruthenium
Solvents: *o*-Xylene; 24 h, 140 °C

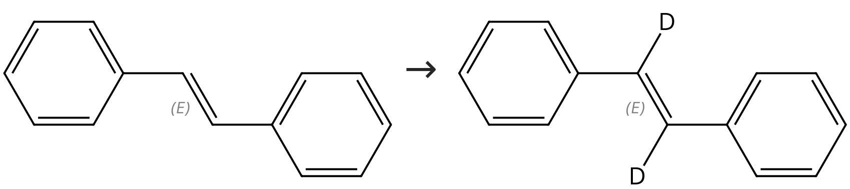
Experimental Protocols

C(sp^3)-H Bond arylations catalyzed by well-defined [Ru(O_2CMes)$_2$(p-cymene)]

By: Phani Kumar, N. Y.; et al

Journal of Organic Chemistry (2013), 78(8), 4145-4152.

Scheme 226 (1 Reaction) Steps: **1** Yield: **85%**



Double bond geometry shown

Suppliers (79)

Double bond geometry shown

Suppliers (18)

31-116-CAS-1527200 Steps: **1** Yield: **85%**

1.1 **Reagents:** Water-*d*$_2$
Catalysts: (*OC*-6-34)-Carbonylchlorohydrotris(triphenyl phosphine)ruthenium
Solvents: 1,4-Dioxane; 4.5 h, 100 °C

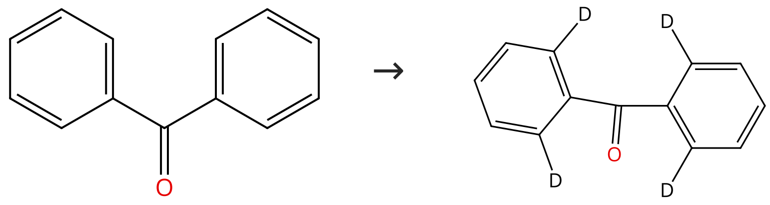
Experimental Protocols

Hydrogen/Deuterium Exchange Reactions of Olefins with Deuterium Oxide Mediated by the Carbonylchlorohydridotris (triphenylphosphine)ruthenium(II) Complex

By: Tse, Sunny Kai San; et al

Advanced Synthesis & Catalysis (2010), 352(9), 1512-1522.

Scheme 227 (2 Reactions) Steps: **1** Yield: **85%**



Suppliers (142) Supplier (1)

31-116-CAS-24182182 Steps: **1** Yield: **85%**

1.1 **Reagents:** Water-*d*$_2$
Catalysts: 4-Chlorobenzoic acid, Silver hexafluoroantimonate, Bis(dichloro(η^6-*p*-cymene)ruthenium), 2-Methyl-3-(trifluor omethyl)aniline
Solvents: 1,2-Dichloroethane; rt → 120 °C; 16 h, 120 °C

Experimental Protocols

Ruthenium-Catalyzed Deuteration of Aromatic Carbonyl Compounds with a Catalytic Transient Directing Group

By: Kopf, Sara; et al

Chemistry - A European Journal (2021), 27(38), 9768-9773.

31-116-CAS-14585687 Steps: **1**

1.1 **Reagents:** Water-*d*$_2$
Catalysts: Stereoisomer of dihydro[(1,2,3,3a,7a-η)-1-phenyl-1*H*-inden-1-yl](triethylsilyl)(triphenylphosphine)ruthenium
Solvents: Toluene; 16 h, 110 atm

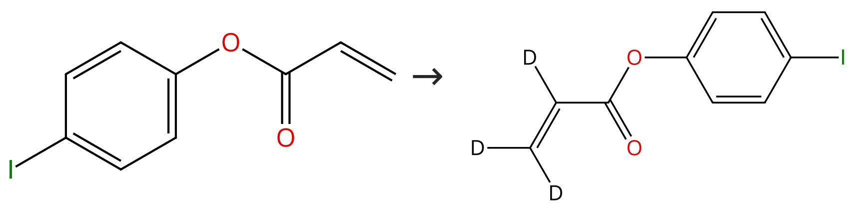
Experimental Protocols

Regioselective ruthenium catalysed H-D exchange using D_2O as the deuterium source

By: Piola, Lorenzo; et al

Organic & Biomolecular Chemistry (2014), 12(43), 8683-8688.

Scheme 228 (1 Reaction) Steps: **1** Yield: **85%**



Suppliers (8)

31-116-CAS-19573243 Steps: **1** Yield: **85%**

1.1 **Reagents:** Water-*d*$_2$
Catalysts: 3-(Trifluoromethyl)benzoic acid, Bis(dichloro(η^6-*p*-cymene)ruthenium), Benzoic acid, 3-(trifluoromethyl)-, potassium salt (1:1); 18 h, rt → 80 °C

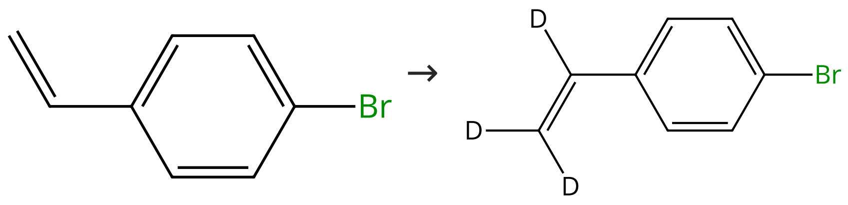
Experimental Protocols

Ruthenium(II)biscarboxylate-Catalyzed Hydrogen-Isotope Exchange by Alkene C-H Activation

By: Bechtoldt, Alexander; et al

ChemCatChem (2019), 11(1), 435-438.

Scheme 229 (1 Reaction) Steps: **1** Yield: **85%**



Suppliers (92)

31-116-CAS-21609331 Steps: **1** Yield: **85%**

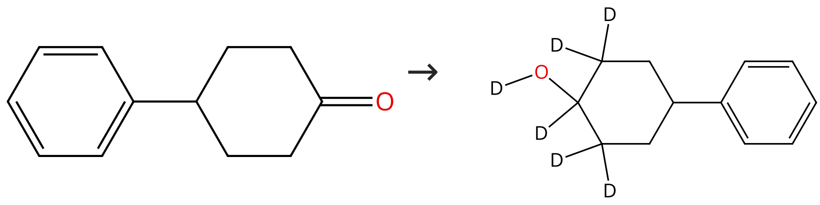
1.1 **Reagents:** Water-*d*$_2$
Catalysts: Carbonylchlorohydrotris(triphenylphosphine)ruthenium
Solvents: Tetrahydrofuran; rt → 100 °C; 6 h, 100 °C

Diverse Fates of β-Silyl Radical under Manganese Catalysis: Hydrosilylation and Dehydrogenative Silylation of Alkenes

By: Yang, Xiaoxu; et al

Chinese Journal of Chemistry (2018), 36(11), 1047-1051.

Scheme 230 (1 Reaction) Steps: **1** Yield: **85%**



Suppliers (85)

31-614-CAS-37222120 Steps: **1** Yield: **85%**

1.1 **Reagents:** Methanol-*d*$_4$, Potassium hydroxide, Water-*d*$_2$
Catalysts: Carbonylchloro[2-(diphenylphosphino-κ*P*)-*N*-[2-(diphenylphosphino-κ*P*)ethyl]ethanamine-κ*N*]hydroruthenium; 12 h, 120 °C

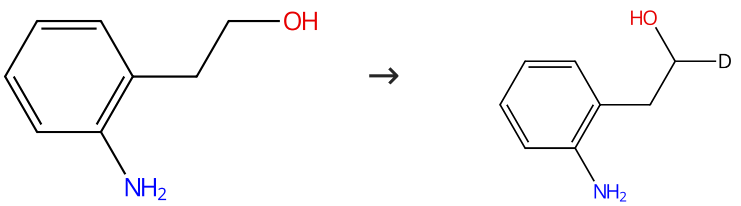
Experimental Protocols

General and selective homogeneous Ru-catalyzed transfer hydrogenation, deuteration, and methylation of functional compounds using methanol

By: Subaramanian, Murugan; et al

Journal of Catalysis (2023), 425, 386-405.

Scheme 231 (1 Reaction) Steps: **1** Yield: **85%**



Suppliers (80)

31-614-CAS-35031115 Steps: **1** Yield: **85%**

1.1 **Reagents:** Potassium *tert*-butoxide
Catalysts: (*OC*-6-13)-Carbonyl[2-(diphenylphosphino-κ*P*)-*N*-[2-(diphenylphosphino-κ*P*)ethyl]ethanamine-κ*N*][tetrahydroborato(1-)-κ*H*]ruthenium
Solvents: Water-*d*$_2$; 24 h, 80 °C

1.2 **Reagents:** Water

Experimental Protocols

Nickel-Catalyzed Direct Synthesis of N-Substituted Indoles from Amino Alcohols and Alcohols

By: Yadav, Vinita; et al

Organic Letters (2022), 24(49), 9054-9059.

Scheme 232 (1 Reaction) Steps: **1** Yield: **85%**

Suppliers (107)

31-116-CAS-24182175 Steps: **1** Yield: **85%**

1.1 **Reagents:** Water-d_2
Catalysts: 4-Chlorobenzoic acid, Silver hexafluoroantimonate, Bis(dichloro(η^6-*p*-cymene)ruthenium), 2-Methyl-3-(trifluor omethyl)aniline
Solvents: 1,2-Dichloroethane; rt → 100 °C; 16 h, 100 °C

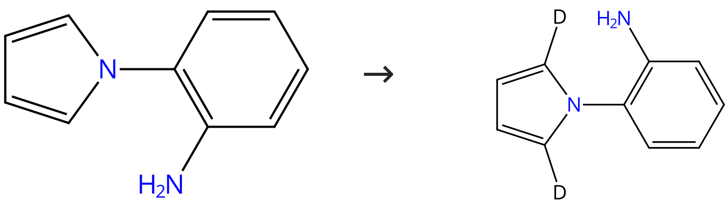
Experimental Protocols

Ruthenium-Catalyzed Deuteration of Aromatic Carbonyl Compounds with a Catalytic Transient Directing Group

By: Kopf, Sara; et al

Chemistry - A European Journal (2021), 27(38), 9768-9773.

Scheme 233 (1 Reaction) Steps: **1** Yield: **85%**



Suppliers (75)

31-116-CAS-22063179 Steps: **1** Yield: **85%**

1.1 **Reagents:** Oxygen, Water-d_2
Catalysts: Bis(dichloro(η^6-*p*-cymene)ruthenium), [1,1,1-Trifluoro-*N*-[(trifluoromethyl)sulfonyl-κ*O*]methanesulfona midato-κ*O*]silver
Solvents: 2-Methyl-2-butanol; 12 h, 100 °C

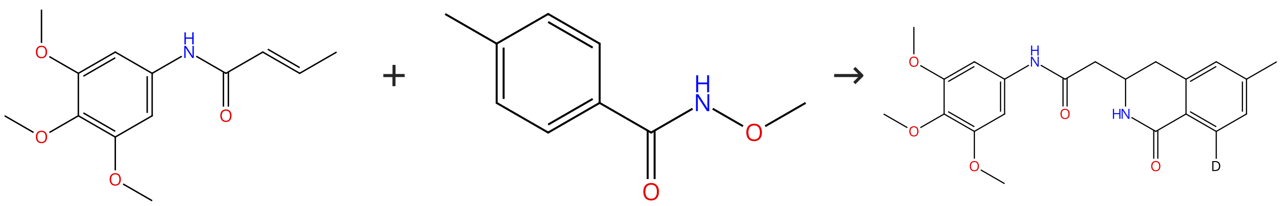
Experimental Protocols

Ruthenium-Catalyzed Synthesis of Pyrrolo[1,2-a]quinoxaline Derivatives from 1-(2-Aminophenyl)pyrroles and Sulfoxonium Ylides

By: Cui, Xin-Feng; et al

Synlett (2020), 31(12), 1205-1210.

Scheme 234 (1 Reaction) Steps: **1** Yield: **84%**



Suppliers (3) Suppliers (22)

31-614-CAS-34633189 Steps: **1** Yield: **84%**

1.1 **Reagents:** Sodium acetate, Water-d_2
Catalysts: Bis(dichloro(η^6-*p*-cymene)ruthenium)
Solvents: 1,1,1,3,3,3-Hexafluoro-2-propanol; 4 h, 60 °C

Experimental Protocols

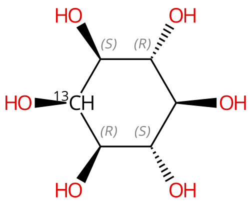
Ruthenium(II)-Catalyzed (4+2) Annulative Difunctionalization of Non-conjugated Alkenyl Amides with Hydroxamic Acid Esters

By: Kumar Giri, Chandan; et al

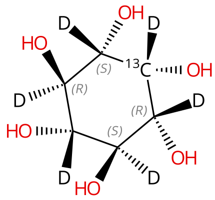
Chemistry - An Asian Journal (2022), 17(23), e202200861.

Scheme 235 (1 Reaction)

Steps: **1** Yield: **84%**



Relative stereochemistry shown



Relative stereochemistry shown

31-116-CAS-18023463

Steps: **1** Yield: **84%**

1.1 **Reagents:** Hydrogen, Water-d_2
Catalysts: Ruthenium; 24 h, 80 °C

Experimental Protocols

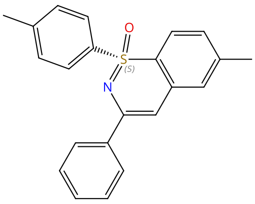
Perdeuterated and ^{13}C-enriched myo-inositol for DNP assisted monitoring of enzymatic phosphorylation by inositol-3-kinase

By: Moure, M. J.; et al

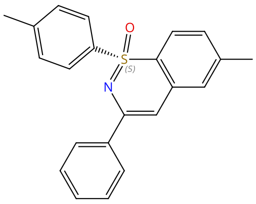
Chemical Communications (Cambridge, United Kingdom) (2017), 53(92), 12398-12401.

Scheme 236 (1 Reaction)

Steps: **1** Yield: **84%**



Absolute stereochemistry shown, Rotation (-)



Absolute stereochemistry shown

31-614-CAS-29131803

Steps: **1** Yield: **84%**

1.1 **Reagents:** Water-d_2
Catalysts: Silver hexafluoroantimonate, Bis(dichloro(η^6-*p*-cymene)ruthenium), (1*S*)-2'-[[Bis(1-methylethyl)amino]carbonyl][1,1'-binaphthalene]-2-carboxylic acid
Solvents: 1,2-Dichloroethane; 2 h, 35 °C

Experimental Protocols

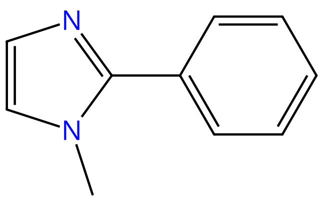
Efficient Synthesis of Sulfur-Stereogenic Sulfoximines via Ru(II)-Catalyzed Enantioselective C-H Functionalization Enabled by Chiral Carboxylic Acid

By: Zhou, Tao; et al

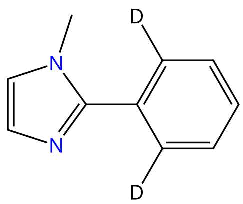
Journal of the American Chemical Society (2021), 143(18), 6810-6816.

Scheme 237 (2 Reactions)

Steps: **1** Yield: **84%**



Suppliers (21)



31-116-CAS-20984012

Steps: **1** Yield: **84%**

1.1 **Reagents:** Water-d_2, Potassium hydroxide (K(OD))
Catalysts: Dichlorotris(triphenylphosphine)ruthenium
Solvents: 1,4-Dioxane; 16 h, 80 °C

Experimental Protocols

Mild, Selective Ru-Catalyzed Deuteration Using D_2O as a Deuterium Source

By: Eisele, Pascal; et al

Chemistry - A European Journal (2019), 25(72), 16550-16554.

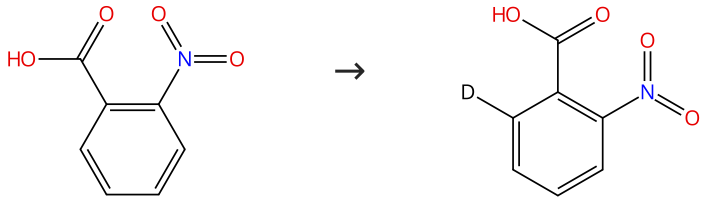
31-116-CAS-15184499	Steps: **1**
1.1	**Reagents:** Water-d_2 **Catalysts:** Stereoisomer of dihydro[(1,2,3,3a,7a-η)-1-phenyl-1*H*-inden-1-yl](triethylsilyl)(triphenylphosphine)ruthenium **Solvents:** Toluene; 16 h, 110 atm
Experimental Protocols	

Regioselective ruthenium catalysed H-D exchange using D_2O as the deuterium source

By: Piola, Lorenzo; et al

Organic & Biomolecular Chemistry (2014), 12(43), 8683-8688.

Scheme 238 (1 Reaction) Steps: **1** Yield: **84%**



Suppliers (105)

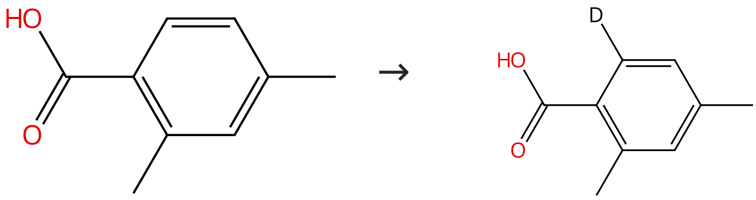
31-116-CAS-20858312	Steps: **1** Yield: **84%**
1.1	**Reagents:** Water-d_2 **Catalysts:** [(1,2,3,4,5,6-η)-1-Methyl-4-(1-methylethyl)benzene](tricyclo[3.3.1.1^{3,7}]decane-1-carboxylato-κ*O*)(tricyclo[3.3.1.1^{3,7}]decane-1-carboxylato-κ*O*,κ*O'*)ruthenium **Solvents:** 1,4-Dioxane; 16 h, 100 °C
Experimental Protocols	

Ruthenium(II)-Catalyzed Hydrogen Isotope Exchange of Pharmaceutical Drugs by C-H Deuteration and C-H Tritiation

By: Mueller, Valentin; et al

ChemCatChem (2020), 12(1), 100-104.

Scheme 239 (1 Reaction) Steps: **1** Yield: **84%**



Suppliers (92)

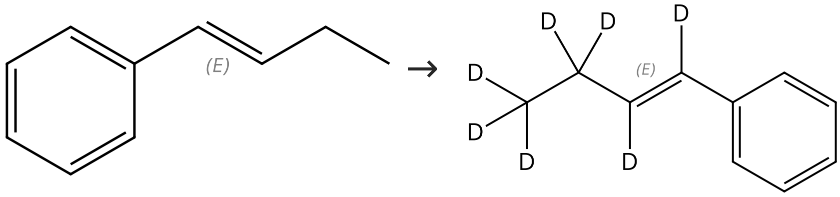
31-116-CAS-11790439	Steps: **1** Yield: **84%**
1.1	**Reagents:** Potassium acetate, Water-d_2 **Catalysts:** Zirconium dioxide, Ruthenium (zirconium-oxide-supported ruthenium catalyst) **Solvents:** Mesitylene; 24 h, 170 °C
Experimental Protocols	

Coupling of carboxylic acids with internal alkynes by supported ruthenium catalysts: direct and selective syntheses of multi-substituted phthalide derivatives

By: Miura, Hiroki; et al

Chemical Communications (Cambridge, United Kingdom) (2015), 51(9), 1654-1657.

Scheme 240 (1 Reaction) Steps: **1** Yield: **83%**



Double bond geometry shown

Double bond geometry shown

Suppliers (35)

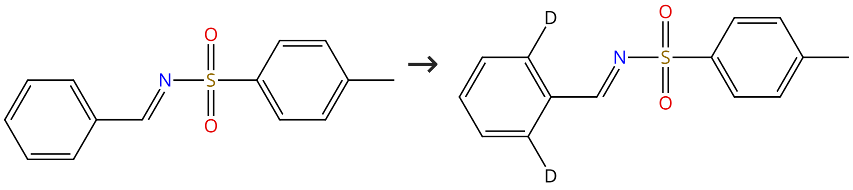
31-116-CAS-3918180	Steps: **1** Yield: **83%**
1.1	**Reagents:** Water-d_2 **Catalysts:** (*OC*-6-34)-Carbonylchlorohydrotris(triphenyl phosphine)ruthenium **Solvents:** 1,4-Dioxane; 10 h, 100 °C
Experimental Protocols	

Hydrogen/Deuterium Exchange Reactions of Olefins with Deuterium Oxide Mediated by the Carbonylchlorohydridotris (triphenylphosphine)ruthenium(II) Complex

By: Tse, Sunny Kai San; et al

Advanced Synthesis & Catalysis (2010), 352(9), 1512-1522.

Scheme 241 (1 Reaction) Steps: **1** Yield: **83%**



Suppliers (37)

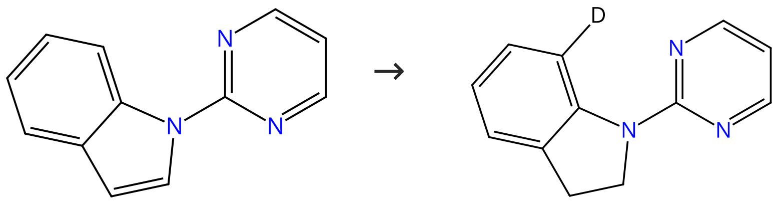
31-116-CAS-5502293	Steps: **1** Yield: **83%**
1.1	**Reagents:** Cupric acetate, Water-d_2 **Catalysts:** Silver hexafluoroantimonate, Bis(dichloro(η^6-*p*-cymene)ruthenium) **Solvents:** 1,2-Dichloroethane; 15 h, 100 °C
Experimental Protocols	

Ruthenium(II)-Catalyzed C-H Bond Activation: An Efficient Route toward Indenamines

By: Hung, Chen-Hsun; et al

ChemCatChem (2014), 6(9), 2692-2697.

Scheme 242 (1 Reaction) Steps: **1** Yield: **83%**



Suppliers (59)

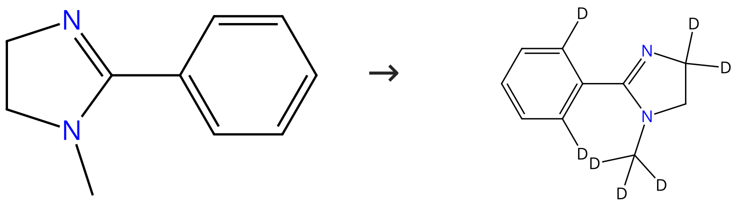
31-116-CAS-19782791	Steps: **1** Yield: **83%**
1.1	**Reagents:** Sodium acetate, Water-d_2, (*OC*-6-11)-Hexafluoro antimonate(1-) **Catalysts:** Bis(dichloro(η^6-*p*-cymene)ruthenium) **Solvents:** 1,2-Dichloroethane; 12 h, 25 °C
Experimental Protocols	

Ru^{II}-Catalysed Regioselective C-N Bond Formation of Indolines and Carbazole with Acyl Azides

By: Banerjee, Sonbidya; et al

European Journal of Organic Chemistry (2019), 2019(7), 1677-1684.

Scheme 243 (1 Reaction) Steps: **1** Yield: **83%**



Suppliers (3)

31-116-CAS-20984016 Steps: **1** Yield: **83%**

1.1 **Reagents:** Zinc, Water-*d*$_2$
Catalysts: Cuprous iodide, Dichlorotris(triphenylphosphine) ruthenium
Solvents: 1,4-Dioxane, THF-*d*$_8$; 16 h, 80 °C

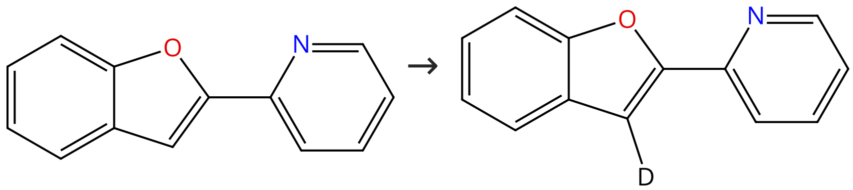
Experimental Protocols

Mild, Selective Ru-Catalyzed Deuteration Using D_2O as a Deuterium Source

By: Eisele, Pascal; et al

Chemistry - A European Journal (2019), 25(72), 16550-16554.

Scheme 244 (1 Reaction) Steps: **1** Yield: **83%**



Suppliers (22)

31-116-CAS-7875358 Steps: **1** Yield: **83%**

1.1 **Reagents:** Silver acetate, Water-*d*$_2$
Catalysts: Dichlorotris(triphenylphosphine)ruthenium
Solvents: Toluene; 24 h, 140 °C

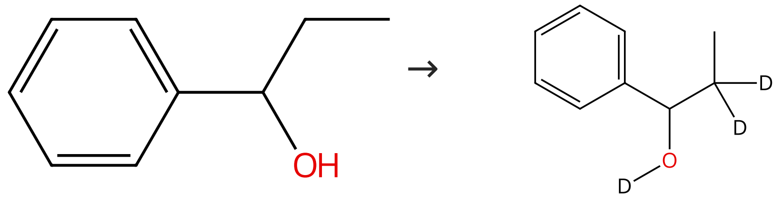
Experimental Protocols

Ruthenium(II)-catalyzed switchable C3-alkylation versus alkenylation with acrylates of 2-pyridylbenzofurans via C-H bond activation

By: Kommagalla, Yadagiri; et al

Catalysis Science & Technology (2015), 5(1), 114-117.

Scheme 245 (1 Reaction) Steps: **1** Yield: **83%**



Suppliers (76)

31-116-CAS-5974196 Steps: **1** Yield: **83%**

1.1 **Reagents:** Water-*d*$_2$
Catalysts: Ethanolamine, Potassium hydroxide, Bis(dichloro (η^6-*p*-cymene)ruthenium); 6 h, 80 °C

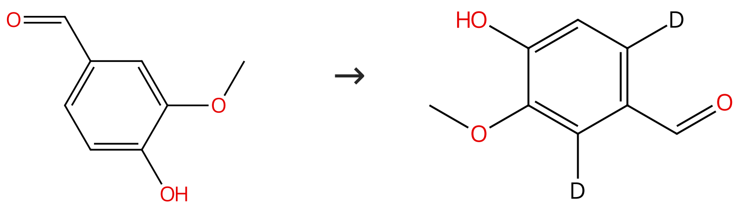
Experimental Protocols

Ruthenium-Catalyzed Regioselective Deuteration of Alcohols at the β-Carbon Position with Deuterium Oxide

By: Tse, Sunny Kai San; et al

Chemistry - A European Journal (2011), 17(49), 13918-13925, S13918/1-S13918/12.

Scheme 246 (1 Reaction) Steps: **1** Yield: **82%**



Suppliers (160)

31-116-CAS-24182149 Steps: **1** Yield: **82%**

1.1 **Reagents:** Water-d_2
Catalysts: 4-Chlorobenzoic acid, Silver hexafluoroantimonate, Bis(dichloro(η^6-*p*-cymene)ruthenium), 2-Methyl-3-(trifluoromethyl)aniline
Solvents: 1,2-Dichloroethane; rt → 100 °C; 16 h, 100 °C

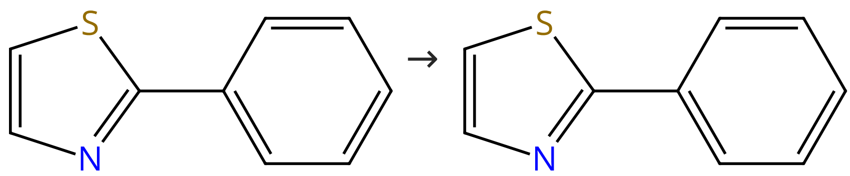
Experimental Protocols

Ruthenium-Catalyzed Deuteration of Aromatic Carbonyl Compounds with a Catalytic Transient Directing Group

By: Kopf, Sara; et al

Chemistry - A European Journal (2021), 27(38), 9768-9773.

Scheme 247 (1 Reaction) Steps: **1** Yield: **82%**



Suppliers (79)

31-614-CAS-40744651 Steps: **1** Yield: **82%**

1.1 **Reagents:** Sodium acetate, Water-d_2
Catalysts: Bis(dichloro(η^6-*p*-cymene)ruthenium)
Solvents: Ethanol; 4 h, 120 °C

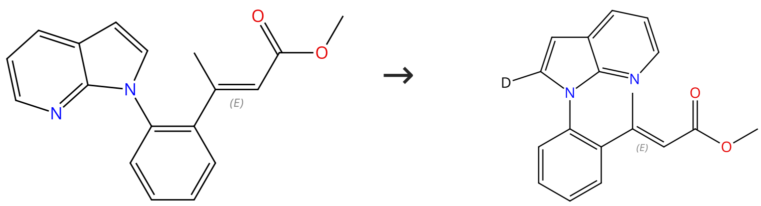
Experimental Protocols

Regiodivergent C-H alkynylation of 2-arylthiazoles switched by Ru^{II} and Pd^{II} catalysis

By: Zhou, Pengfei; et al

Chemical Communications (Cambridge, United Kingdom) (2024), 60(52), 6679-6682.

Scheme 248 (1 Reaction) Steps: **1** Yield: **82%**



Double bond geometry shown

Double bond geometry shown

31-116-CAS-11273741 Steps: **1** Yield: **82%**

1.1 **Reagents:** Acetic acid, Cupric acetate
Catalysts: Ruthenium(1+), tris(acetonitrile)(η^5-2,4-cyclopentadien-1-yl)-, (*OC*-6-11)-hexafluoroantimonate(1-) (1:1)
Solvents: 1,2-Dimethoxyethane; 7 h, 110 °C

1.2 **Reagents:** Water-d_2

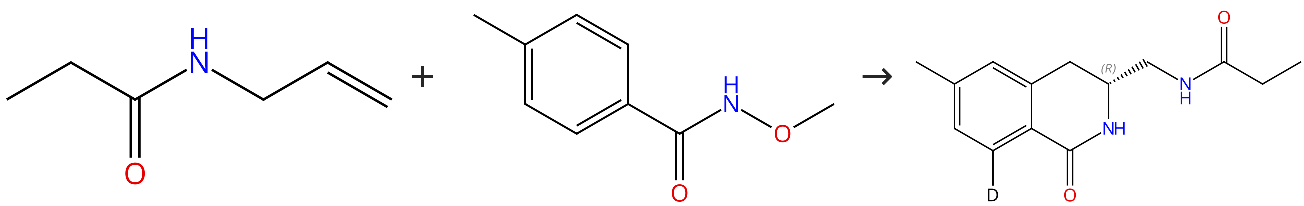
Experimental Protocols

Rhodium-Catalyzed Tandem Annulation Reactions of 7-Azaindoles with Electron-Deficient Olefins via Double C-H Activation

By: Li, Shuai-Shuai; et al

Advanced Synthesis & Catalysis (2016), 358(10), 1595-1601.

Scheme 249 (1 Reaction) Steps: **1** Yield: **82%**



Suppliers (4)

Suppliers (22)

Absolute stereochemistry shown

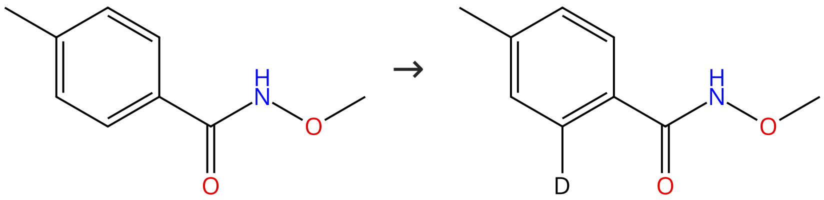
31-614-CAS-24210736	Steps: **1** Yield: **82%**
1.1	**Reagents:** Sodium acetate, Water-d_2 **Catalysts:** Bis(dichloro(η^6-*p*-cymene)ruthenium) **Solvents:** 1,1,1,3,3,3-Hexafluoro-2-propanol; 4 h, 60 °C
Experimental Protocols	

Ruthenium(II)-catalyzed C-H activation and (4+2) annulation of aromatic hydroxamic acid esters with allylic amides

By: Giri, Chandan Kumar; et al

Chemical Communications (Cambridge, United Kingdom) (2021), 57(81), 10536-10539.

Scheme 250 (1 Reaction) Steps: **1** Yield: **82%**



Suppliers (22)

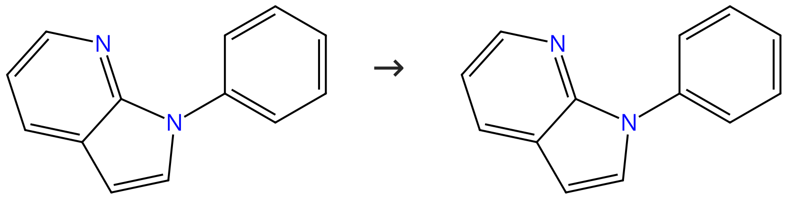
31-614-CAS-32681456	Steps: **1** Yield: **82%**
1.1	**Reagents:** Cupric acetate, Water-d_2 **Catalysts:** Bis(dichloro(η^6-*p*-cymene)ruthenium) **Solvents:** 1,1,1,3,3,3-Hexafluoro-2-propanol; 12 h, 60 °C
Experimental Protocols	

Regioselective Annulation of Allenylphosphine Oxides with Aromatic Amides under Ruthenium(II) Catalysis

By: Chowdhury, Deepan; et al

Organic Letters (2022), 24(20), 3604-3608.

Scheme 251 (2 Reactions) Steps: **1** Yield: **30-82%**



Suppliers (6)

31-614-CAS-27406609	Steps: **1** Yield: **82%**
1.1	**Reagents:** Water-d_2 **Catalysts:** Sodium acetate, Silver triflate, Bis(dichloro(η^6-*p*-cymene)ruthenium) **Solvents:** 1,2-Dichloroethane; 30 h, 110 °C
Experimental Protocols	

Ruthenium-Catalyzed Direct and Selective C-H Cyanation of N-(Hetero)aryl-7-azaindoles

By: Mishra, Aniket; et al

Journal of Organic Chemistry (2016), 81(15), 6525-6534.

31-614-CAS-27401140	Steps: **1** Yield: **30%**
1.1	**Reagents:** Monosodium phosphate, Water-d_2 **Catalysts:** Silver hexafluoroantimonate, Bis(dichloro(η^6-*p*-cymene)ruthenium) **Solvents:** 1,2-Dichloroethane; 30 min, 60 °C
Experimental Protocols	

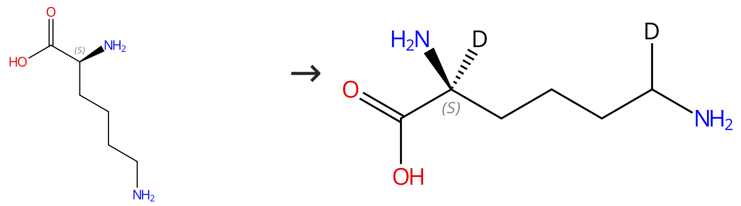
Ruthenium(II)-catalyzed regioselective C-H hydroxymethylation of N-aryl-azaindoles with paraformaldehyde

By: Li, Siqi; et al

Heterocycles (2020), 100(6), 934-945.

Scheme 252 (1 Reaction)

Steps: **1** Yield: **82%**



Absolute stereochemistry shown

Suppliers (122)

Absolute stereochemistry shown

31-116-CAS-3039265

Steps: **1** Yield: **82%**

1.1 **Reagents:** Deuterium
Catalysts: Ruthenium
Solvents: Water-d_2; 36 h, 2 bar, 55 °C

Experimental Protocols

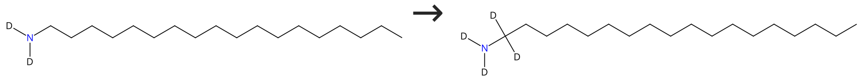
Enantiospecific C-H activation using ruthenium nanocatalysts

By: Taglang, Celine; et al

Angewandte Chemie, International Edition (2015), 54(36), 10474-10477.

Scheme 253 (1 Reaction)

Steps: **1** Yield: **82%**



31-116-CAS-16606097

Steps: **1** Yield: **82%**

1.1 **Catalysts:** Ruthenium, μ-chlorodichloro-μ-hydrobis[(1,2,3,4,5,6-η)-1-methyl-4-(1-methylethyl)benzene]di-, (*Ru-Ru*)
Solvents: 1,4-Dioxane, Water-d_2; 24 h, 135 °C

Experimental Protocols

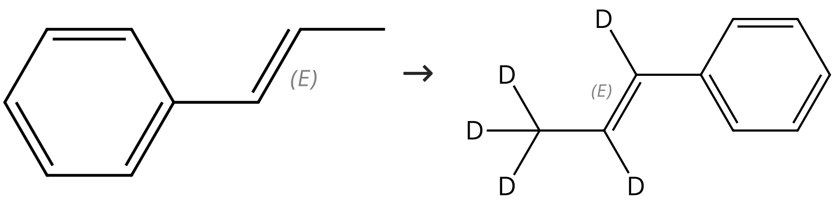
Selective α-Deuteration of Amines and Amino Acids Using D_2O

By: Chatterjee, Basujit; et al

Organic Letters (2016), 18(22), 5892-5895.

Scheme 254 (1 Reaction)

Steps: **1** Yield: **82%**



Double bond geometry shown

Suppliers (59)

Double bond geometry shown

Supplier (1)

31-116-CAS-15181919

Steps: **1** Yield: **82%**

1.1 **Reagents:** Water-d_2
Catalysts: (*OC*-6-34)-Carbonylchlorohydrotris(triphenylphosphine)ruthenium
Solvents: 1,4-Dioxane; 10 h, 100 °C

Experimental Protocols

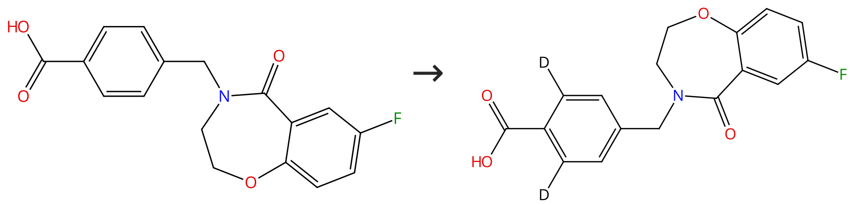
Hydrogen/Deuterium Exchange Reactions of Olefins with Deuterium Oxide Mediated by the Carbonylchlorohydridotris(triphenylphosphine)ruthenium(II) Complex

By: Tse, Sunny Kai San; et al

Advanced Synthesis & Catalysis (2010), 352(9), 1512-1522.

Scheme 255 (1 Reaction)

Steps: **1** Yield: **82%**



Supplier (1)

31-116-CAS-20858322

Steps: **1** Yield: **82%**

1.1 **Reagents:** Water-*d*$_2$
Catalysts: [(1,2,3,4,5,6-η)-1-Methyl-4-(1-methylethyl)benzene](tricyclo[3.3.1.1^{3,7}]decane-1-carboxylato-κ*O*)(tricyclo[3.3.1.1^{3,7}]decane-1-carboxylato-κ*O*,κ*O'*)ruthenium
Solvents: 1,4-Dioxane; 16 h, 100 °C

Experimental Protocols

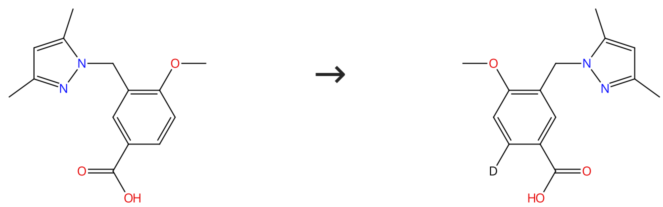
Ruthenium(II)-Catalyzed Hydrogen Isotope Exchange of Pharmaceutical Drugs by C-H Deuteration and C-H Tritiation

By: Mueller, Valentin; et al

ChemCatChem (2020), 12(1), 100-104.

Scheme 256 (1 Reaction)

Steps: **1** Yield: **82%**



Suppliers (37)

31-116-CAS-20858320

Steps: **1** Yield: **82%**

1.1 **Reagents:** Water-*d*$_2$
Catalysts: [(1,2,3,4,5,6-η)-1-Methyl-4-(1-methylethyl)benzene](tricyclo[3.3.1.1^{3,7}]decane-1-carboxylato-κ*O*)(tricyclo[3.3.1.1^{3,7}]decane-1-carboxylato-κ*O*,κ*O'*)ruthenium
Solvents: 1,4-Dioxane; 16 h, 100 °C

Experimental Protocols

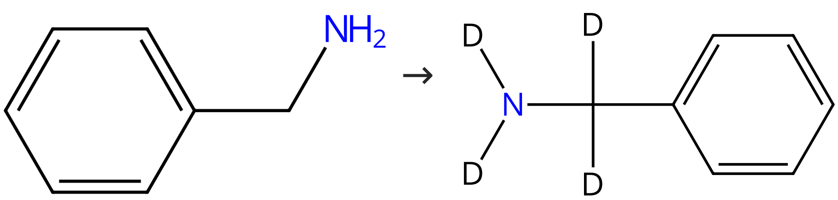
Ruthenium(II)-Catalyzed Hydrogen Isotope Exchange of Pharmaceutical Drugs by C-H Deuteration and C-H Tritiation

By: Mueller, Valentin; et al

ChemCatChem (2020), 12(1), 100-104.

Scheme 257 (1 Reaction)

Steps: **1** Yield: **81%**



Suppliers (87)

31-116-CAS-16604919

Steps: **1** Yield: **81%**

1.1 **Catalysts:** Ruthenium, μ-chlorodichloro-μ-hydrobis[(1,2,3,4,5,6-η)-1-methyl-4-(1-methylethyl)benzene]di-, (*Ru-Ru*)
Solvents: 1,4-Dioxane, Water-*d*$_2$; 24 h, 135 °C

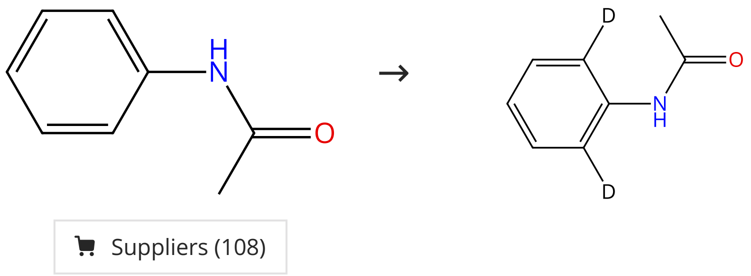
Experimental Protocols

Selective α-Deuteration of Amines and Amino Acids Using D_2O

By: Chatterjee, Basujit; et al

Organic Letters (2016), 18(22), 5892-5895.

Scheme 258 (1 Reaction) Steps: **1** Yield: **81%**



31-116-CAS-3363893	Steps: **1** Yield: **81%**
1.1	**Reagents:** Cupric acetate **Catalysts:** Potassium hexafluorophosphate, Bis(dichloro(η^6-*p*-cymene)ruthenium) **Solvents:** Water-d_2; 20 h, 120 °C

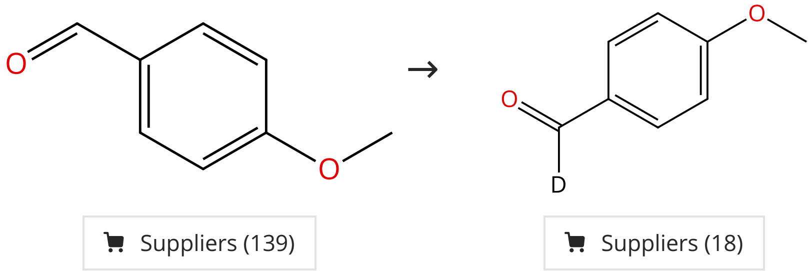
Experimental Protocols

Ruthenium-Catalyzed Oxidative C-H Alkenylations of Anilides and Benzamides in Water

By: Ackermann, Lutz; et al

Organic Letters (2012), 14(3), 728-731.

Scheme 259 (2 Reactions) Steps: **1** Yield: **70-81%**



31-116-CAS-18937433	Steps: **1** Yield: **81%**
1.1	**Reagents:** Water-d_2 **Catalysts:** Carbonylchlorohydrotris(triphenylphosphine) ruthenium **Solvents:** Toluene; rt → 100 °C; 30 min, 100 °C

Catalytic Deuteration of Aldehydes with D 2 O

By: Isbrandt, Eric S.; et al

Synlett (2017), 28(20), 2851-2854.

31-116-CAS-22753683	Steps: **1** Yield: **70%**
1.1	**Reagents:** Water-d_2 **Catalysts:** Carbonylchlorotris(triphenylphosphine)ruthenium (1+) **Solvents:** Toluene; 30 min, 100 °C

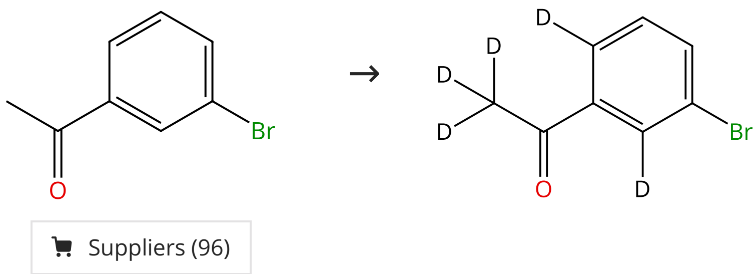
Experimental Protocols

α-Amino Acids Mediated C-C Double Bonds Cleavage in Diastereoselective Synthesis of Aza-Spirocyclic Pyrazolones

By: Awasthi, Annapurna; et al

Advanced Synthesis & Catalysis (2020), 362(20), 4378-4383.

Scheme 260 (1 Reaction) Steps: **1** Yield: **81%**



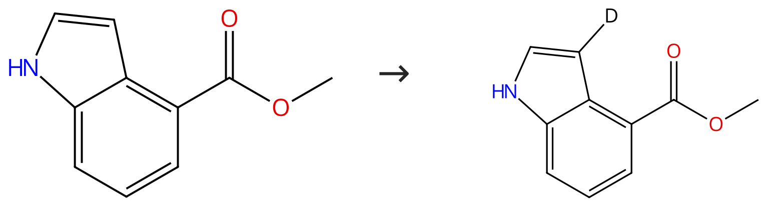
31-116-CAS-24181789	Steps: **1** Yield: **81%**
1.1	**Reagents:** Water-d_2 **Catalysts:** 4-Chlorobenzoic acid, Silver hexafluoroantimonate, Bis(dichloro(η^6-*p*-cymene)ruthenium), 2-Methyl-3-(trifluoromethyl)aniline **Solvents:** 1,2-Dichloroethane; rt → 120 °C; 16 h, 120 °C
Experimental Protocols	

Ruthenium-Catalyzed Deuteration of Aromatic Carbonyl Compounds with a Catalytic Transient Directing Group

By: Kopf, Sara; et al

Chemistry - A European Journal (2021), 27(38), 9768-9773.

Scheme 261 (1 Reaction) Steps: **1** Yield: **81%**



Suppliers (95)

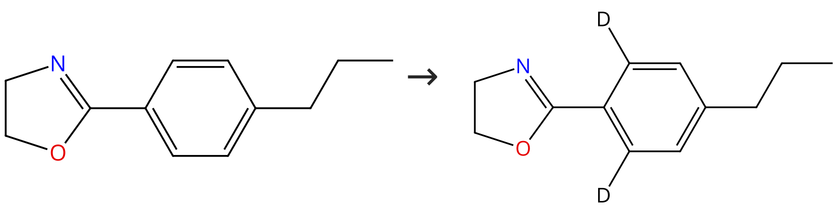
31-614-CAS-43157594	Steps: **1** Yield: **81%**
1.1	**Reagents:** Cupric acetate, Water-d_2, Silver hexafluoro antimonate **Catalysts:** Bis(dichloro(η^6-*p*-cymene)ruthenium) **Solvents:** Tetrahydrofuran; 1 h, 50 °C
Experimental Protocols	

Ruthenium(II) catalyzed C-3 site selective alkenylation of indole derivatives via C-H activation

By: Rallabandi, Jithender; et al

RSC Advances (2024), 14(51), 37788-37796.

Scheme 262 (1 Reaction) Steps: **1** Yield: **81%**



Supplier (1)

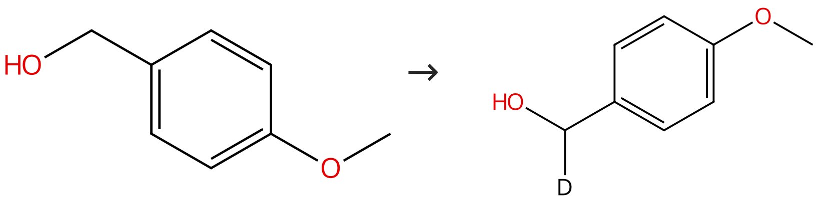
31-614-CAS-36669476	Steps: **1** Yield: **81%**
1.1	**Reagents:** Potassium acetate, Water-d_2 **Catalysts:** Dichloro[(1,2,5,6-η)-1,5-cyclooctadiene]ruthenium **Solvents:** Toluene; 20 h, 120 °C
Experimental Protocols	

Simple and Efficient Aromatic C-H Oxazolination

By: Shi, Qiu; et al

Precision Chemistry (2023), 1(5), 316-325.

Scheme 263 (1 Reaction) Steps: **1** Yield: **80%**



Suppliers (108)

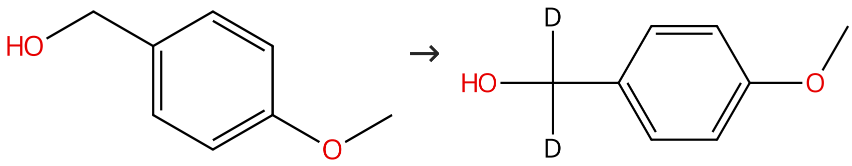
31-614-CAS-35031117	Steps: **1** Yield: **80%**
1.1 **Reagents:** Potassium *tert*-butoxide **Catalysts:** (*OC*-6-13)-Carbonyl[2-(diphenylphosphino-κ*P*)-*N*-[2-(diphenylphosphino-κ*P*)ethyl]ethanamine-κ*N*][tetrahydroborato(1-)-κ*H*]ruthenium **Solvents:** Water-d_2; 24 h, 80 °C 1.2 **Reagents:** Water	
Experimental Protocols	

Nickel-Catalyzed Direct Synthesis of N-Substituted Indoles from Amino Alcohols and Alcohols

By: Yadav, Vinita; et al

Organic Letters (2022), 24(49), 9054-9059.

Scheme 264 (3 Reactions) Steps: **1** Yield: **80%**



Suppliers (108) Suppliers (24)

31-614-CAS-24307692	Steps: **1** Yield: **80%**
1.1 **Reagents:** Water-d_2 **Catalysts:** Potassium *tert*-butoxide, (*OC*-6-52)-Carbonylchloro[2-(diphenylphosphino-κ*P*)-*N*-[2-(diphenylphosphino-κ*P*)ethyl]ethanamine-κ*N*]hydroruthenium; 18 h, 80 °C 1.2 **Reagents:** Water	
Experimental Protocols	

Phosphine-Free Manganese(II)-Catalyst Enables Acceptorless Dehydrogenative Coupling of Alcohols with Indoles

By: Yadav, Vinita; et al

Advanced Synthesis & Catalysis (2021), 363(18), 4430-4439.

31-614-CAS-41681780	Steps: **1**
1.1 **Reagents:** Water-d_2 **Catalysts:** Potassium *tert*-butoxide, (*OC*-6-52)-Carbonylchloro[2-(diphenylphosphino-κ*P*)-*N*-[2-(diphenylphosphino-κ*P*)ethyl]ethanamine-κ*N*]hydroruthenium; 3 h, 60 °C	
Experimental Protocols	

Experimental and theoretical insights for designing Zn^{2+} complexes to trigger chemo-selective hetero-coupling of alcohols

By: Samanta, Arup; et al

Chemical Communications (Cambridge, United Kingdom) (2024), 60(30), 4056-4059.

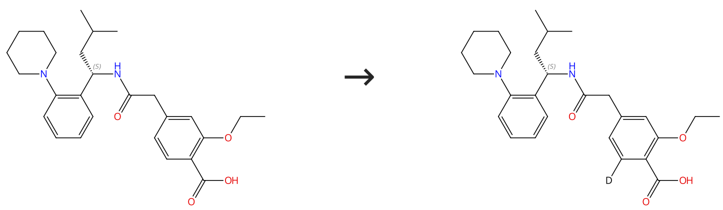
31-614-CAS-31586288	Steps: **1**
1.1 **Reagents:** Potassium *tert*-butoxide, Water-d_2 **Catalysts:** (*OC*-6-52)-Carbonylchloro[2-(diphenylphosphino-κ*P*)-*N*-[2-(diphenylphosphino-κ*P*)ethyl]ethanamine-κ*N*]hydroruthenium; 8 h, 80 °C	
Experimental Protocols	

Well-Defined NNS-Mn Complex Catalyzed Selective Synthesis of C-3 Alkylated Indoles and Bisindolylmethanes Using Alcohols

By: Mondal, Avijit; et al

Journal of Organic Chemistry (2022), 87(6), 3989-4000.

Scheme 265 (1 Reaction) Steps: **1** Yield: **80%**



Absolute stereochemistry shown, Rotation (+) Absolute stereochemistry shown

Suppliers (106)

31-116-CAS-20858323 Steps: **1** Yield: **80%**

1.1 **Reagents:** Water-d_2
Catalysts: [(1,2,3,4,5,6-η)-1-Methyl-4-(1-methylethyl)benzene](tricyclo[3.3.1.1^{3,7}]decane-1-carboxylato-κ*O*)(tricyclo[3.3.1.1^{3,7}]decane-1-carboxylato-κ*O*,κ*O'*)ruthenium
Solvents: 1,4-Dioxane; 16 h, 100 °C

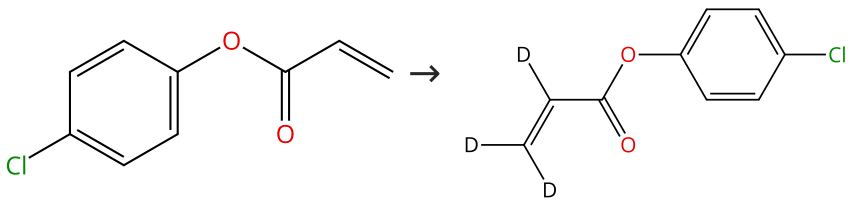
Experimental Protocols

Ruthenium(II)-Catalyzed Hydrogen Isotope Exchange of Pharmaceutical Drugs by C-H Deuteration and C-H Tritiation

By: Mueller, Valentin; et al

ChemCatChem (2020), 12(1), 100-104.

Scheme 266 (1 Reaction) Steps: **1** Yield: **80%**



Suppliers (21)

31-116-CAS-19573241 Steps: **1** Yield: **80%**

1.1 **Reagents:** Water-d_2
Catalysts: 3-(Trifluoromethyl)benzoic acid, Bis(dichloro(η^6-*p*-cymene)ruthenium), Benzoic acid, 3-(trifluoromethyl)-, potassium salt (1:1); 18 h, rt → 80 °C

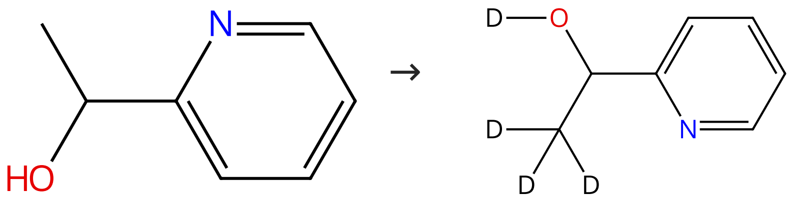
Experimental Protocols

Ruthenium(II)biscarboxylate-Catalyzed Hydrogen-Isotope Exchange by Alkene C-H Activation

By: Bechtoldt, Alexander; et al

ChemCatChem (2019), 11(1), 435-438.

Scheme 267 (1 Reaction) Steps: **1** Yield: **80%**



Suppliers (70)

31-116-CAS-1114861 Steps: **1** Yield: **80%**

1.1 **Reagents:** Water-d_2
Catalysts: Ethanolamine, Potassium hydroxide, Bis(dichloro(η^6-*p*-cymene)ruthenium); 9.25 h, 80 °C

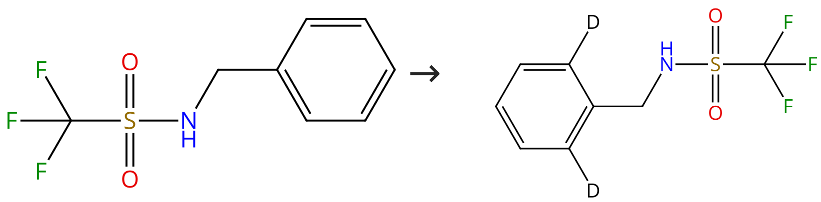
Experimental Protocols

Ruthenium-Catalyzed Regioselective Deuteration of Alcohols at the β-Carbon Position with Deuterium Oxide

By: Tse, Sunny Kai San; et al

Chemistry - A European Journal (2011), 17(49), 13918-13925, S13918/1-S13918/12.

Scheme 268 (1 Reaction) Steps: **1** Yield: **80%**



Suppliers (50)

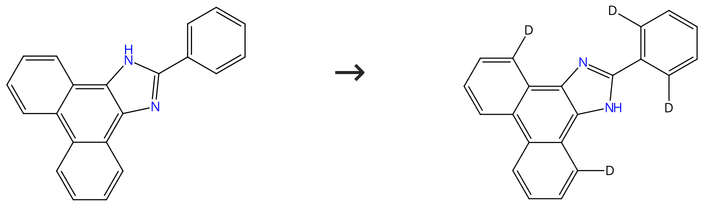
31-614-CAS-41280846	Steps: **1** Yield: **80%**
1.1	**Reagents:** Silver acetate, Water-d_2 **Catalysts:** Bis(dichloro(η^6-*p*-cymene)ruthenium) **Solvents:** 1,2-Dichloroethane; 5 min, rt
1.2	16 h, rt → 50 °C
Experimental Protocols	

Ru(II)-Catalyzed C-H Alkylation of N-Benzyltriflamide with Maleimides: Synthesis of o-Succinimide Substituted Benzaldehydes

By: Dethe, Dattatraya H.; et al

Chemistry - A European Journal (2024), 30(45), e202401301.

Scheme 269 (1 Reaction) Steps: **1** Yield: **80%**



Suppliers (20)

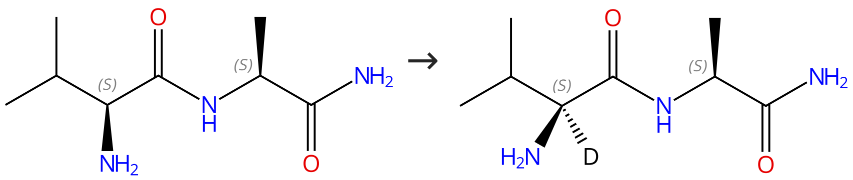
31-614-CAS-40723878	Steps: **1** Yield: **80%**
1.1	**Reagents:** Silver acetate, Water-d_2 **Catalysts:** Silver hexafluoroantimonate, Bis(dichloro(η^6-*p*-cymene)ruthenium) **Solvents:** Dimethylformamide; 24 h, 120 °C
Experimental Protocols	

Ruthenium(II)-Catalyzed Sequential C-H/N-H Alkene Annulation Cascade of Phenanthroimidazoles: Synthesis and Photophysical Studies

By: Thakur, Rekha; et al

Journal of Organic Chemistry (2024), 89(9), 6016-6026.

Scheme 270 (1 Reaction) Steps: **1** Yield: **79%**



Absolute stereochemistry shown

Absolute stereochemistry shown

Suppliers (10)

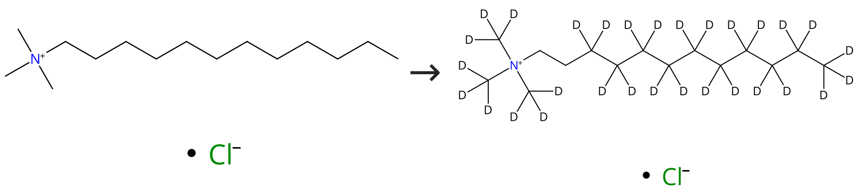
31-116-CAS-2737030	Steps: **1** Yield: **79%**
1.1	**Reagents:** Deuterium **Catalysts:** Ruthenium **Solvents:** Water-d_2; 36 h, 2 bar, 55 °C
Experimental Protocols	

Enantiospecific C-H activation using ruthenium nanocatalysts

By: Taglang, Celine; et al

Angewandte Chemie, International Edition (2015), 54(36), 10474-10477.

Scheme 271 (1 Reaction) Steps: **1** Yield: **79%**



Suppliers (100)

31-614-CAS-39477936 Steps: **1** Yield: **79%**

1.1 **Reagents:** Water-d_2
Catalysts: Platinum, Ruthenium
Solvents: Isopropanol; 24 h, 120 °C

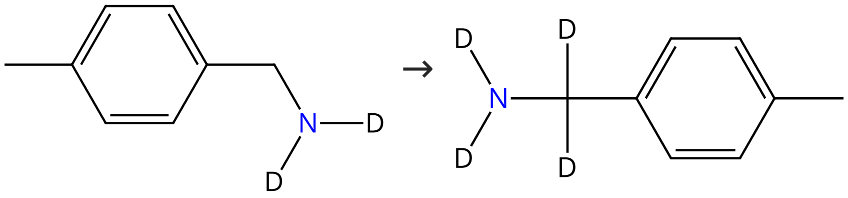
Experimental Protocols

Unprecedented Regioselective Deuterium-Incorporation of Alkyltrimethylammonium Chlorides and Raman Analysis

By: Sawama, Yoshinari; et al

Asian Journal of Organic Chemistry (2023), 12(3), e202200710.

Scheme 272 (1 Reaction) Steps: **1** Yield: **79%**



31-116-CAS-16606074 Steps: **1** Yield: **79%**

1.1 **Catalysts:** Ruthenium, μ-chlorodichloro-μ-hydrobis[(1,2,3,4,5,6-η)-1-methyl-4-(1-methylethyl)benzene]di-, (*Ru-Ru*)
Solvents: 1,4-Dioxane, Water-d_2; 24 h, 135 °C

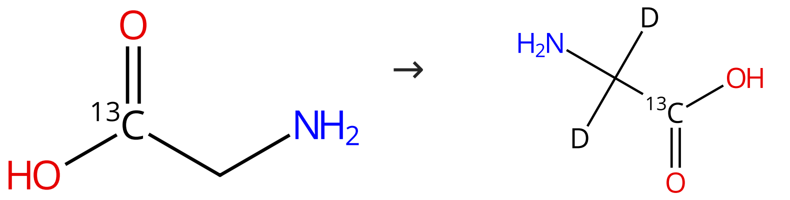
Experimental Protocols

Selective α-Deuteration of Amines and Amino Acids Using D_2O

By: Chatterjee, Basujit; et al

Organic Letters (2016), 18(22), 5892-5895.

Scheme 273 (1 Reaction) Steps: **1** Yield: **79%**



Suppliers (43) Suppliers (5)

31-116-CAS-20212406 Steps: **1** Yield: **79%**

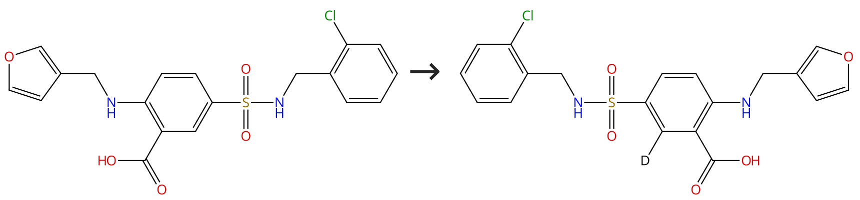
1.1 **Reagents:** Hydrogen, Water-d_2
Catalysts: Ruthenium carbide; 16 h, 1 atm, 80 °C

Late-stage deuteration of ^{13}C-enriched substrates for T_1 prolongation in hyperpolarized ^{13}C MRI

By: Taglang, Celine; et al

Chemical Communications (Cambridge, United Kingdom) (2018), 54(41), 5233-5236.

Scheme 274 (1 Reaction) Steps: **1** Yield: **79%**



31-116-CAS-20858331 Steps: **1** Yield: **79%**

1.1 **Reagents:** Water-d_2
Catalysts: [(1,2,3,4,5,6-η)-1-Methyl-4-(1-methylethyl)benzene](tricyclo[3.3.1.1^{3,7}]decane-1-carboxylato-κ*O*)(tricyclo[3.3.1.1^{3,7}]decane-1-carboxylato-κ*O*,κ*O'*)ruthenium
Solvents: 1,4-Dioxane; 16 h, 100 °C

Experimental Protocols

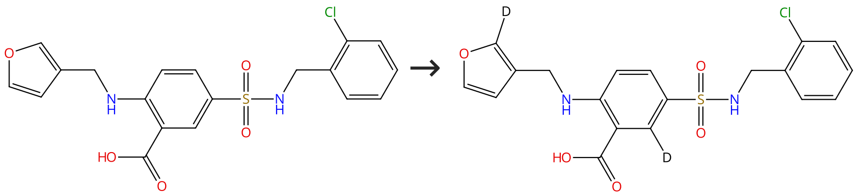
Ruthenium(II)-Catalyzed Hydrogen Isotope Exchange of Pharmaceutical Drugs by C-H Deuteration and C-H Tritiation

By: Mueller, Valentin; et al

ChemCatChem (2020), 12(1), 100-104.

Scheme 275 (1 Reaction)

Steps: 1 Yield: 79%



31-116-CAS-20858333

Steps: 1 Yield: 79%

1.1 **Reagents:** Water-d_2
Catalysts: [(1,2,3,4,5,6-η)-1-Methyl-4-(1-methylethyl)benzene](tricyclo[3.3.1.1^{3,7}]decane-1-carboxylato-κ*O*)(tricyclo[3.3.1.1^{3,7}]decane-1-carboxylato-κ*O*,κ*O*')ruthenium
Solvents: 1,4-Dioxane; 16 h, 100 °C

Experimental Protocols

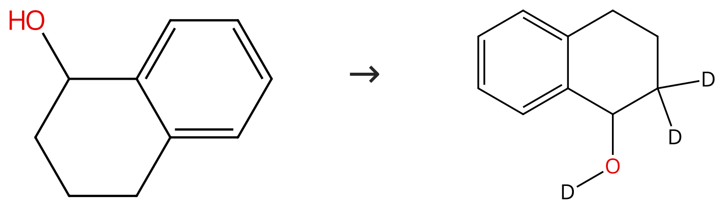
Ruthenium(II)-Catalyzed Hydrogen Isotope Exchange of Pharmaceutical Drugs by C-H Deuteration and C-H Tritiation

By: Mueller, Valentin; et al

ChemCatChem (2020), 12(1), 100-104.

Scheme 276 (1 Reaction)

Steps: 1 Yield: 79%



Suppliers (92)

31-116-CAS-8110316

Steps: 1 Yield: 79%

1.1 **Reagents:** Water-d_2
Catalysts: Ethanolamine, Potassium hydroxide, Bis(dichloro(η^6-*p*-cymene)ruthenium); 6 h, 80 °C

Experimental Protocols

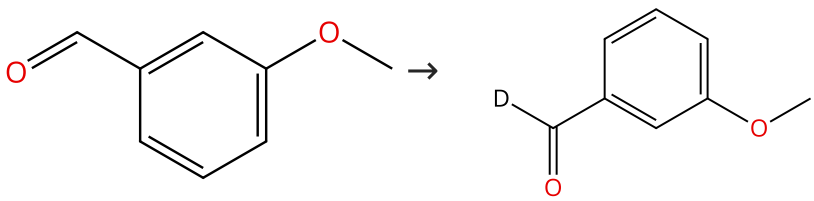
Ruthenium-Catalyzed Regioselective Deuteration of Alcohols at the β-Carbon Position with Deuterium Oxide

By: Tse, Sunny Kai San; et al

Chemistry - A European Journal (2011), 17(49), 13918-13925, S13918/1-S13918/12.

Scheme 277 (1 Reaction)

Steps: 1 Yield: 79%



Suppliers (94)

Supplier (1)

31-116-CAS-18937434

Steps: 1 Yield: 79%

1.1 **Reagents:** Water-d_2
Catalysts: Carbonylchlorohydrotris(triphenylphosphine)ruthenium
Solvents: Toluene; rt → 100 °C; 30 min, 100 °C

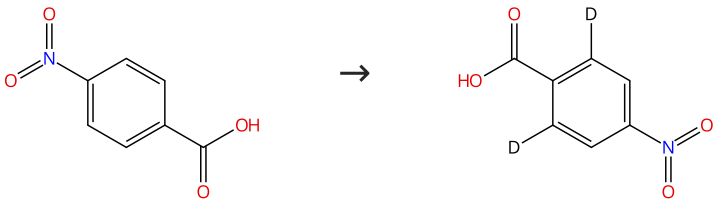
Catalytic Deuteration of Aldehydes with D 2 O

By: Isbrandt, Eric S.; et al

Synlett (2017), 28(20), 2851-2854.

Scheme 278 (1 Reaction)

Steps: **1** Yield: **79%**



Suppliers (112)

Suppliers (19)

31-116-CAS-20858308

Steps: **1** Yield: **79%**

1.1 **Reagents:** Water-d_2
Catalysts: [(1,2,3,4,5,6-η)-1-Methyl-4-(1-methylethyl)benzene](tricyclo[3.3.1.1^{3,7}]decane-1-carboxylato-κ*O*)(tricyclo[3.3.1.1^{3,7}]decane-1-carboxylato-κ*O*,κ*O'*)ruthenium
Solvents: 1,4-Dioxane; 16 h, 100 °C

Experimental Protocols

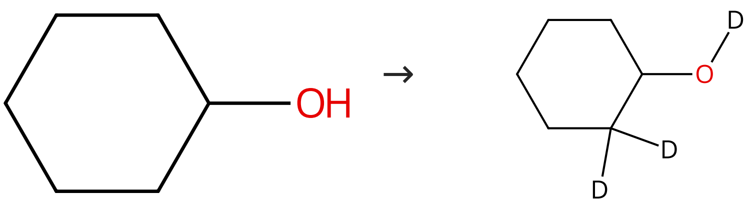
Ruthenium(II)-Catalyzed Hydrogen Isotope Exchange of Pharmaceutical Drugs by C-H Deuteration and C-H Tritiation

By: Mueller, Valentin; et al

ChemCatChem (2020), 12(1), 100-104.

Scheme 279 (1 Reaction)

Steps: **1** Yield: **78%**



Suppliers (83)

31-116-CAS-12371343

Steps: **1** Yield: **78%**

1.1 **Reagents:** Water-d_2
Catalysts: Ethanolamine, Potassium hydroxide, Bis(dichloro(η^6-*p*-cymene)ruthenium); 8 h, 80 °C

Experimental Protocols

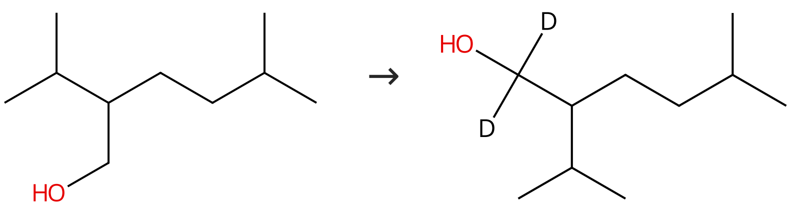
Ruthenium-Catalyzed Regioselective Deuteration of Alcohols at the β-Carbon Position with Deuterium Oxide

By: Tse, Sunny Kai San; et al

Chemistry - A European Journal (2011), 17(49), 13918-13925, S13918/1-S13918/12.

Scheme 280 (1 Reaction)

Steps: **1** Yield: **78%**



Suppliers (40)

31-116-CAS-2119839

Steps: **1** Yield: **78%**

1.1 **Reagents:** Hydrogen, Water-d_2
Catalysts: Ruthenium
Solvents: Water-d_2; 24 h, 1 atm, 80 °C

1.2 **Reagents:** Water
Solvents: Diethyl ether; rt

Experimental Protocols

A convenient and effective method for the regioselective deuteration of alcohols

By: Maegawa, Tomohiro; et al

Advanced Synthesis & Catalysis (2008), 350(14+15), 2215-2218.

Scheme 281 (1 Reaction)

Steps: **1** Yield: **78%**

Suppliers (90)

31-116-CAS-24181309

Steps: **1** Yield: **78%**

1.1 **Reagents:** Water-d_2
Catalysts: 4-Chlorobenzoic acid, Silver hexafluoroantimonate, Bis(dichloro(η^6-*p*-cymene)ruthenium), 2-Methyl-3-(trifluoromethyl)aniline
Solvents: 1,2-Dichloroethane; rt → 120 °C; 16 h, 120 °C

Experimental Protocols

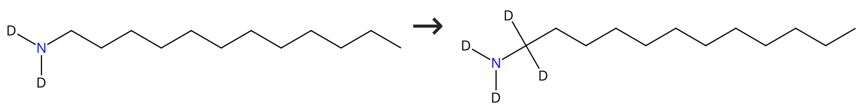
Ruthenium-Catalyzed Deuteration of Aromatic Carbonyl Compounds with a Catalytic Transient Directing Group

By: Kopf, Sara; et al

Chemistry - A European Journal (2021), 27(38), 9768-9773.

Scheme 282 (1 Reaction)

Steps: **1** Yield: **78%**



31-116-CAS-16606096

Steps: **1** Yield: **78%**

1.1 **Catalysts:** Ruthenium, μ-chlorodichloro-μ-hydrobis[(1,2,3,4,5,6-η)-1-methyl-4-(1-methylethyl)benzene]di-, (*Ru-Ru*)
Solvents: 1,4-Dioxane, Water-d_2; 24 h, 135 °C

Experimental Protocols

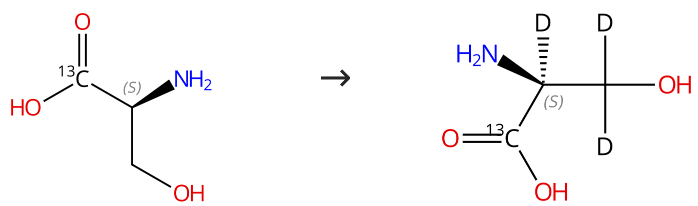
Selective α-Deuteration of Amines and Amino Acids Using D_2O

By: Chatterjee, Basujit; et al

Organic Letters (2016), 18(22), 5892-5895.

Scheme 283 (1 Reaction)

Steps: **1** Yield: **78%**



Absolute stereochemistry shown

Absolute stereochemistry shown

Suppliers (39)

31-116-CAS-20212404

Steps: **1** Yield: **78%**

1.1 **Reagents:** Hydrogen, Water-d_2
Catalysts: Ruthenium carbide; 16 h, 1 atm, 80 °C

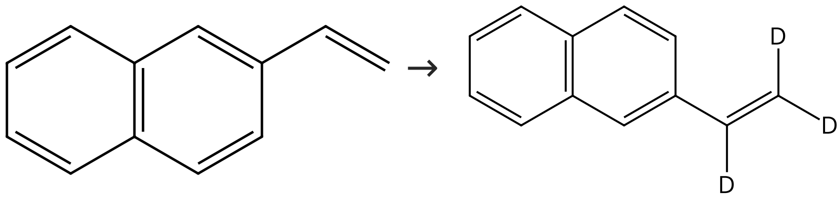
Late-stage deuteration of ^{13}C-enriched substrates for T_1 prolongation in hyperpolarized ^{13}C MRI

By: Taglang, Celine; et al

Chemical Communications (Cambridge, United Kingdom) (2018), 54(41), 5233-5236.

Scheme 284 (1 Reaction)

Steps: **1** Yield: **78%**



Suppliers (74)

31-116-CAS-8516154

Steps: **1** Yield: **78%**

1.1 **Reagents:** Water-d_2
Catalysts: (*OC*-6-34)-Carbonylchlorohydrotris(triphenyl phosphine)ruthenium
Solvents: 1,4-Dioxane; 3.5 h, 100 °C

Experimental Protocols

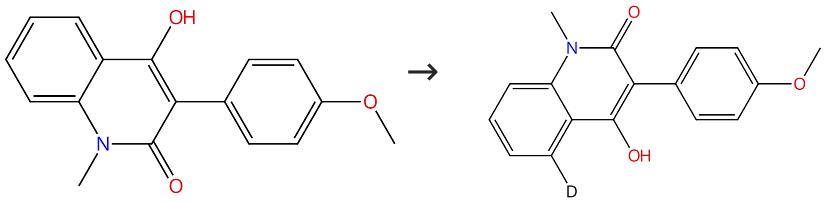
Hydrogen/Deuterium Exchange Reactions of Olefins with Deuterium Oxide Mediated by the Carbonylchlorohydridotris (triphenylphosphine)ruthenium(II) Complex

By: Tse, Sunny Kai San; et al

Advanced Synthesis & Catalysis (2010), 352(9), 1512-1522.

Scheme 285 (1 Reaction)

Steps: **1** Yield: **78%**



Supplier (1)

31-116-CAS-6114612

Steps: **1** Yield: **78%**

1.1 **Reagents:** Water-d_2
Catalysts: Cupric acetate, Bis(dichloro(η^6-*p*-cymene) ruthenium)
Solvents: Dimethylformamide; 15 min, 90 °C

Experimental Protocols

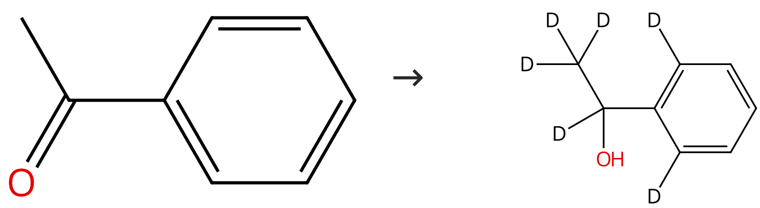
Catalyst-Controlled Divergent C-H Functionalization of Unsymmetrical 2-Aryl Cyclic 1,3-Dicarbonyl Compounds with Alkynes and Alkenes

By: Dooley, Johnathon D.; et al

Journal of the American Chemical Society (2013), 135(29), 10829-10836.

Scheme 286 (1 Reaction)

Steps: **1** Yield: **78%**



Suppliers (109)

31-116-CAS-20984001

Steps: **1** Yield: **78%**

1.1 **Reagents:** Zinc, Water-d_2, Potassium hydroxide (K(OD))
Catalysts: Dichlorotris(triphenylphosphine)ruthenium
Solvents: 1,4-Dioxane; 62 h, 80 °C

Experimental Protocols

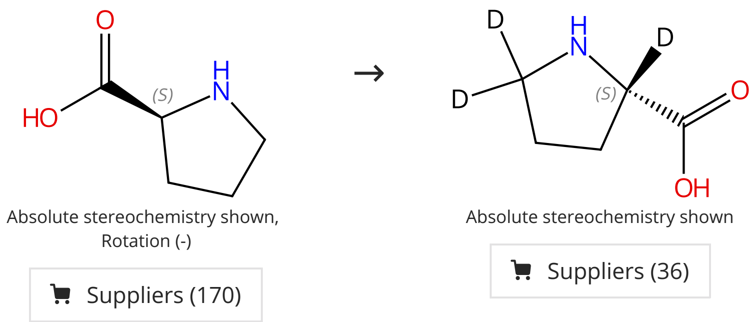
Mild, Selective Ru-Catalyzed Deuteration Using D_2O as a Deuterium Source

By: Eisele, Pascal; et al

Chemistry - A European Journal (2019), 25(72), 16550-16554.

Scheme 287 (1 Reaction)

Steps: **1** Yield: **77%**



31-116-CAS-17957981

Steps: **1** Yield: **77%**

1.1 **Reagents:** Sodium hydroxide, Hydrogen, Water- *d*2
Catalysts: Ruthenium; 6 h, 70 °C; 70 °C → rt

1.2 **Reagents:** Dowex 50W-X8; pH 5 - 6, rt

Experimental Protocols

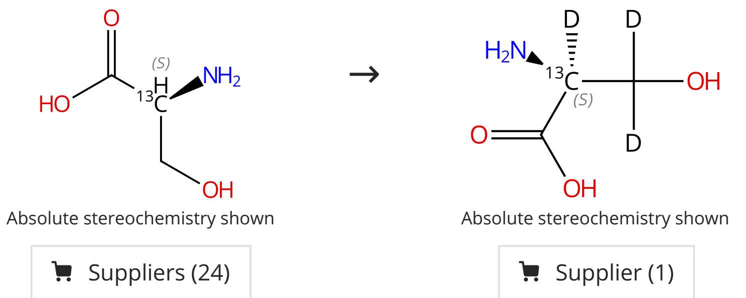
Development and Scale-Up of Stereoretentive α-Deuteration of Amines

By: Michelotti, Alessia; et al

Organic Process Research & Development (2017), 21(11), 1741-1744.

Scheme 288 (1 Reaction)

Steps: **1** Yield: **77%**



31-116-CAS-20212408

Steps: **1** Yield: **77%**

1.1 **Reagents:** Hydrogen, Water- *d*2
Catalysts: Ruthenium carbide; 16 h, 1 atm, 80 °C

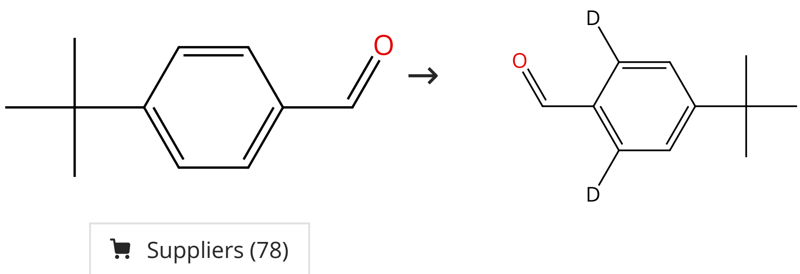
Late-stage deuteration of ^{13}C-enriched substrates for T_1 prolongation in hyperpolarized ^{13}C MRI

By: Taglang, Celine; et al

Chemical Communications (Cambridge, United Kingdom) (2018), 54(41), 5233-5236.

Scheme 289 (1 Reaction)

Steps: **1** Yield: **77%**



31-116-CAS-24181166

Steps: **1** Yield: **77%**

1.1 **Reagents:** Water-*d*2
Catalysts: 4-Chlorobenzoic acid, Silver hexafluoroantimonate, Bis(dichloro(η6-*p*-cymene)ruthenium), 2-Methyl-3-(trifluoromethyl)aniline
Solvents: 1,2-Dichloroethane; rt → 100 °C; 16 h, 100 °C

Experimental Protocols

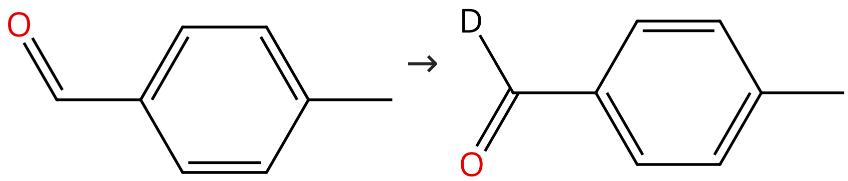
Ruthenium-Catalyzed Deuteration of Aromatic Carbonyl Compounds with a Catalytic Transient Directing Group

By: Kopf, Sara; et al

Chemistry - A European Journal (2021), 27(38), 9768-9773.

Scheme 290 (3 Reactions)

Steps: **1** Yield: **68-76%**



Suppliers (107)

Supplier (1)

31-116-CAS-23640287

Steps: **1** Yield: **76%**

1.1 **Reagents:** Water-d_2
Catalysts: Carbonylchlorotris(triphenylphosphine)ruthenium (1+)
Solvents: Toluene; rt; 1 h, 100 °C

Experimental Protocols

Au(I) Catalyzed Synthesis of Densely Substi tuted Pyrazolines and Dihydropyridines via Sequential Aza-Enyne Metathe sis/6π-Electrocyclization

By: Sugimoto, Kenji; et al

Organic Letters (2021), 23(10), 3981-3985.

31-116-CAS-18937431

Steps: **1** Yield: **76%**

1.1 **Reagents:** Water-d_2
Catalysts: Carbonylchlorohydrotris(triphenylphosphine) ruthenium
Solvents: Toluene; rt → 100 °C; 30 min, 100 °C

Catalytic Deuteration of Aldehydes with D 2 O

By: Isbrandt, Eric S.; et al

Synlett (2017), 28(20), 2851-2854.

31-116-CAS-19428122

Steps: **1** Yield: **68%**

1.1 **Catalysts:** Carbonylchlorohydrotris(triphenylphosphine) ruthenium
Solvents: Toluene, Water-d_2; rt → 100 °C; 30 min, 100 °C

Experimental Protocols

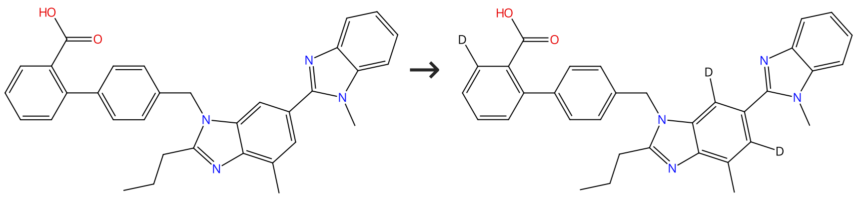
Synthesis of Enones and Enals via Dehydrog enation of Saturated Ketones and Aldehydes

By: Pan, Gao-Fei; et al

Advanced Synthesis & Catalysis (2018), 360(24), 4774-4783.

Scheme 291 (1 Reaction)

Steps: **1** Yield: **76%**



Suppliers (113)

31-116-CAS-20858324

Steps: **1** Yield: **76%**

1.1 **Reagents:** Water-d_2
Catalysts: [(1,2,3,4,5,6-η)-1-Methyl-4-(1-methylethyl)benzene](tricyclo[3.3.1.1^{3,7}]decane-1-carboxylato-κ*O*)(tricyclo[3.3.1.1^{3,7}]decane-1-carboxylato-κ*O*,κ*O'*)ruthenium
Solvents: 1,4-Dioxane; 16 h, 100 °C

Experimental Protocols

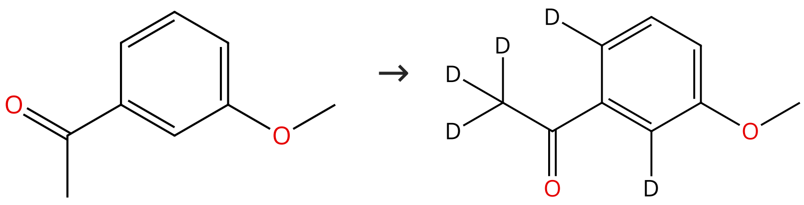
Ruthenium(II)-Catalyzed Hydrogen Isotope Exchange of Pharmaceutical Drugs by C-H Deuteration and C-H Tritiation

By: Mueller, Valentin; et al

ChemCatChem (2020), 12(1), 100-104.

Scheme 292 (1 Reaction)

Steps: **1** Yield: **76%**



Suppliers (96)

31-116-CAS-24181126

Steps: **1** Yield: **76%**

1.1 **Reagents:** Water-d_2
Catalysts: 4-Chlorobenzoic acid, Silver hexafluoroantimonate, Bis(dichloro(η^6-*p*-cymene)ruthenium), 2-Methyl-3-(trifluoromethyl)aniline
Solvents: 1,2-Dichloroethane; rt → 120 °C; 16 h, 120 °C

Experimental Protocols

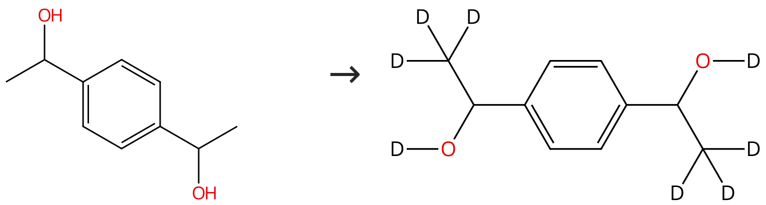
Ruthenium-Catalyzed Deuteration of Aromatic Carbonyl Compounds with a Catalytic Transient Directing Group

By: Kopf, Sara; et al

Chemistry - A European Journal (2021), 27(38), 9768-9773.

Scheme 293 (1 Reaction)

Steps: **1** Yield: **76%**



Suppliers (18)

31-116-CAS-3840141

Steps: **1** Yield: **76%**

1.1 **Reagents:** Water-d_2
Catalysts: Ethanolamine, Potassium hydroxide, Bis(dichloro(η^6-*p*-cymene)ruthenium); 9.25 h, 80 °C

Experimental Protocols

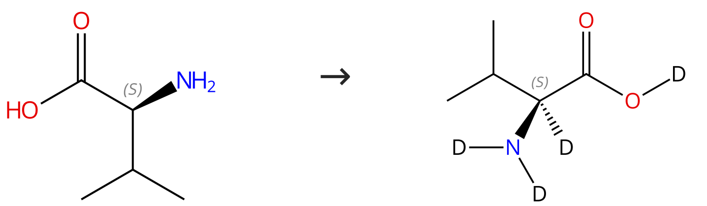
Ruthenium-Catalyzed Regioselective Deuteration of Alcohols at the β-Carbon Position with Deuterium Oxide

By: Tse, Sunny Kai San; et al

Chemistry - A European Journal (2011), 17(49), 13918-13925, S13918/1-S13918/12.

Scheme 294 (1 Reaction)

Steps: **1** Yield: **76%**



Absolute stereochemistry shown, Rotation (+)

Absolute stereochemistry shown

Suppliers (196)

31-116-CAS-16030366

Steps: **1** Yield: **76%**

1.1 **Reagents:** Water-d_2
Catalysts: Ruthenium; 8 h, pH 7 - 12, 75 °C

Stereoretentive H/D Exchange via an Electroactivated Heterogeneous Catalyst at sp^3 C-H Sites Bearing Amines or Alcohols

By: Bhatia, Souful; et al

European Journal of Organic Chemistry (2016), 2016(24), 4230-4235.

Scheme 295 (3 Reactions)

Steps: **1** Yield: **39-76%**

Suppliers (27)

31-116-CAS-6083848

Steps: **1** Yield: **76%**

1.1 **Reagents:** Ethanol, Sodium dodecyl sulfate, Water- *d*$_2$
Catalysts: Dichlorotris(triphenylphosphine)ruthenium
Solvents: Water-*d*$_2$; 60 min, 0.34 M Pa, 140 °C

Preparation of cyclohexene-d$_{10}$ by H/D-exchange reaction

By: Ishibashi, Kenichi; et al

Chemistry Letters (2007), 36(6), 724-725.

31-116-CAS-6056154

Steps: **1** Yield: **39%**

1.1 **Reagents:** Water-*d*$_2$
Catalysts: (*OC*-6-34)-Carbonylchlorohydrotris(triphenyl phosphine)ruthenium
Solvents: 1,4-Dioxane; 84 h, 100 °C

Experimental Protocols

Hydrogen/Deuterium Exchange Reactions of Olefins with Deuterium Oxide Mediated by the Carbonylchlorohydridotris (triphenylphosphine)ruthenium(II) Complex

By: Tse, Sunny Kai San; et al

Advanced Synthesis & Catalysis (2010), 352(9), 1512-1522.

31-614-CAS-43182397

Steps: **1**

1.1 **Reagents:** Sodium dodecyl sulfate, Water- *d*$_2$
Catalysts: Dichlorotris(triphenylphosphine)ruthenium; 150 °C

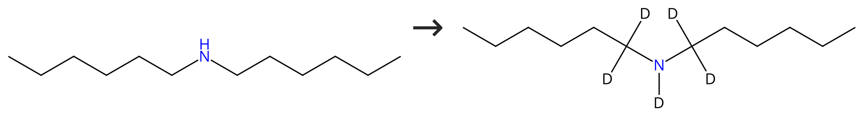
Fabrication and characterization of deuteration-rich polymer microsphere for high-yield neutron source

By: Liu, Meifang; et al

Polymer Engineering & Science (2024), 64(11), 5426-5434.

Scheme 296 (2 Reactions)

Steps: **1** Yield: **75%**



Suppliers (64)

31-116-CAS-16606104

Steps: **1** Yield: **75%**

1.1 **Catalysts:** Ruthenium, μ-chlorodichloro-μ-hydrobis[(1,2,3,4,5, 6-η)-1-methyl-4-(1-methylethyl)benzene]di-, (*Ru-Ru*)
Solvents: 1,4-Dioxane, Water-*d*$_2$; 24 h, 135 °C

Experimental Protocols

Selective α-Deuteration of Amines and Amino Acids Using D_2O

By: Chatterjee, Basujit; et al

Organic Letters (2016), 18(22), 5892-5895.

31-116-CAS-891374

Steps: **1**

1.1 **Reagents:** Water-*d*$_2$
Catalysts: Dichlorobis(triphenylphosphine)ruthenium; 30 min, 10 atm, 150 °C

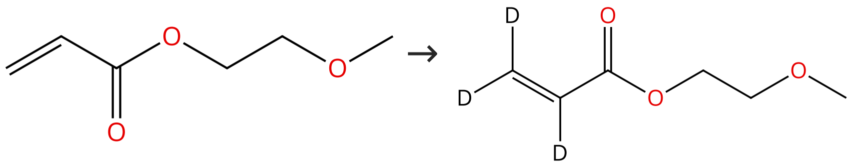
Ruthenium catalyzed deuterium labeling of α-carbon in primary alcohol and primary/secondary amine in D_2O

By: Takahashi, Masaaki; et al

Chemistry Letters (2005), 34(2), 192-193.

Scheme 297 (1 Reaction)

Steps: **1** Yield: **75%**



Suppliers (65)

31-116-CAS-19573239

Steps: **1** Yield: **75%**

1.1 **Reagents:** Water-d_2
Catalysts: 3-(Trifluoromethyl)benzoic acid, Bis(dichloro(η^6-*p*-cymene)ruthenium), Benzoic acid, 3-(trifluoromethyl)-, potassium salt (1:1); 18 h, rt → 80 °C

Experimental Protocols

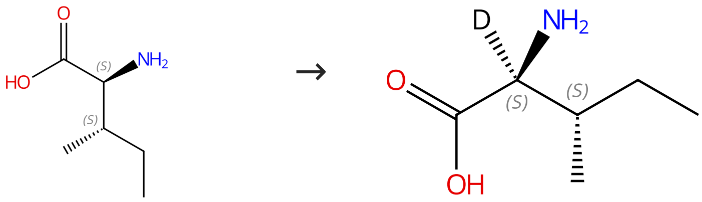
Ruthenium(II)biscarboxylate-Catalyzed Hydrogen-Isotope Exchange by Alkene C-H Activation

By: Bechtoldt, Alexander; et al

ChemCatChem (2019), 11(1), 435-438.

Scheme 298 (1 Reaction)

Steps: **1** Yield: **75%**



Absolute stereochemistry shown

Absolute stereochemistry shown

Suppliers (190)

Suppliers (22)

31-116-CAS-662963

Steps: **1** Yield: **75%**

1.1 **Reagents:** Deuterium
Catalysts: Ruthenium
Solvents: Water-d_2; 36 h, 2 bar, 55 °C

Experimental Protocols

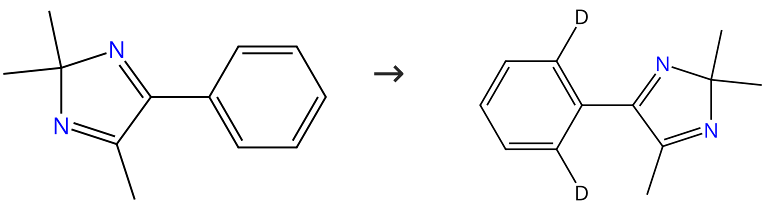
Enantiospecific C-H activation using ruthenium nanocatalysts

By: Taglang, Celine; et al

Angewandte Chemie, International Edition (2015), 54(36), 10474-10477.

Scheme 299 (1 Reaction)

Steps: **1** Yield: **75%**



31-614-CAS-40978453

Steps: **1** Yield: **75%**

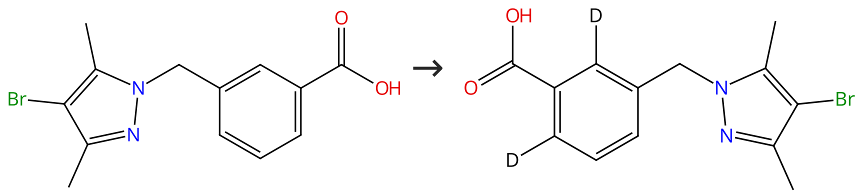
1.1 **Reagents:** Potassium carbonate
Catalysts: Tris[4-(trifluoromethyl)phenyl]phosphine, (*OC*-6-22)-Bis(acetato-κ*O*,κ*O*')[(1*R*)-[1,1'-binaphthalene]-2,2'-diylbis[diphenylphosphine-κ*P*]]ruthenium
Solvents: 1,2-Dichloroethane, Water-d_2; 2 h, 120 °C

Multicomponent remote C(sp^2)-H bond addition by Ru catalysis: An efficient access to the alkylarylation of 2H-imidazoles

By: Luo, Yi; et al

Chinese Chemical Letters (2024), 35(10), 109648.

Scheme 300 (1 Reaction) Steps: **1** Yield: **74%**



Suppliers (42)

31-116-CAS-20858321 Steps: **1** Yield: **74%**

1.1 **Reagents:** Water-*d*$_2$
Catalysts: [(1,2,3,4,5,6-η)-1-Methyl-4-(1-methylethyl)benzene](tricyclo[3.3.1.1^{3,7}]decane-1-carboxylato-κ*O*)(tricyclo[3.3.1.1^{3,7}]decane-1-carboxylato-κ*O*,κ*O'*)ruthenium
Solvents: 1,4-Dioxane; 16 h, 100 °C

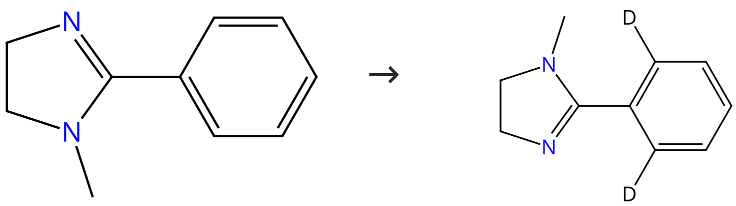
Experimental Protocols

Ruthenium(II)-Catalyzed Hydrogen Isotope Exchange of Pharmaceutical Drugs by C-H Deuteration and C-H Tritiation

By: Mueller, Valentin; et al

ChemCatChem (2020), 12(1), 100-104.

Scheme 301 (1 Reaction) Steps: **1** Yield: **74%**



Suppliers (3)

31-116-CAS-20984015 Steps: **1** Yield: **74%**

1.1 **Reagents:** Water-*d*$_2$, Potassium hydroxide (K(OD))
Catalysts: Dichlorotris(triphenylphosphine)ruthenium
Solvents: 1,4-Dioxane, THF-*d*$_8$; 16 h, 80 °C

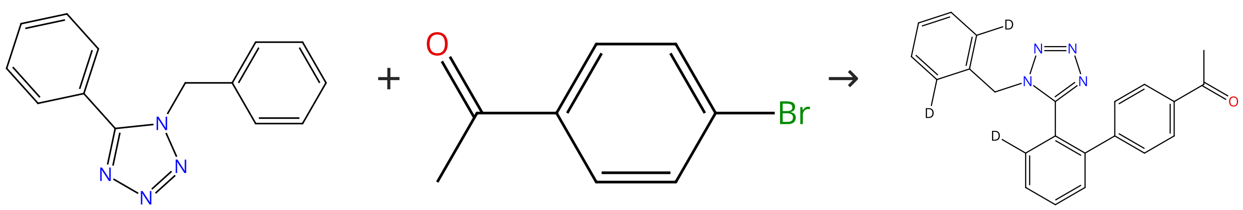
Experimental Protocols

Mild, Selective Ru-Catalyzed Deuteration Using D_2O as a Deuterium Source

By: Eisele, Pascal; et al

Chemistry - A European Journal (2019), 25(72), 16550-16554.

Scheme 302 (1 Reaction) Steps: **1** Yield: **74%**



Suppliers (12) Suppliers (92)

31-116-CAS-14178673 Steps: **1** Yield: **74%**

1.1 **Reagents:** Potassium carbonate
Catalysts: 2,4,6-Trimethylbenzoic acid, Bis(dichloro(η^6-*p*-cymene)ruthenium)
Solvents: Toluene, Water-*d*$_2$; 18 h, 120 °C

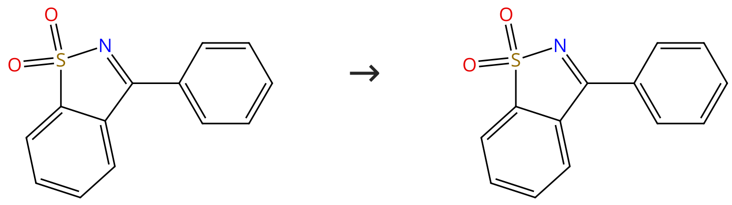
Carboxylate-assisted ruthenium(II)-catalyzed C-H arylations of 5-aryl tetrazoles: step-economical access to Valsartan

By: Diers, Emelyne; et al

Tetrahedron (2013), 69(22), 4445-4453.

Scheme 303 (1 Reaction)

Steps: **1** Yield: **74%**



Suppliers (30)

31-614-CAS-25069651

Steps: **1** Yield: **74%**

1.1 **Reagents:** Water-d_2
Catalysts: Silver acetate, Silver hexafluoroantimonate, Bis(dichloro(η^6-*p*-cymene)ruthenium)
Solvents: 1,2-Dichloroethane; 5 min, rt; 24 h, 100 °C

Experimental Protocols

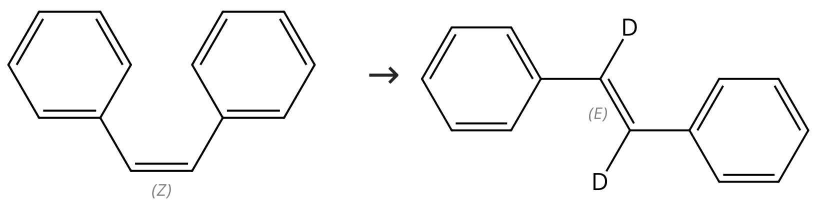
Ruthenium-Catalyzed C-H Amidation and Alkenylation of Cyclic N-Sulfonyl Ketimines

By: Manoharan, Ramasamy; et al

European Journal of Organic Chemistry (2016), 2016(23), 4013-4019.

Scheme 304 (1 Reaction)

Steps: **1** Yield: **74%**



Double bond geometry shown

Double bond geometry shown

Suppliers (65)

Suppliers (18)

31-116-CAS-10929061

Steps: **1** Yield: **74%**

1.1 **Reagents:** Water-d_2
Catalysts: (*OC*-6-34)-Carbonylchlorohydrotris(triphenylphosphine)ruthenium
Solvents: 1,4-Dioxane; 4.5 h, 100 °C

Experimental Protocols

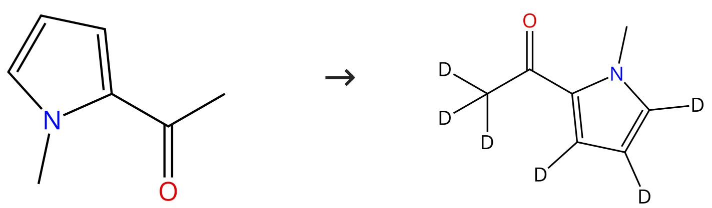
Hydrogen/Deuterium Exchange Reactions of Olefins with Deuterium Oxide Mediated by the Carbonylchlorohydridotris(triphenylphosphine)ruthenium(II) Complex

By: Tse, Sunny Kai San; et al

Advanced Synthesis & Catalysis (2010), 352(9), 1512-1522.

Scheme 305 (1 Reaction)

Steps: **1** Yield: **74%**



Suppliers (76)

31-116-CAS-24181705

Steps: **1** Yield: **74%**

1.1 **Reagents:** Water-d_2
Catalysts: 4-Chlorobenzoic acid, Silver hexafluoroantimonate, Bis(dichloro(η^6-*p*-cymene)ruthenium), 2-Methyl-3-(trifluoromethyl)aniline
Solvents: 1,2-Dichloroethane; rt → 120 °C; 16 h, 120 °C

Experimental Protocols

Ruthenium-Catalyzed Deuteration of Aromatic Carbonyl Compounds with a Catalytic Transient Directing Group

By: Kopf, Sara; et al

Chemistry - A European Journal (2021), 27(38), 9768-9773.

Scheme 306 (2 Reactions)

Steps: **1** Yield: **73%**

Suppliers (92)

Suppliers (94)

31-017-CAS-19528061

Steps: **1** Yield: **73%**

1.1 **Reagents:** Copper oxide (CuO), 1,8-Diazabicyclo[5.4.0]undec-7-ene, Water-*d*$_2$
Catalysts: Bis(dichloro(η^6-*p*-cymene)ruthenium)
Solvents: 1,4-Dioxane; 14 h, 110 °C

1.2 **Reagents:** Potassium carbonate
Solvents: Acetonitrile; 4 h, rt

Experimental Protocols

Ruthenium(II) Catalysis/Noncovalent Interaction Synergy for Cross-Dehydrogenative Coupling of Arene Carboxylic Acids

By: Dana, Suman; et al

ACS Catalysis (2018), 8(11), 10173-10179.

31-017-CAS-19248850

Steps: **1**

1.1 **Reagents:** Trilithium phosphate
Catalysts: Bis(dichloro(η^6-*p*-cymene)ruthenium)
Solvents: Water-*d*$_2$; 12 h, 110 °C

1.2 **Reagents:** Potassium carbonate
Solvents: Acetonitrile; 2.5 h, 60 °C

Experimental Protocols

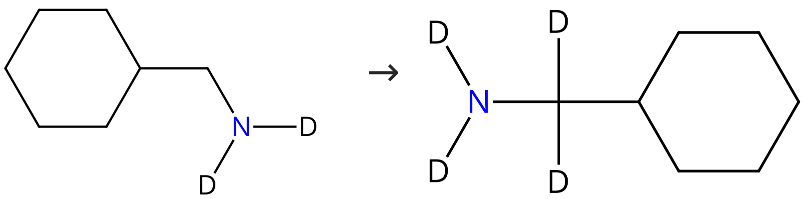
Regioselective C-H Alkylation via Carboxylate-Directed Hydroarylation in Water

By: Zhang, Guodong; et al

Chemistry - A European Journal (2018), 24(18), 4537-4541.

Scheme 307 (1 Reaction)

Steps: **1** Yield: **73%**



31-116-CAS-16606098

Steps: **1** Yield: **73%**

1.1 **Catalysts:** Ruthenium, μ-chlorodichloro-μ-hydrobis[(1,2,3,4,5,6-η)-1-methyl-4-(1-methylethyl)benzene]di-, (*Ru-Ru*)
Solvents: 1,4-Dioxane, Water-*d*$_2$; 24 h, 135 °C

Experimental Protocols

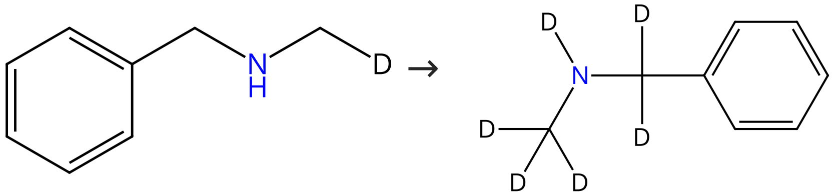
Selective α-Deuteration of Amines and Amino Acids Using D_2O

By: Chatterjee, Basujit; et al

Organic Letters (2016), 18(22), 5892-5895.

Scheme 308 (1 Reaction)

Steps: **1** Yield: **73%**



31-116-CAS-16606102

Steps: **1** Yield: **73%**

1.1 **Catalysts:** Ruthenium, μ-chlorodichloro-μ-hydrobis[(1,2,3,4,5,6-η)-1-methyl-4-(1-methylethyl)benzene]di-, (*Ru-Ru*)
Solvents: 1,4-Dioxane, Water-*d*$_2$; 24 h, 135 °C

Experimental Protocols

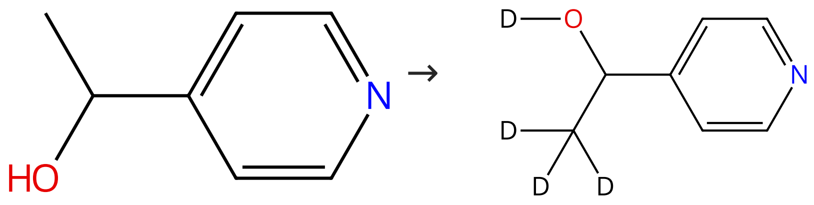
Selective α-Deuteration of Amines and Amino Acids Using D_2O

By: Chatterjee, Basujit; et al

Organic Letters (2016), 18(22), 5892-5895.

Scheme 309 (1 Reaction)

Steps: **1** Yield: **73%**



Suppliers (76)

31-116-CAS-14500249

Steps: **1** Yield: **73%**

1.1 **Reagents:** Water-d_2
Catalysts: Ethanolamine, Potassium hydroxide, Bis(dichloro (η[6]-*p*-cymene)ruthenium); 9.25 h, 80 °C

Experimental Protocols

Ruthenium-Catalyzed Regioselective Deuteration of Alcohols at the β-Carbon Position with Deuterium Oxide

By: Tse, Sunny Kai San; et al

Chemistry - A European Journal (2011), 17(49), 13918-13925, S13918/1-S13918/12.

Scheme 310 (1 Reaction)

Steps: **1** Yield: **73%**

Suppliers (67)

31-116-CAS-20858325

Steps: **1** Yield: **73%**

1.1 **Reagents:** Water-d_2
Catalysts: [(1,2,3,4,5,6-η)-1-Methyl-4-(1-methylethyl)benzene](tricyclo[3.3.1.1^{3,7}]decane-1-carboxylato-κ*O*)(tricyclo[3.3.1.1^{3,7}]decane-1-carboxylato-κ*O*,κ*O'*)ruthenium
Solvents: 1,4-Dioxane; 16 h, 100 °C

Experimental Protocols

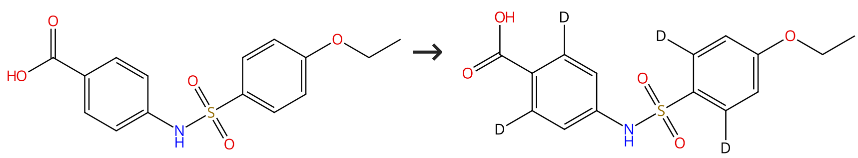
Ruthenium(II)-Catalyzed Hydrogen Isotope Exchange of Pharmaceutical Drugs by C-H Deuteration and C-H Tritiation

By: Mueller, Valentin; et al

ChemCatChem (2020), 12(1), 100-104.

Scheme 311 (1 Reaction)

Steps: **1** Yield: **73%**



Suppliers (26)

31-116-CAS-20858329

Steps: **1** Yield: **73%**

1.1 **Reagents:** Water-d_2
Catalysts: [(1,2,3,4,5,6-η)-1-Methyl-4-(1-methylethyl)benzene](tricyclo[3.3.1.1^{3,7}]decane-1-carboxylato-κ*O*)(tricyclo[3.3.1.1^{3,7}]decane-1-carboxylato-κ*O*,κ*O'*)ruthenium
Solvents: 1,4-Dioxane; 16 h, 100 °C

Experimental Protocols

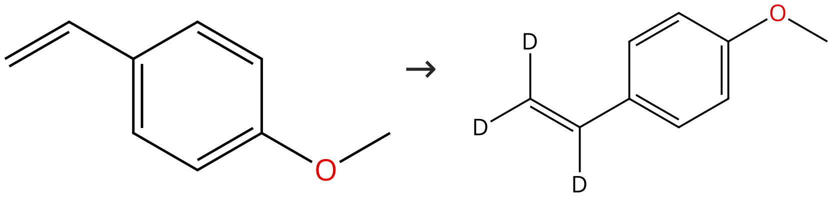
Ruthenium(II)-Catalyzed Hydrogen Isotope Exchange of Pharmaceutical Drugs by C-H Deuteration and C-H Tritiation

By: Mueller, Valentin; et al

ChemCatChem (2020), 12(1), 100-104.

Scheme 312 (1 Reaction)

Steps: **1** Yield: **73%**



Suppliers (88)

31-116-CAS-4219890

Steps: **1** Yield: **73%**

1.1 **Reagents:** Water-d_2
Catalysts: (*OC*-6-34)-Carbonylchlorohydrotris(triphenyl phosphine)ruthenium
Solvents: 1,4-Dioxane; 3.5 h, 100 °C

Experimental Protocols

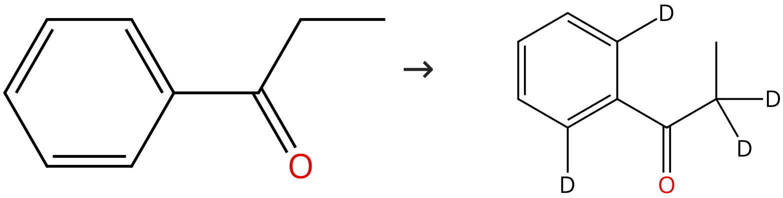
Hydrogen/Deuterium Exchange Reactions of Olefins with Deuterium Oxide Mediated by the Carbonylchlorohydridotris (triphenylphosphine)ruthenium(II) Complex

By: Tse, Sunny Kai San; et al

Advanced Synthesis & Catalysis (2010), 352(9), 1512-1522.

Scheme 313 (2 Reactions)

Steps: **1** Yield: **73%**



Suppliers (72)

31-116-CAS-24181188

Steps: **1** Yield: **73%**

1.1 **Reagents:** Water-d_2
Catalysts: 4-Chlorobenzoic acid, Silver hexafluoroantimonate, Bis(dichloro(η^6-*p*-cymene)ruthenium), 2-Methyl-3-(trifluor omethyl)aniline
Solvents: 1,2-Dichloroethane; rt → 120 °C; 16 h, 120 °C

Experimental Protocols

Ruthenium-Catalyzed Deuteration of Aromatic Carbonyl Compounds with a Catalytic Transient Directing Group

By: Kopf, Sara; et al

Chemistry - A European Journal (2021), 27(38), 9768-9773.

31-116-CAS-3578594

Steps: **1**

1.1 **Reagents:** Water-d_2
Catalysts: Stereoisomer of dihydro[(1,2,3,3a,7a-η)-1-phenyl-1*H*-inden-1-yl](triethylsilyl)(triphenylphosphine)ruthenium
Solvents: Toluene; 16 h, 110 atm

Experimental Protocols

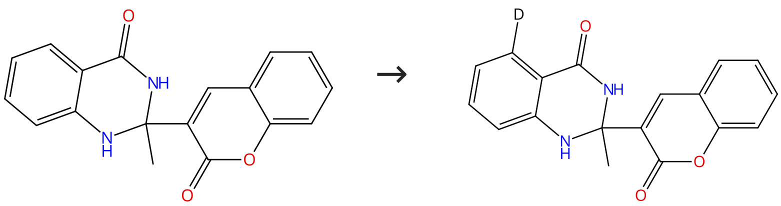
Regioselective ruthenium catalysed H-D exchange using D_2O as the deuterium source

By: Piola, Lorenzo; et al

Organic & Biomolecular Chemistry (2014), 12(43), 8683-8688.

Scheme 314 (1 Reaction)

Steps: **1** Yield: **72%**



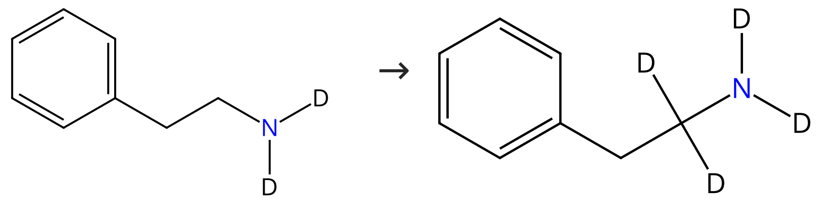
31-614-CAS-33718363	Steps: **1** Yield: **72%**
1.1	**Reagents:** Copper diacetate monohydrate, Water-d_2 **Catalysts:** Silver hexafluoroantimonate, Bis(dichloro(η^6-*p*-cymene)ruthenium) **Solvents:** 1,2-Dichloroethane; 12 h, 120 °C
Experimental Protocols	

Ru(II)-Catalyzed Regioselective C(5)-H Functionalization of Quinazolinone-Coumarin Conjugates: Synthesis and Photophysical Studies

By: Singla, Dinesh; et al

Journal of Organic Chemistry (2022), 87(16), 10673-10683.

Scheme 315 (1 Reaction) Steps: **1** Yield: **72%**



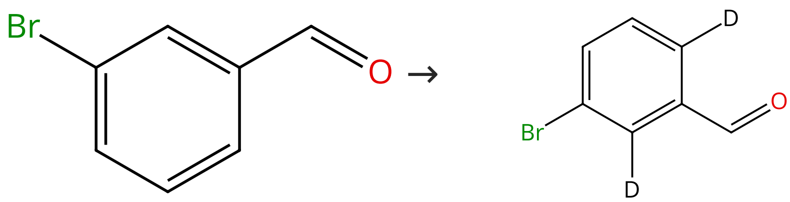
31-116-CAS-16606078	Steps: **1** Yield: **72%**
1.1	**Catalysts:** Ruthenium, μ-chlorodichloro-μ-hydrobis[(1,2,3,4,5,6-η)-1-methyl-4-(1-methylethyl)benzene]di-, (*Ru-Ru*) **Solvents:** 1,4-Dioxane, Water-d_2; 24 h, 135 °C
Experimental Protocols	

Selective α-Deuteration of Amines and Amino Acids Using D_2O

By: Chatterjee, Basujit; et al

Organic Letters (2016), 18(22), 5892-5895.

Scheme 316 (1 Reaction) Steps: **1** Yield: **72%**



Suppliers (102)

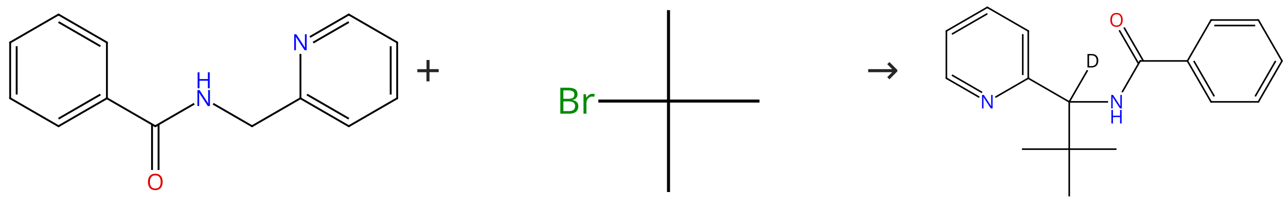
31-116-CAS-24182207	Steps: **1** Yield: **72%**
1.1	**Reagents:** Water-d_2 **Catalysts:** 4-Chlorobenzoic acid, Silver hexafluoroantimonate, Bis(dichloro(η^6-*p*-cymene)ruthenium), 2-Methyl-3-(trifluoromethyl)aniline **Solvents:** 1,2-Dichloroethane; rt → 100 °C; 16 h, 100 °C
Experimental Protocols	

Ruthenium-Catalyzed Deuteration of Aromatic Carbonyl Compounds with a Catalytic Transient Directing Group

By: Kopf, Sara; et al

Chemistry - A European Journal (2021), 27(38), 9768-9773.

Scheme 317 (1 Reaction) Steps: **1** Yield: **72%**



Suppliers (14) Suppliers (62)

31-614-CAS-36257384	Steps: **1** Yield: **72%**
1.1	**Reagents:** Cesium carbonate, Diphenyl phosphate, Water-d_2 **Catalysts:** Bis(dichloro(η^6-*p*-cymene)ruthenium) **Solvents:** 1,4-Dioxane; 24 h, rt

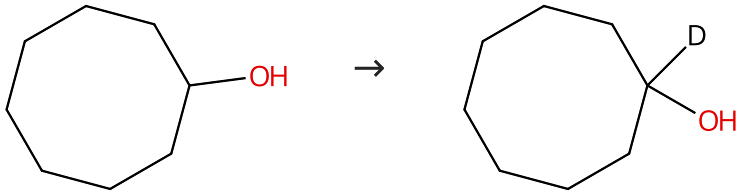
Photoinduced ruthenium-catalyzed alkyl-alkyl cross-coupling reactions

By: Jana, Sripati; et al

Chem Catalysis (2021), 1(2), 467-479.

Scheme 318 (1 Reaction)

Steps: **1** Yield: **72%**



Suppliers (71)

Supplier (1)

31-116-CAS-2453405

Steps: **1** Yield: **72%**

1.1 **Reagents:** Hydrogen, Water-d_2
Catalysts: Ruthenium
Solvents: Water-d_2; 3 h, 1 atm, 50 °C

1.2 **Reagents:** Water
Solvents: Diethyl ether; rt

Experimental Protocols

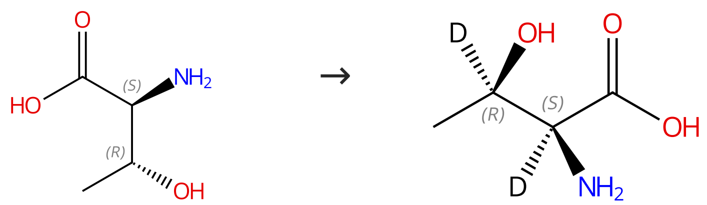
A convenient and effective method for the regioselective deuteration of alcohols

By: Maegawa, Tomohiro; et al

Advanced Synthesis & Catalysis (2008), 350(14+15), 2215-2218.

Scheme 319 (1 Reaction)

Steps: **1** Yield: **72%**



Absolute stereochemistry shown

Absolute stereochemistry shown

Suppliers (213)

Suppliers (31)

31-116-CAS-7258419

Steps: **1** Yield: **72%**

1.1 **Reagents:** Deuterium
Catalysts: Ruthenium
Solvents: Water-d_2; 36 h, 2 bar, 55 °C

Experimental Protocols

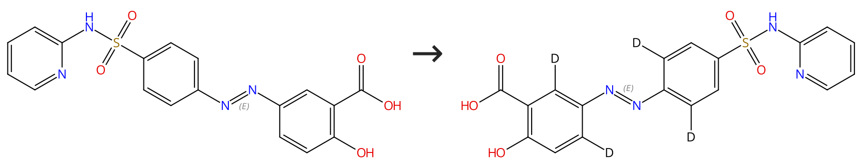
Enantiospecific C-H activation using ruthenium nanocatalysts

By: Taglang, Celine; et al

Angewandte Chemie, International Edition (2015), 54(36), 10474-10477.

Scheme 320 (1 Reaction)

Steps: **1** Yield: **72%**



Double bond geometry shown

Double bond geometry shown

Suppliers (11)

31-116-CAS-20858326

Steps: **1** Yield: **72%**

1.1 **Reagents:** Water-d_2
Catalysts: [(1,2,3,4,5,6-η)-1-Methyl-4-(1-methylethyl)benzene](tricyclo[3.3.1.1^{3,7}]decane-1-carboxylato-κ*O*)(tricyclo[3.3.1.1^{3,7}]decane-1-carboxylato-κ*O*,κ*O'*)ruthenium
Solvents: 1,4-Dioxane; 16 h, 100 °C

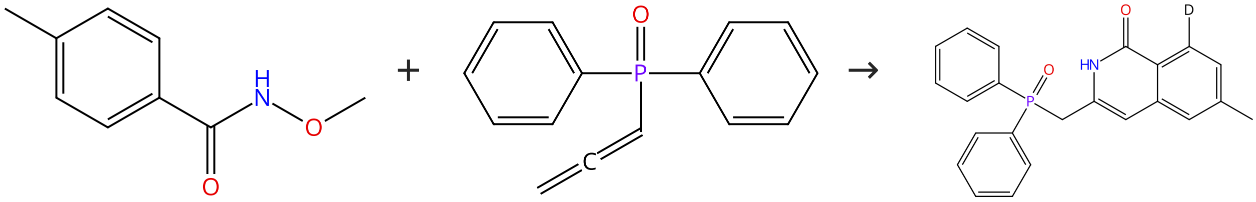
Experimental Protocols

Ruthenium(II)-Catalyzed Hydrogen Isotope Exchange of Pharmaceutical Drugs by C-H Deuteration and C-H Tritiation

By: Mueller, Valentin; et al

ChemCatChem (2020), 12(1), 100-104.

Scheme 321 (1 Reaction) Steps: **1** Yield: **71%**



Suppliers (22) Suppliers (4)

31-614-CAS-32681444 Steps: **1** Yield: **71%**

1.1 **Reagents:** Cupric acetate, Water-d_2
Catalysts: Bis(dichloro(η^6-*p*-cymene)ruthenium)
Solvents: 1,1,1,3,3,3-Hexafluoro-2-propanol; 12 h, 60 °C

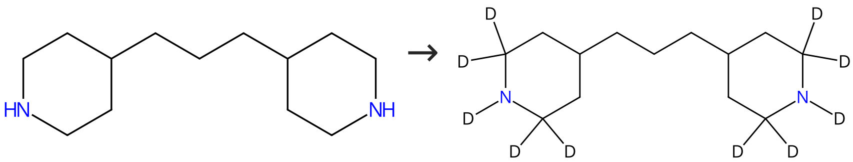
Experimental Protocols

Regioselective Annulation of Allenylphosphine Oxides with Aromatic Amides under Ruthenium(II) Catalysis

By: Chowdhury, Deepan; et al

Organic Letters (2022), 24(20), 3604-3608.

Scheme 322 (1 Reaction) Steps: **1** Yield: **71%**



Suppliers (67)

31-116-CAS-16606107 Steps: **1** Yield: **71%**

1.1 **Catalysts:** Ruthenium, μ-chlorodichloro-μ-hydrobis[(1,2,3,4,5,6-η)-1-methyl-4-(1-methylethyl)benzene]di-, (*Ru-Ru*)
Solvents: 1,4-Dioxane, Water-d_2; 24 h, 135 °C

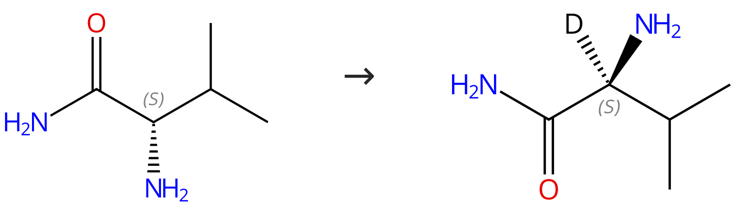
Experimental Protocols

Selective α-Deuteration of Amines and Amino Acids Using D_2O

By: Chatterjee, Basujit; et al

Organic Letters (2016), 18(22), 5892-5895.

Scheme 323 (1 Reaction) Steps: **1** Yield: **71%**



Absolute stereochemistry shown, Rotation (+)

Absolute stereochemistry shown

Suppliers (22)

31-116-CAS-13995239 Steps: **1** Yield: **71%**

1.1 **Reagents:** Deuterium
Catalysts: Ruthenium
Solvents: Water-d_2; 36 h, 2 bar, 55 °C

Experimental Protocols

Enantiospecific C-H activation using ruthenium nanocatalysts

By: Taglang, Celine; et al

Angewandte Chemie, International Edition (2015), 54(36), 10474-10477.

Scheme 324 (1 Reaction)

Steps: **1** Yield: **71%**

Double bond geometry shown

Suppliers (47)

31-614-CAS-32073305

Steps: **1** Yield: **71%**

1.1 **Reagents:** Water-d_2
Catalysts: Dichlorotetrakis(triphenylphosphine)ruthenium
Solvents: Sodium dodecyl sulfate; 15 min, 150 °C

Experimental Protocols

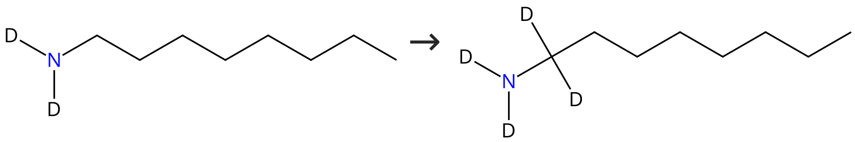
A convenient strategy to prepare supramo lecular deuterated polymers

By: Tan, Xinxin; et al

Polymer (2022), 251, 124891.

Scheme 325 (1 Reaction)

Steps: **1** Yield: **70%**



31-116-CAS-16606083

Steps: **1** Yield: **70%**

1.1 **Catalysts:** Ruthenium, μ-chlorodichloro-μ-hydrobis[(1,2,3,4,5,6-η)-1-methyl-4-(1-methylethyl)benzene]di-, (*Ru-Ru*)
Solvents: 1,4-Dioxane, Water-d_2; 24 h, 135 °C

Experimental Protocols

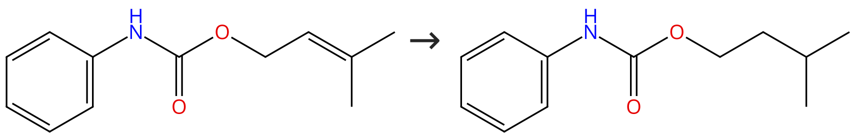
Selective α-Deuteration of Amines and Amino Acids Using D_2O

By: Chatterjee, Basujit; et al

Organic Letters (2016), 18(22), 5892-5895.

Scheme 326 (1 Reaction)

Steps: **1** Yield: **70%**



Suppliers (8)

31-614-CAS-35386501

Steps: **1** Yield: **70%**

1.1 **Reagents:** Water-d_2, 2883789-97-5
Catalysts: Tris(2,2'-bipyridyl)ruthenium(II) chloride, (*SP*-4-2)-[[2,2'-[1,2-Phenylenebis[(nitrilo-κ*N*)methylidyne]]bis[4,6-bis(1,1-dimethylethyl)phenolato-κ*O*]](2-)]cobalt
Solvents: Acetonitrile; 18 h, 25 °C; 0 °C

1.2 **Reagents:** Sodium bicarbonate
Solvents: Water

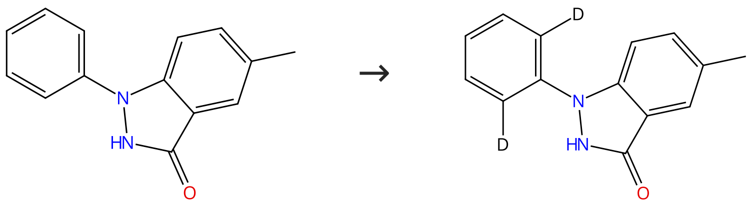
Experimental Protocols

Photocatalytic Deuterium Atom Transfer Deuteration of Electron-Deficient Alkenes with High Functional Group Tolerance

By: Suzuki, Akihiko; et al

Angewandte Chemie, International Edition (2023), 62(3), e202214433.

Scheme 327 (1 Reaction) Steps: **1** Yield: **70%**



Supplier (1)

31-614-CAS-35334055 Steps: **1** Yield: **70%**

1.1 **Reagents:** Cesium acetate, Water-d_2
Catalysts: Potassium hexafluorophosphate, Bis(dichloro(η^6-*p*-cymene)ruthenium)
Solvents: Toluene; 12 h, 110 °C; 110 °C → rt

1.2 **Reagents:** Water; rt

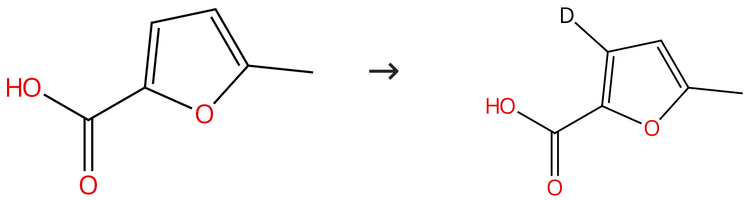
Experimental Protocols

Regiodivergent Synthesis of Cinnoline-Fused Indazolones through Pd-Catalyzed Annulation of 1-Arylindazolones with Allenoates

By: Mahesha, Chikkagundagal K.; et al

Journal of Organic Chemistry (2022), 87(5), 3701-3706.

Scheme 328 (1 Reaction) Steps: **1** Yield: **70%**



Suppliers (89)

31-116-CAS-20852730 Steps: **1** Yield: **70%**

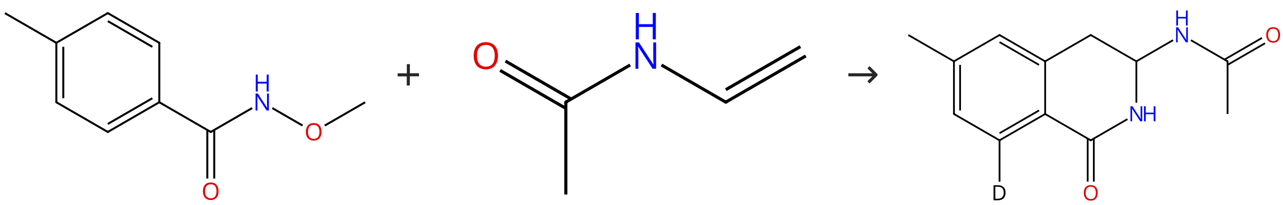
1.1 **Reagents:** Potassium acetate, Cupric acetate, Water-d_2
Catalysts: Bis(dichloro(η^6-*p*-cymene)ruthenium)
Solvents: Dimethylformamide; 4 h

Selective Conversion of Furoic Acid Deriva tives to Multi-Substi tuted Furanacrylate by a Ruthenium Catalyst

By: Li, Feng; et al

ChemCatChem (2019), 11(20), 5124-5130.

Scheme 329 (1 Reaction) Steps: **1** Yield: **70%**



Suppliers (22) Suppliers (55)

31-116-CAS-23285572 Steps: **1** Yield: **70%**

1.1 **Reagents:** Sodium acetate, Oxygen, Water-d_2
Catalysts: Bis(dichloro(η^6-*p*-cymene)ruthenium)
Solvents: 1,1,1,3,3,3-Hexafluoro-2-propanol; 4 h, 60 °C

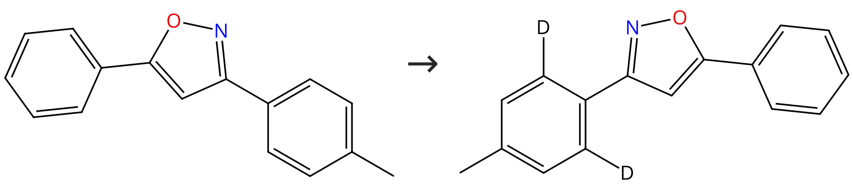
Experimental Protocols

Ruthenium(II)-Catalyzed C-H Activation/Annulation of Aromatic Hydroxamic Acid Esters with Enamides Leading to Aminal Motifs

By: Dana, Suman; et al

European Journal of Organic Chemistry (2021), 2021(9), 1385-1389.

Scheme 330 (3 Reactions) Steps: **1** Yield: **70%**



31-116-CAS-19894827	Steps: **1** Yield: **70%**
1.1	**Reagents:** Cupric acetate, Water-*d*$_2$ **Catalysts:** Silver hexafluoroantimonate, Bis(dichloro(η^6-*p*-cymene)ruthenium) **Solvents:** 1,2-Dichloroethane; 2 h, 100 °C

Experimental Protocols

Catalyst Control in Positional-Selective C-H Alkenylation of Isoxazoles and a Ruthenium-Mediated Assembly of Trisubstituted Pyrroles

By: Kumar, Pravin; et al

Organic Letters (2019), 21(7), 2134-2138.

31-614-CAS-37379746	Steps: **1**
1.1	**Reagents:** Water-*d*$_2$, Silver fluoride (AgF_3) **Catalysts:** Bis(dichloro(η^6-*p*-cymene)ruthenium) **Solvents:** Dichloromethane; 18 h, 65 °C

Isoxazole as a nitrile synthon: en routes to the ortho- alkenylated isoxazole and benzonitrile with allyl sulfone catalyzed by Ru(II)

By: Panigrahi, Pritishree; et al

Chemical Communications (Cambridge, United Kingdom) (2023), 59(70), 10536-10539.

31-614-CAS-31691964	Steps: **1**
1.1	**Reagents:** Water-*d*$_2$ **Catalysts:** Silver hexafluoroantimonate, Bis(dichloro(η^6-*p*-cymene)ruthenium) **Solvents:** 1,1,1,3,3,3-Hexafluoro-2-propanol; 12 h, 90 °C

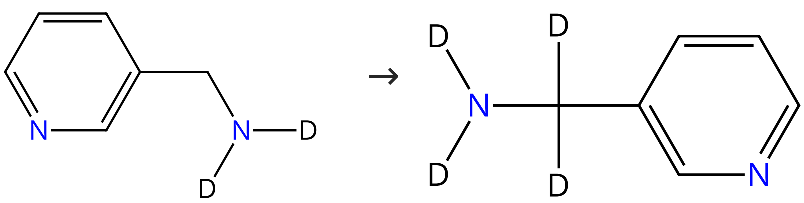
Experimental Protocols

Ruthenium-catalyzed oxidative coupling of vinylene carbonate with isoxazoles: access to fused anthranils

By: Kumar, Pravin; et al

Chemical Communications (Cambridge, United Kingdom) (2022), 58(28), 4476-4479.

Scheme 331 (1 Reaction) Steps: **1** Yield: **69%**



31-116-CAS-16606076	Steps: **1** Yield: **69%**
1.1	**Catalysts:** Ruthenium, μ-chlorodichloro-μ-hydrobis[(1,2,3,4,5,6-η)-1-methyl-4-(1-methylethyl)benzene]di-, (*Ru-Ru*) **Solvents:** 1,4-Dioxane, Water-*d*$_2$; 24 h, 135 °C

Experimental Protocols

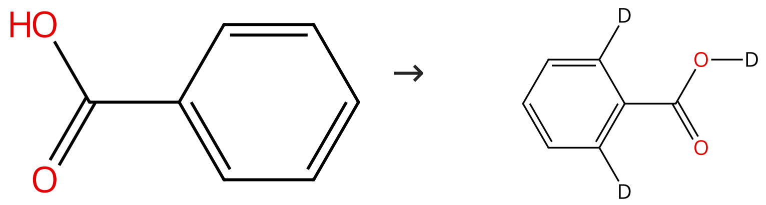
Selective α-Deuteration of Amines and Amino Acids Using D_2O

By: Chatterjee, Basujit; et al

Organic Letters (2016), 18(22), 5892-5895.

Scheme 332 (2 Reactions)

Steps: **1** Yield: **69%**



Suppliers (193)

Suppliers (2)

31-614-CAS-39940587

Steps: **1** Yield: **69%**

1.1 **Reagents:** Potassium acetate, Water-*d*2
Catalysts: Ruthenium(2+), aquapentakis(2,2-dimethylpropane nitrile)-, (*OC*-6-22)-, tetrafluoroborate(1-) (1:2)
Solvents: Tetrahydrofuran; 24 h, 40 °C

Experimental Protocols

An air- and moisture-stable ruthenium precatalyst for diverse reactivity

By: McArthur, Gillian; et al

Nature Chemistry (2024), 16(7), 1141-1150.

31-116-CAS-12391658

Steps: **1**

1.1 **Reagents:** Water-*d*2
Catalysts: Stereoisomer of dihydro[(1,2,3,3a,7a-η)-1-phenyl-1*H*-inden-1-yl](triethylsilyl)(triphenylphosphine)ruthenium
Solvents: Toluene; 16 h, 110 atm

Experimental Protocols

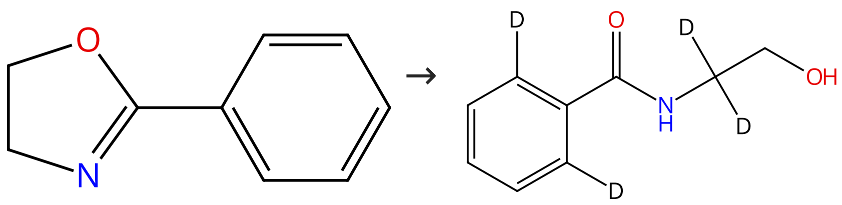
Regioselective ruthenium catalysed H-D exchange using D_2O as the deuterium source

By: Piola, Lorenzo; et al

Organic & Biomolecular Chemistry (2014), 12(43), 8683-8688.

Scheme 333 (1 Reaction)

Steps: **1** Yield: **69%**



Suppliers (68)

31-116-CAS-20984017

Steps: **1** Yield: **69%**

1.1 **Reagents:** Zinc, Water-*d*2
Catalysts: Cuprous iodide, Dichlorotris(triphenylphosphine) ruthenium
Solvents: 1,4-Dioxane; 62 h, 80 °C

Experimental Protocols

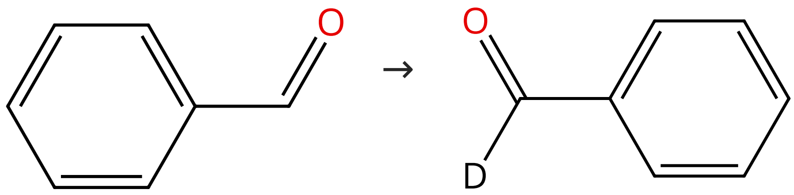
Mild, Selective Ru-Catalyzed Deuteration Using D_2O as a Deuterium Source

By: Eisele, Pascal; et al

Chemistry - A European Journal (2019), 25(72), 16550-16554.

Scheme 334 (1 Reaction)

Steps: **1** Yield: **68%**



Suppliers (80)

Suppliers (27)

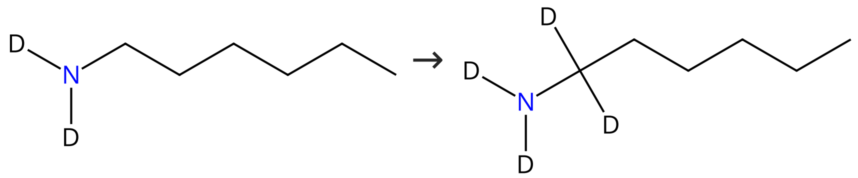
31-116-CAS-18937436	Steps: **1** Yield: **68%**
1.1	**Reagents:** Water-d_2 **Catalysts:** Carbonylchlorohydrotris(triphenylphosphine) ruthenium **Solvents:** Toluene; rt → 100 °C; 30 min, 100 °C

Catalytic Deuteration of Aldehydes with D 2 O

By: Isbrandt, Eric S.; et al

Synlett (2017), 28(20), 2851-2854.

Scheme 335 (1 Reaction) Steps: **1** Yield: **68%**



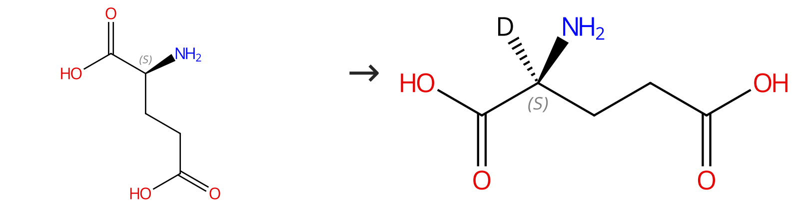
31-116-CAS-16606081	Steps: **1** Yield: **68%**
1.1	**Catalysts:** Ruthenium, μ-chlorodichloro-μ-hydrobis[(1,2,3,4,5,6-η)-1-methyl-4-(1-methylethyl)benzene]di-, (*Ru-Ru*) **Solvents:** 1,4-Dioxane, Water-d_2; 24 h, 135 °C
Experimental Protocols	

Selective α-Deuteration of Amines and Amino Acids Using D_2 O

By: Chatterjee, Basujit; et al

Organic Letters (2016), 18(22), 5892-5895.

Scheme 336 (1 Reaction) Steps: **1** Yield: **68%**



Absolute stereochemistry shown

Suppliers (189)

Absolute stereochemistry shown, Rotation (+)

Suppliers (2)

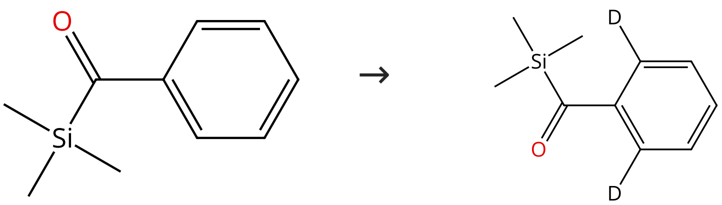
31-116-CAS-13726956	Steps: **1** Yield: **68%**
1.1	**Reagents:** Deuterium **Catalysts:** Ruthenium **Solvents:** Water-d_2; 36 h, 2 bar, 55 °C
Experimental Protocols	

Enantiospecific C-H activation using ruthenium nanocatalysts

By: Taglang, Celine; et al

Angewandte Chemie, International Edition (2015), 54(36), 10474-10477.

Scheme 337 (1 Reaction) Steps: **1** Yield: **68%**



Suppliers (15)

31-614-CAS-23926369	Steps: **1** Yield: **68%**
1.1	**Reagents:** Cupric acetate, Water-d_2 **Catalysts:** Sodium acetate, Silver hexafluoroantimonate, Bis(dichloro(η^6-*p*-cymene)ruthenium) **Solvents:** Dichloromethane; 6 h, rt → 90 °C
Experimental Protocols	

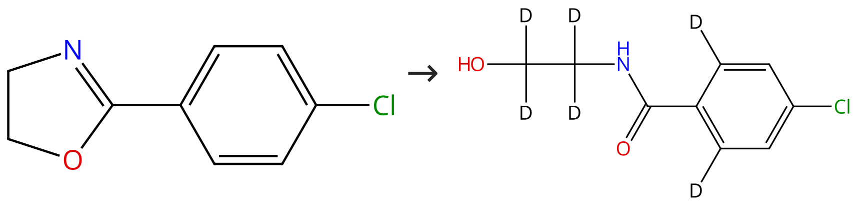
Ruthenium-catalyzed C-H amination of aroylsilanes

By: Yu, Feifei; et al

Organic & Biomolecular Chemistry (2021), 19(28), 6313-6321.

Scheme 338 (1 Reaction)

Steps: **1** Yield: **68%**



Suppliers (13)

31-116-CAS-20984021

Steps: **1** Yield: **68%**

1.1 **Reagents:** Zinc, Water-d_2
Catalysts: Cuprous iodide, Dichlorotris(triphenylphosphine) ruthenium
Solvents: 1,4-Dioxane; 16 h, 80 °C

Experimental Protocols

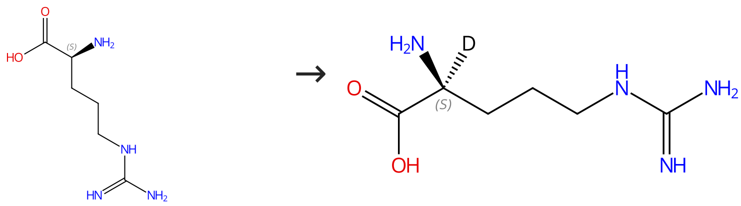
Mild, Selective Ru-Catalyzed Deuteration Using D_2O as a Deuterium Source

By: Eisele, Pascal; et al

Chemistry - A European Journal (2019), 25(72), 16550-16554.

Scheme 339 (1 Reaction)

Steps: **1** Yield: **68%**



Absolute stereochemistry shown

Absolute stereochemistry shown

Suppliers (168)

31-116-CAS-945805

Steps: **1** Yield: **68%**

1.1 **Reagents:** Deuterium
Catalysts: Ruthenium
Solvents: Water-d_2; 36 h, 2 bar, 55 °C

Experimental Protocols

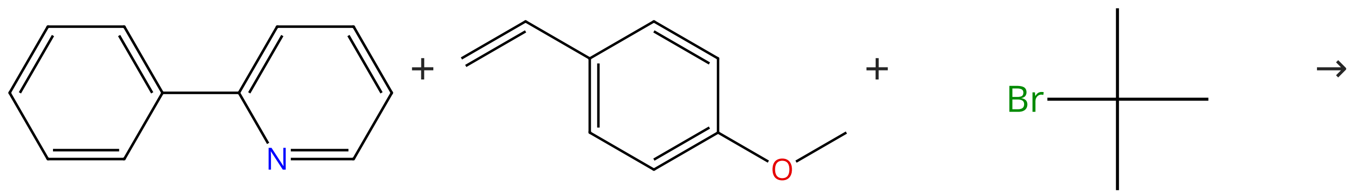
Enantiospecific C-H activation using ruthenium nanocatalysts

By: Taglang, Celine; et al

Angewandte Chemie, International Edition (2015), 54(36), 10474-10477.

Scheme 340 (1 Reaction)

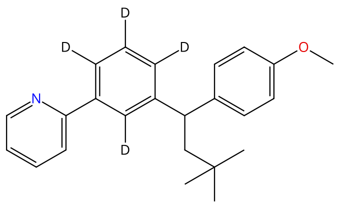
Steps: **1** Yield: **67%**



Suppliers (94)

Suppliers (88)

Suppliers (62)



31-614-CAS-31902397 Steps: **1** Yield: **67%**

1.1 **Reagents:** Potassium carbonate, Water-*d*$_2$
Catalysts: Tris[4-(trifluoromethyl)phenyl]phosphine, Bis(dichloro(η^6-*p*-cymene)ruthenium)
Solvents: 1,4-Dioxane; 18 h, 90 °C

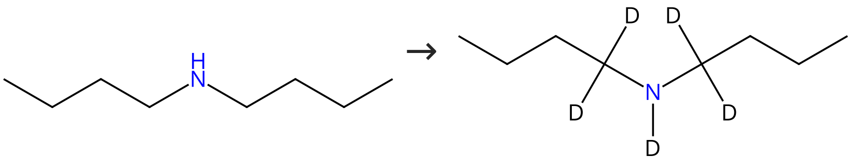
Experimental Protocols

Three-Component Ru-Catalyzed Regioselective Alkylarylation of Vinylarenes via Meta-Selective C(sp^2)-H Bond Functionalization

By: Liu, Hong-Chao; et al

Organic Letters (2022), 24(16), 3043-3047.

Scheme 341 (1 Reaction) Steps: **1** Yield: **67%**



Suppliers (77)

31-116-CAS-16606103 Steps: **1** Yield: **67%**

1.1 **Catalysts:** Ruthenium, μ-chlorodichloro-μ-hydrobis[(1,2,3,4,5,6-η)-1-methyl-4-(1-methylethyl)benzene]di-, (*Ru-Ru*)
Solvents: 1,4-Dioxane, Water-*d*$_2$; 24 h, 135 °C

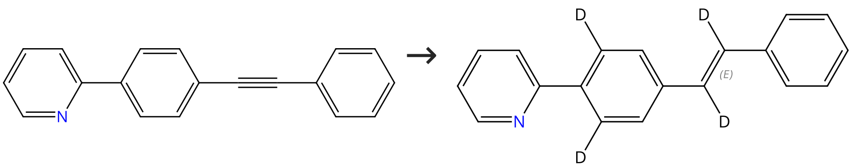
Experimental Protocols

Selective α-Deuteration of Amines and Amino Acids Using D_2O

By: Chatterjee, Basujit; et al

Organic Letters (2016), 18(22), 5892-5895.

Scheme 342 (1 Reaction) Steps: **1** Yield: **67%**



Suppliers (2)

Double bond geometry shown

31-116-CAS-20984031 Steps: **1** Yield: **67%**

1.1 **Reagents:** Zinc, Water-*d*$_2$
Catalysts: Cuprous iodide, Dichlorotris(triphenylphosphine)ruthenium
Solvents: 1,4-Dioxane; 62 h, 80 °C

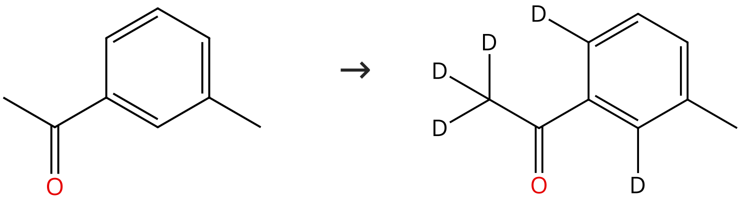
Experimental Protocols

Mild, Selective Ru-Catalyzed Deuteration Using D_2O as a Deuterium Source

By: Eisele, Pascal; et al

Chemistry - A European Journal (2019), 25(72), 16550-16554.

Scheme 343 (1 Reaction) Steps: **1** Yield: **67%**



Suppliers (86)

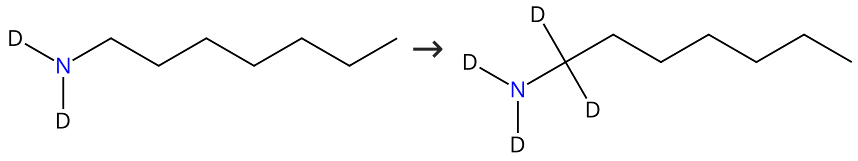
31-116-CAS-24182116	Steps: **1** Yield: **67%**
1.1	**Reagents:** Water-d_2 **Catalysts:** 4-Chlorobenzoic acid, Silver hexafluoroantimonate, Bis(dichloro(η^6-*p*-cymene)ruthenium), 2-Methyl-3-(trifluoromethyl)aniline **Solvents:** 1,2-Dichloroethane; rt → 120 °C; 16 h, 120 °C
Experimental Protocols	

Ruthenium-Catalyzed Deuteration of Aromatic Carbonyl Compounds with a Catalytic Transient Directing Group

By: Kopf, Sara; et al

Chemistry - A European Journal (2021), 27(38), 9768-9773.

Scheme 344 (1 Reaction) Steps: **1** Yield: **67%**



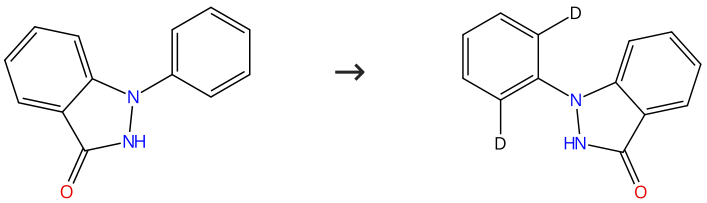
31-116-CAS-16606082	Steps: **1** Yield: **67%**
1.1	**Catalysts:** Ruthenium, μ-chlorodichloro-μ-hydrobis[(1,2,3,4,5,6-η)-1-methyl-4-(1-methylethyl)benzene]di-, (*Ru-Ru*) **Solvents:** 1,4-Dioxane, Water-d_2; 24 h, 135 °C
Experimental Protocols	

Selective α-Deuteration of Amines and Amino Acids Using D_2O

By: Chatterjee, Basujit; et al

Organic Letters (2016), 18(22), 5892-5895.

Scheme 345 (2 Reactions) Steps: **1** Yield: **61-66%**



Suppliers (15)

31-116-CAS-22563756	Steps: **1** Yield: **66%**
1.1	**Reagents:** Cesium acetate, Water-d_2 **Catalysts:** Potassium hexafluorophosphate, stereoisomer of Di-μ-chlorodichlorobis[(1,2,3,4,5,6-η)-1-methyl-4-(1-methylethyl)benzene]diruthenium **Solvents:** Toluene; rt; 15 h, 120 °C
Experimental Protocols	

Indazolone-Assisted Sequential ortho-Alkenylation-Oxidative Aza-Michael addition of 1-Arylindazolone Using Acrylates Under Ru(II) Catalysis

By: Mahesha, Chikkagundagal K.; et al

Asian Journal of Organic Chemistry (2020), 9(8), 1199-1204.

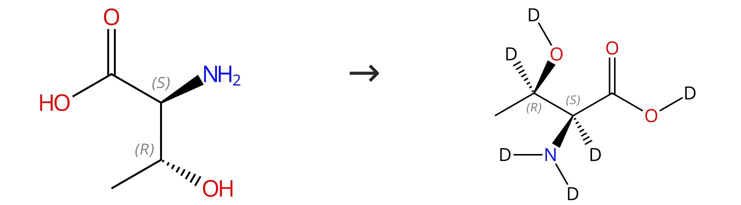
31-614-CAS-33520166	Steps: **1** Yield: **61%**
1.1	**Reagents:** Water-d_2 **Catalysts:** Bis(dichloro(η^6-*p*-cymene)ruthenium), Zinc triflate **Solvents:** 1,2-Dichloroethane; 12 h, 120 °C
Experimental Protocols	

Ruthenium-catalyzed C-H Functionalization/Annulation of N-Aryl Indazoles/Phthalazines with Sulfoxonium Ylides to access Tetracyclic-fused Cinnolines

By: Pan, Changduo; et al

Asian Journal of Organic Chemistry (2022), 11(8), e202200346.

Scheme 346 (1 Reaction) Steps: **1** Yield: **66%**



Suppliers (213)

31-116-CAS-16030367 Steps: **1** Yield: **66%**

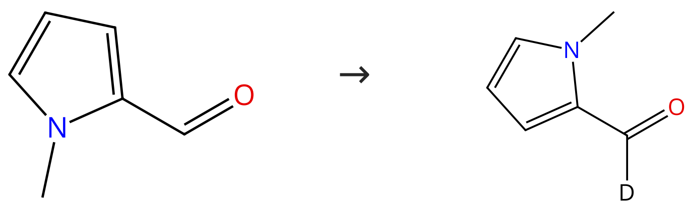
1.1 **Reagents:** Water-*d*$_2$
Catalysts: Ruthenium; 9 h, pH 7 - 12, 75 °C

Stereoretentive H/D Exchange via an Electroa ctivated Heterog eneous Catalyst at sp^3 C-H Sites Bearing Amines or Alcohols

By: Bhatia, Souful; et al

European Journal of Organic Chemistry (2016), 2016(24), 4230-4235.

Scheme 347 (1 Reaction) Steps: **1** Yield: **65%**



Suppliers (92)

31-116-CAS-18937438 Steps: **1** Yield: **65%**

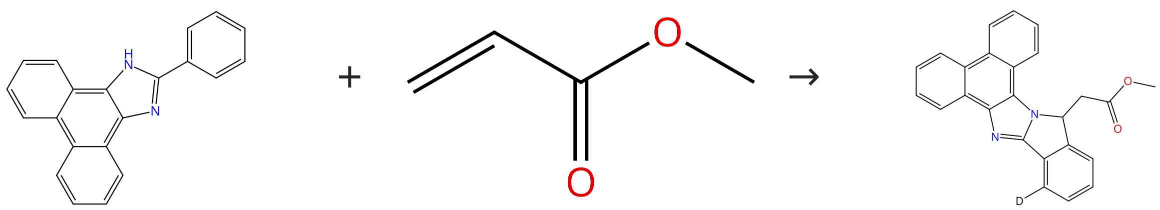
1.1 **Reagents:** Water-*d*$_2$
Catalysts: Carbonylchlorohydrotris(triphenylphosphine) ruthenium
Solvents: Toluene; rt → 100 °C; 30 min, 100 °C

Catalytic Deuteration of Aldehydes with D 2 O

By: Isbrandt, Eric S.; et al

Synlett (2017), 28(20), 2851-2854.

Scheme 348 (1 Reaction) Steps: **1** Yield: **65%**



Suppliers (20) Suppliers (66)

31-614-CAS-40723868 Steps: **1** Yield: **65%**

1.1 **Reagents:** Silver acetate, Water-*d*$_2$
Catalysts: Silver hexafluoroantimonate, Bis(dichloro(η^6-*p*-cymene)ruthenium)
Solvents: Dimethylformamide; 24 h, 120 °C

Experimental Protocols

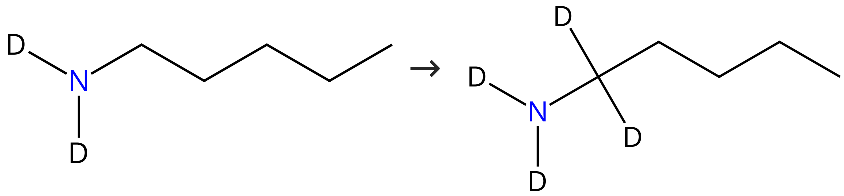
Ruthenium(II)-Catalyzed Sequential C-H/N-H Alkene Annulation Cascade of Phenanthroimidazoles: Synthesis and Photophysical Studies

By: Thakur, Rekha; et al

Journal of Organic Chemistry (2024), 89(9), 6016-6026.

Scheme 349 (1 Reaction)

Steps: **1** Yield: **64%**



31-116-CAS-16606080

Steps: **1** Yield: **64%**

1.1 **Catalysts:** Ruthenium, μ-chlorodichloro-μ-hydrobis[(1,2,3,4,5,6-η)-1-methyl-4-(1-methylethyl)benzene]di-, (*Ru-Ru*)
Solvents: 1,4-Dioxane, Water-d_2; 24 h, 135 °C

Experimental Protocols

Selective α-Deuteration of Amines and Amino Acids Using D_2O

By: Chatterjee, Basujit; et al

Organic Letters (2016), 18(22), 5892-5895.

Scheme 350 (1 Reaction)

Steps: **1** Yield: **64%**

Suppliers (52)

31-116-CAS-16606106

Steps: **1** Yield: **64%**

1.1 **Catalysts:** Ruthenium, μ-chlorodichloro-μ-hydrobis[(1,2,3,4,5,6-η)-1-methyl-4-(1-methylethyl)benzene]di-, (*Ru-Ru*)
Solvents: 1,4-Dioxane, Water-d_2; 24 h, 135 °C

Experimental Protocols

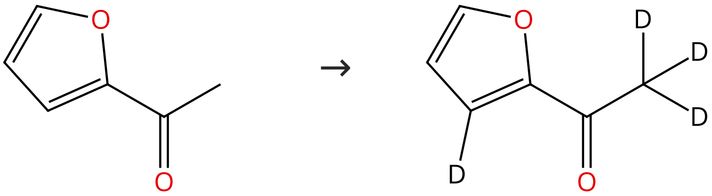
Selective α-Deuteration of Amines and Amino Acids Using D_2O

By: Chatterjee, Basujit; et al

Organic Letters (2016), 18(22), 5892-5895.

Scheme 351 (1 Reaction)

Steps: **1** Yield: **64%**



Suppliers (92)

31-116-CAS-24181184

Steps: **1** Yield: **64%**

1.1 **Reagents:** Water-d_2
Catalysts: 4-Chlorobenzoic acid, Silver hexafluoroantimonate, Bis(dichloro(η^6-*p*-cymene)ruthenium), 2-Methyl-3-(trifluoromethyl)aniline
Solvents: 1,2-Dichloroethane; rt → 120 °C; 16 h, 120 °C

Experimental Protocols

Ruthenium-Catalyzed Deuteration of Aromatic Carbonyl Compounds with a Catalytic Transient Directing Group

By: Kopf, Sara; et al

Chemistry - A European Journal (2021), 27(38), 9768-9773.

CAS SciFinder

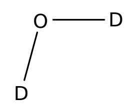
Task History

Initiating Search

February 23, 2025, 6:45 PM

Substances:

Filtered By:



Structure Match: **As Drawn**

Search Tasks

Task	Search Type	View
Returned Substance Results + Filters (1,728)	Substances	View Results
Exported: Retrieved Related Reaction Results + Filters (1,495)	Reactions	View Results

Filtered By:

Substance Role: **Reagent, Solvent**

Catalyst: [(1,2,3,4,5,6-η)-1-Methyl-4-(1-methylethyl)benzene](2,4,6-trimethylbenzoato-κ*O*)(2,4,6-trimethylbenzoato-κ*O*,κ*O'*)ruthenium, [(1,2,3,4,5,6-η)-1-Methyl-4-(1-methylethyl)benzene](tricyclo[3.3.1.1^{3,7}]decane-1-carboxylato-κ*O*)(tricyclo[3.3.1.1^{3,7}]decane-1-carboxylato-κ*O*,κ*O'*)ruthenium, [μ-[(2*R*,2'*S*)-1,1'-Bis[(4*S*)-4-(1,1-dimethylethyl)-4,5-dihydro-2-oxazolyl-κN^3]-2,2'-bis(diphenylphosphino-κ*P*)ruthenocene]]tetrachlorobis(triphenylphosphine)diruthenium, (Acetato-κ*O*)(acetato-κ*O*,κ*O'*)[(1,2,3,4,5,6-η)-1-methyl-4-(1-methylethyl)benzene]ruthenium, (Acetonitrile)[2-[bis(1-methylethyl)phosphino-κ*P*]-4-(1,1-dimethylethyl)-1-methyl-1*H*-imidazole-κN^3](η^5-2,4-cyclopentadien-1-yl)ruthenium(1+), Bis(2,2'-bipyridine)ruthenium(2+), Bis(η^6-benzene)di-μ-chlorodichlorodiruthenium, Bis(acetato-κ*O*)[(1,2,3,4,5,6-η)-1-methyl-4-(1-methylethyl)benzene]ruthenium, Bis(acetato-κ*O*)bis(triphenylphosphine)ruthenium, Bis(dichloro(η^6-*p*-cymene)ruthenium), Carbonylchloro[2-(diphenylphosphino-κ*P*)-*N*-[2-(diphenylphosphino-κ*P*)ethyl]ethanamine-κ*N*]hydroruthenium, Carbonylchlorohydrotris(triphenylphosphine)ruthenium, Carbonylchlorotris(triphenylphosphine)ruthenium(1+), Chloro[(1,2,5,6-η)-1,5-cyclooctadiene][(1,2,3,4,5-η)-1,2,3,4,5-pentamethyl-2,4-cyclopentadien-1-yl]ruthenium, Chloro(η^5-cyclopentadienyl)bis(triphenylphosphine)ruthenium, Chloro(η^5-indenyl)bis(triphenylphosphine)ruthenium, μ-Chlorodichloro-μ-hydrobis[(1,2,3,4,5,6-η)-1-methyl-4-(1-methylethyl)benzene]diruthenium, Chloro[[*N*,*N'*-(1,3-dimethyl-1,3-propanediylidene)bis[2,6-dimethylbenzenaminato-κ*N*]](1-)][(1,2,3,4,5-η)-1,2,3,4,5-pentamethyl-2,4-cyclopentadien-1-yl]ruthenium, Chloro[[*N*,*N'*-(1,3-dimethyl-1,3-propanediylidene)bis[3,5-bis(trifluoromethyl)benzenaminato-κ*N*]](1-)][(1,2,3,4,5-η)-1,2,3,4,5-pentamethyl-2,4-cyclopentadien-1-yl]ruthenium, Chloro[[*N*,*N'*-(1,3-dimethyl-1,3-propanediylidene)bis[3,5-dimethylbenzenaminato-κ*N*]](1-)][(1,2,3,4,5-η)-1,2,3,4,5-pentamethyl-2,4-cyclopentadien-1-yl]ruthenium, Dichloro[(1,2,3,4,5-η)-1,2,3,4,5-pentamethyl-2,4-cyclopentadien-1-yl]ruthenium, Dichloro[(1,2,3,4,5-η)-1,2,3,4,5-

pentamethyl-2,4-cyclopentadien-1-yl](triphenylphosphine)ruthenium, Dichloro[(1,2,3,4,5,6-η)-1-methyl-4-(1-methylethyl)benzene]ruthenium, Dichloro[(1,2,5,6-η)-1,5-cyclooctadiene]ruthenium, Dichloro[[2-(dimethylphosphino-κ*P*)ethyl]dimethylphosphine oxide][(1,2,3,4,5,6-η)-1-methyl-4-(1-methylethyl)benzene]ruthenium, Dichlorobis(triphenylphosphine)ruthenium, Di-μ-chlorodichlorobis[(1,2,3,4,5-η)-1,2,3,4,5-pentamethyl-2,4-cyclopentadien-1-yl]diruthenium, Dichloro[[(dimethylphosphino-κ*P*)methyl]dimethylphosphine oxide][(1,2,3,4,5,6-η)-1-methyl-4-(1-methylethyl)benzene]ruthenium, Dichloro(*N*,*N*,*N'*,*N'*,*N''*,*N''*-hexamethylphosphorous triamide-κ*P*)[(1,2,3,4,5,6-η)-1-methyl-4-(1-methylethyl)benzene]ruthenium, Dichlorotetrakis(triphenylphosphine)ruthenium, Dichlorotris(triphenylphosphine)ruthenium, (Dihydrogen-κ*H*,κ*H'*)dihydrotris(triphenylphosphine)ruthenium, Hexacarbonyldi-μ-chlorodichlorodiruthenium, Hydro[(1,2,3,3a,7a-η)-1*H*-inden-1-yl][1,1'-methylenebis[1,1-diphenylphosphine-κ*P*]]ruthenium, Hydroiodotris(triphenylphosphine)ruthenium, Iridium, compd. with ruthenium (1:2), Iridium, compd. with ruthenium (2:1), [*N*-[(1*R*,2*R*)-2-(Amino-κ*N*)-1,2-diphenylethyl]-2,3,4,5,6-pentafluorobenzenesulfonamidato-κ*N*]chloro[(1,2,3,4,5,6-η)-1-methyl-4-(1-methylethyl)benzene]ruthenium, [*N*-[(1*R*,2*R*)-2-(Amino-κ*N*)-1,2-diphenylethyl]-4-methylbenzenesulfonamidato-κ*N*]chloro[(1,2,3,4,5,6-η)-1-methyl-4-(1-methylethyl)benzene]ruthenium, [[*N*,*N'*-[1,3-Bis(trifluoromethyl)-1,3-propanediylidene]bis[3,5-bis(trifluoromethyl)benzenaminato-κ*N*]](1-)]chloro[(1,2,3,4,5-η)-1,2,3,4,5-pentamethyl-2,4-cyclopentadien-1-yl]ruthenium, [[*N*,*N'*-[1,3-Bis(trifluoromethyl)-1,3-propanediylidene]bis[3,5-dimethylbenzenaminato-κ*N*]](1-)]chloro[(1,2,3,4,5-η)-1,2,3,4,5-pentamethyl-2,4-cyclopentadien-1-yl]ruthenium, (*OC*-6-12)-Hydro[[*N*,*N'*-(1*H*-isoindole-1,3(2*H*)-diyl-κ*N*)bis[6-methyl-2-pyridinaminato-κN^1]](1-)](triphenylphosphine)ruthenium, (*OC*-6-13)-Carbonyl[2-(diphenylphosphino-κ*P*)-*N*-[2-(diphenylphosphino-κ*P*)ethyl]ethanamine-κ*N*][tetrahydroborato(1-)-κ*H*]ruthenium, (*OC*-6-14)-Dichloro(2-pyridinemethanamine-κN^1,κN^2)bis(triphenylphosphine)ruthenium, (*OC*-6-22)-Bis(acetato-κ*O*,κ*O'*)[(1*R*)-[1,1'-binaphthalene]-2,2'-diylbis[diphenylphosphine-κ*P*]]ruthenium, (*OC*-6-32)-[2-[6-[(Amino-κ*N*)methyl]-2-pyridinyl-κ*N*]-5-methylphenyl-κ*C*][1,1'-(1,4-butanediyl)bis[1,1-diphenylphosphine-κ*P*]](formato-κ*O*)ruthenium, (*OC*-6-32)-Diaqua[*N*,*N*-bis[(2-pyridinyl-κ*N*)methyl]-2-pyridinemethanamine-κN^1,κN^2]ruthenium(2+), (*OC*-6-32)-[*rel*-(11*R*,12*R*)-1,8-Bis(diphenylphosphino-κ*P*)-9,10-dihydro-11,12-bis(hydroxymethyl)-9,10-ethanoanthracen-9-yl-κ*C*]dicarbonylchlororuthenium, (*OC*-6-34)-Carbonylchlorohydrotris(triphenylphosphine)ruthenium, (*OC*-6-43)-Aqua[α-(2-pyridinyl-κ*N*)-*N*,*N*-bis[(2-pyridinyl-κ*N*)methyl]-2-pyridinemethanamine-κN^1,κN^2]ruthenium(2+), (*OC*-6-52)-[4,5-Bis[[bis(1-methylethyl)phosphino-κ*P*]methyl]acridine-κ*N*]carbonylchlorohydroruthenium, (*OC*-6-52)-Carbonylchloro[2-(diphenylphosphino-κ*P*)-*N*-[2-(diphenylphosphino-κ*P*)ethyl]ethanamine-κ*N*]hydroruthenium, (*OC*-6-54)-Aqua[6-[[bis[(2-pyridinyl-κ*N*)methyl]amino-κ*N*]methyl]-2-pyridinecarboxylato-κN^1,κO^2]ruthenium(1+), Poly(oxy-1,2-ethanediyl), α-methyl-ω-hydroxy-, ether with dichloro[4-(hydroxymethyl)-1,3-bis(2,4,6-trimethylphenyl)-2-imidazolidinylidene][[2-(1-methylethoxy-κ*O*)phenyl]methylene-κ*C*]ruthenium, Ruthenate(1-), [1,3-bis(2,4,6-trimethylphenyl)-2-imidazolidinylidene][[5-(2-carboxylatoethyl)-2-(1-methylethoxy-κ*O*)phenyl]methylene-κ*C*]dichloro-, hydrogen, (*SP*-5-41)-, Ruthenate(1-), dichloro(diethyl phosphito-κ*P*)[(1,2,3,4,5,6-η)-1-methyl-4-(1-methylethyl)benzene]-, hydrogen (1:1), Ruthenate(1-), dichloro(*P*,*P*-dimethylphosphinito-κ*P*)[(1,2,3,4,5,6-η)-1-methyl-4-(1-methylethyl)benzene]-, hydrogen (1:1), Ruthenate(4-), [29*H*,31*H*-phthalocyanine-2,9,16,23-tetrasulfonato(6-)-κN^{29},κN^{30},κN^{31},κN^{32}]-, (*SP*-4-1)-, Ruthenate(4-), di-μ-chlorodichlorotetrakis[3-(diphenylphosphino-κ*P*)benzenesulfonato]di-, sodium (1:4), Ruthenate(5-), (η^6-benzene)chlorobis[[3,3',3''-(phosphinidyne-κ*P*)tris[benzenesulfonato]](3-)]-, sodium chloride (1:6:1), Ruthenium, Ruthenium(1+), [1,3-bis(2,4,6-trimethylphenyl)-2-imidazolidinylidene][3-[[(4-bromo-2,6-dimethylphenyl)imino-κ*N*]methyl]-4-(hydroxy-κ*O*)-*N*,*N*,*N*-trimethylbenzenaminiumato]chloro(phenylmethylene)-, chloride (1:1), (*TB*-5-12)-, Ruthenium(1+), [1,3-bis(2,4,6-trimethylphenyl)-2-imidazolidinylidene]dichloro[[2-[(1,1-dimethylpiperidinium-4-yl)oxy-κ*O*]phenyl]methylene-κ*C*]-, chloride (1:1), (*SP*-5-41)-, Ruthenium(1+), [1,3-bis(2,4,6-trimethylphenyl)-2-imidazolidinylidene]dichloro[[2-(1-methylethoxy-κ*O*)-4-(diethylmethylammonio)phenyl]methylene-κ*C*]-, (*SP*-5-41)-, hexafluorophosphate(1-) (1:1), Ruthenium(1+), [1,3-bis(2,4,6-trimethylphenyl)-2-imidazolidinylidene]dichloro[[2-(1-methylethoxy-κ*O*)-4-(diethylmethylammonio)phenyl]methylene-κ*C*]-, (*SP*-5-41)-, tetrafluoroborate(1-) (1:1), Ruthenium(1+), [1,3-bis(2,4,6-trimethylphenyl)-2-imidazolidinylidene]dichloro[[2-(1-methylethoxy-κ*O*)-5-(pyridiniomethyl)phenyl]methylene-κ*C*]-, (*SP*-5-41)-, hexafluorophosphate(1-) (1:1), Ruthenium(1+), [1,3-bis(2,4,6-trimethylphenyl)-2-imidazolidinylidene]dichloro[[2-(1-methylethoxy-κ*O*)-5-

pyridiniophenyl]methylene-κ*C*]-, (*SP*-5-41)-, hexafluorophosphate(1-) (1:1), Ruthenium(1+), [1,3-bis(2,4,6-trimethylphenyl)-2-imidazolidinylidene]dichloro[[4-(diethylmethylammonio)-2-(1-methylethoxy-κ*O*)phenyl]methylene-κ*C*]-, iodide (1:1), (*SP*-5-41)-, Ruthenium, [(1,2,3,4,5,6-η)-1-methyl-4-(1-methylethyl)benzene]bis(trifluoromethanesulfonato-κ*O*)-, Ruthenium(1+), [2-(amino-κ*N*)ethanol-κ*O*]chloro[(1,2,3,4,5,6-η)-1-methyl-4-(1-methylethyl)benzene]-, chloride, compd. with [2-(amino-κ*N*)ethanolato-κ*O*]chloro[(1,2,3,4,5,6-η)-1-methyl-4-(1-methylethyl)benzene]ruthenium (1:1:1), Ruthenium(1+), [4-(2-aminoethoxy)-2-quinolinecarboxylato-κN^{1},κO^{2}](η^{5}-2,4-cyclopentadien-1-yl)(η^{3}-2-propen-1-yl)-, hexafluorophosphate(1-) (1:1), Ruthenium(1+), [[[4-[[[2-(amino-κ*N*)ethyl]amino-κ*N*]sulfonyl]phenyl]methyl][3-[[6-[4-methoxy-2,5-bis(2-phenylethenyl)phenoxy]hexyl]amino]-3-oxopropyl]diphenylphosphoniumato]chloro[(1,2,3,4,5,6-η)-1-methyl-4-(1-methylethyl)benzene]-, bromide (1:1), Ruthenium(1+), [4-(aminomethyl)-1,3-bis(2,4,6-trimethylphenyl)-2-imidazolidinylidene]dichloro[[2-(1-methylethoxy-κ*O*)-5-[(trimethylammonio)methyl]phenyl]methylene-κ*C*]-, chloride, hydrochloride (1:1:1), (*SP*-5-41)-, Ruthenium(1+), (η^{5}-2,4-cyclopentadien-1-yl)(4-methoxy-2-quinolinecarboxylato-κN^{1},κO^{2})(η^{3}-2-propen-1-yl)-, hexafluorophosphate(1-) (1:1), Ruthenium(1+), (acetonitrile)[2-[bis(1-methylethyl)phosphino-κ*P*]-4-(1,1-dimethylethyl)-1-methyl-1*H*-imidazole-κN^{3}](η^{5}-2,4-cyclopentadien-1-yl)-, hexafluorophosphate(1-) (1:1), Ruthenium(1+), (acetonitrile)(η^{5}-2,4-cyclopentadien-1-yl)bis[2-(1,1-dimethylethyl)-6-(diphenylphosphino-κ*P*)pyridine]-, hexafluorophosphate(1-) (1:1), Ruthenium(1+), [μ-(benzenethiolato)]bis[μ-[4-(1,1-dimethylethyl)benzenemethanethiolato]]bis[(1,2,3,4,5,6-η)-1-methyl-4-(1-methylethyl)benzene]di-, chloride (1:1), Ruthenium(1+), bis[(1,2,3,4,5,6-η)-1-methyl-4-(1-methylethyl)benzene]tris[μ-(4-methylbenzenethiolato)]di-, Ruthenium(1+), bis[μ-[4-(1,1-dimethylethyl)benzenemethanethiolato]][μ-[4-(1,1-dimethylethyl)benzenethiolato]]bis[(1,2,3,4,5,6-η)-1-methyl-4-(1-methylethyl)benzene]di-, chloride (1:1), Ruthenium(1+), bis(acetonitrile)(η^{5}-2,4-cyclopentadien-1-yl)(trimethylphosphine)-, stereoisomer of hexakis[μ-[[*N*,*N'*-1,5-naphthalenediylbis[2,3-di(hydroxy-κ*O*)benzamidato]](4-)]]tetragallate(12-) (1:1), Ruthenium(1+), bis(acetonitrile)(η^{5}-2,4-cyclopentadien-1-yl)(triphenylphosphine)-, hexafluorophosphate(1-) (1:1), Ruthenium(1+), bis(acetonitrile)[hydrotris(1*H*-pyrazolato-κN^{1})borato(1-)-κN^{2},κ$N^{2'}$,κ$N^{2''}$](triphenylphosphine)-, (*OC*-6-23)-, hexafluorophosphate(1-) (1:1), Ruthenium(1+), bis[μ-(benzeneethanethiolato)][μ-[4-(1-methylethyl)benzenethiolato]]bis[(1,2,3,4,5,6-η)-1-methyl-4-(1-methylethyl)benzene]di-, chloride (1:1), Ruthenium(1+), bis[μ-(benzeneethanethiolato)][μ-[4-(mercapto-κ*S*:κ*S*)phenolato]]bis[(1,2,3,4,5,6-η)-1-methyl-4-(1-methylethyl)benzene]di-, chloride (1:1), Ruthenium(1+), bis[μ-(benzenemethanethiolato)][μ-[4-(1,1-dimethylethyl)benzenethiolato]]bis[(1,2,3,4,5,6-η)-1-methyl-4-(1-methylethyl)benzene]di-, chloride (1:1), Ruthenium(1+), bis[μ-(benzenemethanethiolato)][μ-(4-bromobenzenethiolato-κ*S*:κ*S*)]bis[(1,2,3,4,5,6-η)-1-methyl-4-(1-methylethyl)benzene]di-, chloride (1:1), Ruthenium(1+), carbonylhydro(η^{6}-benzene)(tricyclohexylphosphine)-, tetrafluoroborate(1-) (1:1), Ruthenium(1+), chloro[(1,2,3,4,5,6-η)-1-methyl-4-(1-methylethyl)benzene](4,4',5,5'-tetrahydro-2,2'-bi-1*H*-imidazole-κN^{3},κ$N^{3'}$)-, chloride (1:1), Ruthenium(1+), chloro(4,4'-dimethoxy-2,2'-bipyridine-κN^{1},κ$N^{1'}$)[(1,2,3,4,5,6-η)-1-methyl-4-(1-methylethyl)benzene]-, tetrafluoroborate(1-) (1:1), Ruthenium(1+), diaqua[μ-[1*H*-pyrazole-3,5-dicarboxylato(3-)-κN^{1},κO^{5}:κN^{2},κO^{3}]]bis(2,2':6',2''-terpyridine-κN^{1},κ$N^{1'}$,κ$N^{1''}$)di-, Ruthenium(1+), dichloro[[2-(1-methylethoxy-κ*O*)-5-nitrophenyl]methylene-κ*C*][4-[(trimethylammonio)methyl]-1,3-bis(2,4,6-trimethylphenyl)-2-imidazolidinylidene]-, chloride (1:1), (*SP*-5-41)-, Ruthenium(1+), dichloro[4-[(4-ethyl-4-methylpiperazinium-1-yl)methyl]-1,3-bis(2,4,6-trimethylphenyl)-2-imidazolidinylidene][[2-(1-methylethoxy-κ*O*)phenyl]methylene-κ*C*]-, chloride (1:1), (*SP*-5-41)-, Ruthenium(1+), hydro[*N*-methyl-*N*-(6-methyl-2-pyridinyl-κ*N*)-1-[(6-methyl-2-pyridinyl-κ*N*)imino]-1*H*-isoindol-3-amine-κN^{2}](1,1,1-trifluoromethanesulfonato-κ*O*)(triphenylphosphine)-, (*OC*-6-26)-, 1,1,1-trifluoromethanesulfonate (1:1), Ruthenium(1+), (nickel)[(1,2,3,4,5-η)-1,2,3,4,5-pentamethyl-2,4-cyclopentadien-1-yl]peroxy[μ-[[2,2'-[1,3-propanediylbis(methylimino-κ*N*)]bis[ethanethiolato-κ*S*:κ*S*]](2-)]]-, stereoisomer, nitrate (1:1), Ruthenium(1+), tris[μ-[4-(1,1-dimethylethyl)benzenethiolato]]bis[(1,2,3,4,5,6-η)-1-methyl-4-(1-methylethyl)benzene]di-, chloride (1:1), Ruthenium(1+), tri-μ-chlorobis[(1,2,3,4,5,6-η)-1-methyl-4-(1-methylethyl)benzene]di-, hexafluorophosphate(1-) (1:1), Ruthenium(1+), tris(acetonitrile)[(1,2,3,4,5-η)-1,2,3,4,5-pentamethyl-2,4-cyclopentadien-1-yl]-, hexafluorophosphate(1-) (1:1), Ruthenium(1+), tris(acetonitrile)[(1,2,3,4,5-η)-1,2,3,4,5-pentamethyl-2,4-cyclopentadien-1-yl]-, (*OC*-6-11)-hexafluoroantimonate(1-), Ruthenium(1+), tris(acetonitrile)(η^{5}-2,4-cyclopentadien-1-yl)-, hexafluorophosphate(1-) (1:1), Ruthenium(1+), tris(acetonitrile)(η^{5}-2,4-cyclopentadien-1-yl)-, (*OC*-6-11)-hexafluoroantimonate(1-) (1:1), Ruthenium(2+), [1,3-bis(2,4,6-trimethylphenyl)-2-imidazolidinylidene]dichloro[[5-

[[dimethyl[2-(trimethylammonio)ethyl]ammonio]methyl]-2-(1-methylethoxy-κ*O*)phenyl]methylene-κ*C*]-, chloride (1:2), (*SP*-5-41)-, Ruthenium(2+), (2,2'-bipyridine-κN^{1},κ$N^{1'}$)bis(1,10-phenanthroline-κN^{1},κN^{10})-, dichloride, (*OC*-6-22)-, Ruthenium(2+), (2,2'-bipyrimidine-κN^{1},κ$N^{1'}$)[(1,2,3,4,5,6-η)-1-methyl-4-(1-methylethyl)benzene](pyridine)-, Ruthenium(2+), [2-amino-7,9-dihydro-9-[4-(4'-methyl[2,2'-bipyridin]-4-yl-κN^{1},κ$N^{1'}$)butyl]-1*H*-purine-6,8-dione]bis(2,2'-bipyridine-κN^{1},κ$N^{1'}$)-, chloride (1:2), (*OC*-6-33)-, Ruthenium, (2,2'-bipyridine-κN^{1},κ$N^{1'}$)[1,1'-(1,4-butanediyl)bis[1,1-diphenylphosphine-κ*P*]]dichloro-, (*OC*-6-32)-, Ruthenium(2+), aqua([2,2'-bipyridine]-4,4'-diol-κN^{1},κ$N^{1'}$)[(1,2,3,4,5,6-η)-1,2,3,4,5,6-hexamethylbenzene]-, sulfate (1:1), Ruthenium(2+), aqua(2,2'-bipyridine-κN^{1},κ$N^{1'}$)(2,2':6',2''-terpyridine-κN^{1},κ$N^{1'}$,κ$N^{1''}$)-, perchlorate (1:2), Ruthenium(2+), aqua[α-(2-pyridinyl-κ*N*)-*N*,*N*-bis[(2-pyridinyl-κ*N*)methyl]-2-pyridinemethanamine-κN^{1},κN^{2}]-, (*OC*-6-43)-, hexafluorophosphate(1-) (1:2), Ruthenium(2+), aquapentakis(2,2-dimethylpropanenitrile)-, (*OC*-6-22)-, tetrafluoroborate(1-) (1:2), Ruthenium(2+), diaquabis(2,9-dimethyl-1,10-phenanthroline-κN^{1},κN^{10})-, (*OC*-6-22)-, hexafluorophosphate(1-) (1:2), Ruthenium(2+), diaqua[*N*,*N*-bis[(2-pyridinyl-κ*N*)methyl]-2-pyridinemethanamine-κN^{1},κN^{2}]-, (*OC*-6-32)-, hexafluorophosphate(1-) (1:2), Ruthenium(2+), dichloro[[2-[(1,1-dimethylpiperidinium-4-yl)oxy-κ*O*]phenyl]methylene-κ*C*][4-[(4-ethyl-4-methylpiperazinium-1-yl)methyl]-1,3-bis(2,4,6-trimethylphenyl)-2-imidazolidinylidene]-, chloride (1:2), (*SP*-5-41)-, Ruthenium(2+), hexaaqua-, (*OC*-6-11)-, 4-methylbenzenesulfonate (1:2), Ruthenium(2+), trichlorobis[(1,2,3,4,5,6-η)-1,2,3,4,5,6-hexamethylbenzene][μ_3-[*N*-[6-[[[[6-[[(1,10-phenanthrolin-4-yl-κN^{1},κN^{10})carbonyl]amino]-2-pyridinyl-κ*N*]methyl][(2-pyridinyl-κ*N*)methyl]amino-κ*N*]methyl]-2-pyridinyl-κ*N*]-1,10-phenanthroline-4-carboxamidato-κN^{1},κN^{10}:κO^{4}]]tri-, stereoisomer, hexafluorophosphate(1-) (1:2), Ruthenium(2+), trichlorobis[(1,2,3,4,5,6-η)-1-methyl-4-(1-methylethyl)benzene][μ_3-[*N*-[6-[[[[6-[[(1,10-phenanthrolin-4-yl-κN^{1},κN^{10})carbonyl]amino]-2-pyridinyl-κ*N*]methyl][(2-pyridinyl-κ*N*)methyl]amino-κ*N*]methyl]-2-pyridinyl-κ*N*]-1,10-phenanthroline-4-carboxamidato-κN^{1},κN^{10}:κO^{4}]]tri-, stereoisomer, hexafluorophosphate(1-) (1:2), Ruthenium(2+), tris(2,2'-bipyrazine-κN^{1},κ$N^{1'}$)-, (*OC*-6-11)-, hexafluorophosphate(1-) (1:2), Ruthenium(2+), tris(acetonitrile)[(1,2,3,4,5,6-η)-1-methyl-4-(1-methylethyl)benzene]-, (*OC*-6-11)-hexafluoroantimonate(1-) (1:2), Ruthenium(3+), bis[4,4'-bis(1,1-dimethylethyl)-2,2'-bipyridine-κN^{1},κ$N^{1'}$][chloro[(1,2,3,4,5-η)-1,2,3,4,5-pentamethyl-2,4-cyclopentadien-1-yl]rhodium][μ-(dipyrido[3,2-5,6:3',2'-5,6]quinoxalino[2,3-*f*][1,10]phenanthroline-κN^{4},κN^{5}:κN^{13},κN^{14})]-, chloride hexafluorophosphate(1-) (1:1:2), Ruthenium(4+), aquatris(2,2'-bipyridine-κN^{1},κ$N^{1'}$)[μ-[4-(2-pyridinyl-κ*N*)-2,2'-bipyrimidine-κN^{1},κ$N^{1'}$:κN^{3},κ$N^{3'}$]]di-, tetrafluoroborate(1-) (1:4), Ruthenium(6+), aquatetrakis(2,2'-bipyridine-κN^{1},κ$N^{1'}$)bis[μ-(2,2'-bipyrimidine-κN^{1},κ$N^{1'}$:κN^{3},κ$N^{3'}$)](pyridine)tri-, stereoisomer, tetrafluoroborate(1-) (1:6), Ruthenium, (η^{6}-benzene)dichloro[(pentafluorophenyl)diphenylphosphine-κ*P*]-, Ruthenium, [6-[[bis(1,1-dimethylethyl)phosphino-κ*P*]methyl]-2,2'-bipyridine-κN^{1},κ$N^{1'}$]carbonylchlorohydro-, (*OC*-6-64)-, Ruthenium(6+), tris[μ-[5,8-di(hydroxy-κ*O*)-1,4-naphthalenedionato(2-)-κO^{1}:κO^{4}]]hexakis[(1,2,3,4,5,6-η)-1-methyl-4-(1-methylethyl)benzene]bis[μ_3-[2,4,6-tri(4-pyridinyl-κ*N*)-1,3,5-triazine]]hexa-, 1,1,1-trifluoromethanesulfonate (1:6), Ruthenium carbide, Ruthenium, μ-chlorodichloro-μ-hydrobis[(1,2,3,4,5,6-η)-1-methyl-4-(1-methylethyl)benzene]di-, (*Ru*-*Ru*), Ruthenium, di-μ-carbonyldicarbonylbis(η^{5}-2,4-cyclopentadien-1-yl)di-, (*Ru*-*Ru*), Ruthenium dioxide, Ruthenium oxide, Ruthenium trichloride, Ruthenium, trichloro[4-(3,5-dimethyl-1*H*-pyrazol-1-yl-κN^{2})-6-(4-methylphenyl)-*N*-(2-pyridinyl-κ*N*)-1,3,5-triazin-2-amine-κN^{3}]-, (*OC*-6-31)-, (*SP*-5-41)-[1,3-Bis(2,4,6-trimethylphenyl)-2-imidazolidinylidene]dichloro[[2-(1-methylethoxy-κ*O*)-5-nitrophenyl]methylene-κ*C*]ruthenium, (*SP*-5-41)-[1,3-Bis(2,4,6-trimethylphenyl)-2-imidazolidinylidene]dichloro[[2-(1-methylethoxy-κ*O*)phenyl]methylene-κ*C*]ruthenium, (*SP*-5-41)-[1,3-Bis[2,6-bis(1-methylethyl)phenyl]-2-imidazolidinylidene]dichloro(phenylmethylene)(tricyclohexylphosphine)ruthenium, (*SP*-5-41)-Dichloro[[2-(1-methylethoxy-κ*O*)phenyl]methylene-κ*C*][4-[97-(tricyclo[3.3.1.1^{3,7}]dec-1-yloxy)-2,5,8,11,14,17,20,23,26,29,32,35,38,41,44,47,50,53,56,59,62,65,68,71,74,77,80,83,86,89,92,95-dotriacontaoxaheptanonacont-1-yl]-1,3-bis(2,4,6-trimethylphenyl)-2-imidazolidinylidene]ruthenium, (*SP*-5-52)-[6-[[Bis(1,1-dimethylethyl)phosphino-κ*P*]methylene]-*N*,*N*-diethyl-1,6-dihydro-2-pyridinemethanaminato-κN^{1},κN^{2}]carbonylhydroruthenium, Stereoisomer of dichloro[(1,2,3,6,7,8-η)-(2*E*,6*E*)-2,7-dimethyl-2,6-octadiene-1,8-diyl](triphenylphosphine)ruthenium, stereoisomer of Di-μ-chlorodichlorobis[(1,2,3,4,5,6-η)-1-methyl-4-(1-methylethyl)benzene]diruthenium, Stereoisomer of dihydro[(1,2,3,3a,7a-η)-1-phenyl-1*H*-inden-1-yl](triethylsilyl)(triphenylphosphine)ruthenium, stereoisomer of Di-μ-iododiiodobis[(1,2,3,4,5,6-η)-1-methyl-4-(1-methylethyl)benzene]diruthenium, (*TB*-5-23)-[4,5-Bis[[bis(1-methylethyl)phosphino-κ*P*]methyl]-9,10-dihydroacridinato-κ*N*]carbonylhydroruthenium, Tetracarbonyl-μhydro[(1,2,3,4,5-η)-1-hydroxylato-2,3,4,5-tetraphenyl-2,4-cyclopentadien-1-yl][(1,2,3,4,5-η)-1-hydroxy-2,3,4,5-tetraphenyl-2,4-cyclopentadien-1-yl]diruthenium, Tri-μ-chlorochloro(η^2-ethene)[(1,2,3,4,5,6-η)-1-methyl-4-(1-methylethyl)benzene](tricyclohexylphosphine)diruthenium, Tri-μ-chlorochloro(η^2-ethene)[(1,2,3,4,5,6-η)-1-methyl-4-(1-methylethyl)benzene](tricyclopentylphosphine)diruthenium, Tri-μ-chlorochloro(η^2-ethene)[(1,2,3,4,5,6-η)-1-methyl-4-(1-methylethyl)benzene](triphenylphosphine)diruthenium, Tri-μ-chlorodichloro[(1,2,3,4,5,6-η)-1-methyl-4-(1-methylethyl)benzene](tricyclohexylphosphine)diruthenium, Tri-μ-chlorodichloro[(1,2,3,4,5,6-η)-1-methyl-4-(1-methylethyl)benzene](tricyclopentylphosphine)diruthenium, Tris(2,2'-bipyridyl)ruthenium(II) chloride, Tris(2,2'-bipyridyl)dichlororuthenium(II) hexahydrate, Tris(2,2'-bipyridine)ruthenium(2+) bis(hexafluorophosphate), Tris(2,2'-bipyridine)ruthenium(2+), Triruthenium dodecacarbonyl

Document Type: Journal

Language: English

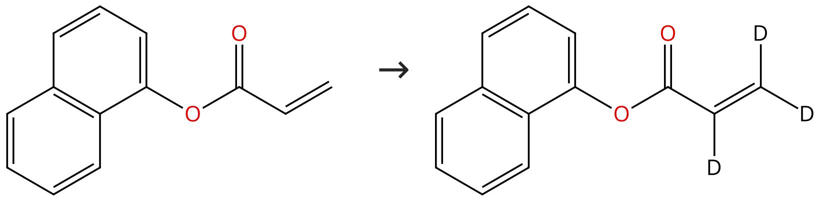
CAS SciFinder

Reactions (486)

View in CAS SciFinder

Scheme 1 (1 Reaction)

Steps: **1** Yield: **64%**



Suppliers (18)

31-116-CAS-21847296

Steps: **1** Yield: **64%**

1.1 **Reagents:** Water-d_2
Catalysts: 3-(Trifluoromethyl)benzoic acid, Potassium benzoate, Bis(dichloro(η^6-*p*-cymene)ruthenium); 18 h, rt → 80 °C

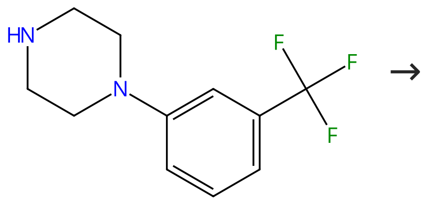
Sulfoxonium-Ylide-Directed C-H Activation and Tandem (4 + 1) Annulation

By: Hanchate, Vinayak; et al

Organic Letters (2020), 22(8), 2878-2882.

Scheme 2 (3 Reactions)

Steps: **1** Yield: **63%**



Multi-component structure image available in CAS SciFinder

Suppliers (28)

31-614-CAS-28617708

Steps: **1** Yield: **63%**

1.1 **Reagents:** Water-d_2
Catalysts: Dichlorotris(triphenylphosphine)ruthenium
Solvents: Dimethyl sulfoxide; 3 h, 150 °C

One-step exchange-labeling of piperidines, piperazines and dialkylamines with deuterium oxide: catalysis by various ruthenium complexes

By: Alexakis, Efstathios; et al

Tetrahedron Letters (2005), 46(25), 4291-4293.

31-614-CAS-26895234

Steps: **1**

1.1 **Reagents:** Water-d_2
Catalysts: Bis(η^6-benzene)di-μ-chlorodichlorodiruthenium
Solvents: Dimethyl sulfoxide; 3 h, 150 °C

One-step exchange-labeling of piperidines, piperazines and dialkylamines with deuterium oxide: catalysis by various ruthenium complexes

By: Alexakis, Efstathios; et al

Tetrahedron Letters (2005), 46(25), 4291-4293.

31-614-CAS-28268486

Steps: **1**

1.1 **Reagents:** Water-d_2
Catalysts: Hexacarbonyldi-μ-chlorodichlorodiruthenium
Solvents: Dimethyl sulfoxide; 3 h, 150 °C

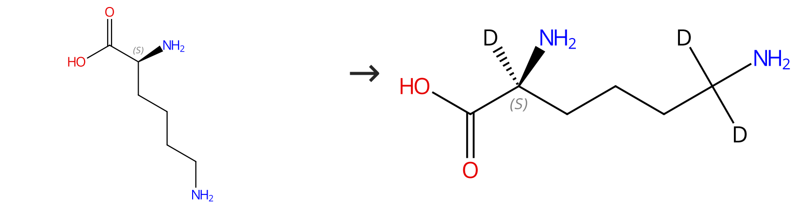
One-step exchange-labeling of piperidines, piperazines and dialkylamines with deuterium oxide: catalysis by various ruthenium complexes

By: Alexakis, Efstathios; et al

Tetrahedron Letters (2005), 46(25), 4291-4293.

Scheme 3 (1 Reaction)

Steps: 1 Yield: 63%



Suppliers (122)

31-116-CAS-17957982

Steps: 1 Yield: 63%

1.1 **Reagents:** Potassium carbonate, Hydrogen, Water- d_2
Catalysts: Ruthenium; 34 h, 70 °C; 70 °C → rt

1.2 **Reagents:** Dowex 50W-X8; pH 5 - 6, rt

Experimental Protocols

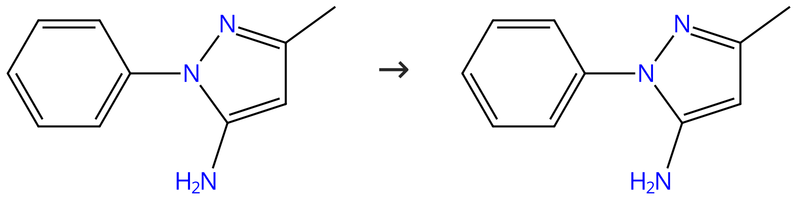
Development and Scale-Up of Stereoretentive α-Deuteration of Amines

By: Michelotti, Alessia; et al

Organic Process Research & Development (2017), 21(11), 1741-1744.

Scheme 4 (1 Reaction)

Steps: 1 Yield: 62%



Suppliers (98)

31-614-CAS-40734993

Steps: 1 Yield: 62%

1.1 **Reagents:** Zinc acetate, Water- d_2
Catalysts: Bis(dichloro(η^6-*p*-cymene)ruthenium)
Solvents: Ethanol; 8 h, 70 °C

Experimental Protocols

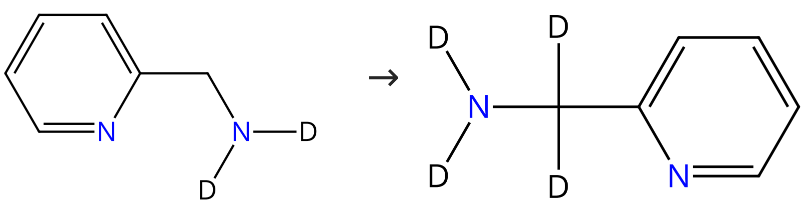
Ru(II)-catalyzed cyclization of 1-aryl-5-aminopyrazoles and α-diazolidinones for one-pot synthesis of benzopyrazole[1,3] diazepines in H_2O/EtOH

By: Liu, Fu-Rao; et al

Tetrahedron (2024), 160, 134047.

Scheme 5 (1 Reaction)

Steps: 1 Yield: 62%



31-116-CAS-16606077

Steps: 1 Yield: 62%

1.1 **Catalysts:** Ruthenium, μ-chlorodichloro-μ-hydrobis[(1,2,3,4,5,6-η)-1-methyl-4-(1-methylethyl)benzene]di-, (*Ru-Ru*)
Solvents: 1,4-Dioxane, Water- d_2; 24 h, 135 °C

Experimental Protocols

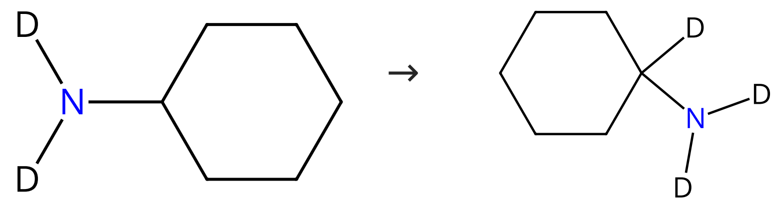
Selective α-Deuteration of Amines and Amino Acids Using D_2O

By: Chatterjee, Basujit; et al

Organic Letters (2016), 18(22), 5892-5895.

Scheme 6 (1 Reaction)

Steps: **1** Yield: **62%**



31-116-CAS-16606099 Steps: **1** Yield: **62%**

1.1 **Catalysts:** Ruthenium, μ-chlorodichloro-μ-hydrobis[(1,2,3,4,5,6-η)-1-methyl-4-(1-methylethyl)benzene]di-, (*Ru-Ru*)
Solvents: 1,4-Dioxane, Water-d_2; 24 h, 135 °C

Experimental Protocols

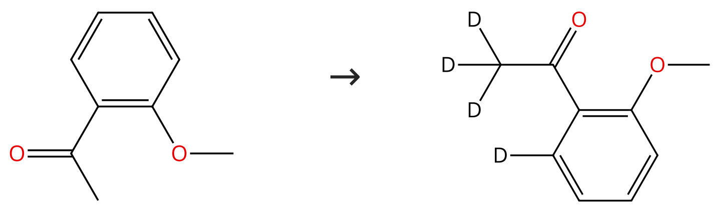
Selective α-Deuteration of Amines and Amino Acids Using D_2O

By: Chatterjee, Basujit; et al

Organic Letters (2016), 18(22), 5892-5895.

Scheme 7 (1 Reaction)

Steps: **1** Yield: **62%**



Suppliers (93)

31-116-CAS-24181545 Steps: **1** Yield: **62%**

1.1 **Reagents:** Water-d_2
Catalysts: 4-Chlorobenzoic acid, Silver hexafluoroantimonate, Bis(dichloro(η^6-*p*-cymene)ruthenium), 2-Methyl-3-(trifluoromethyl)aniline
Solvents: 1,2-Dichloroethane; rt → 120 °C; 16 h, 120 °C

Experimental Protocols

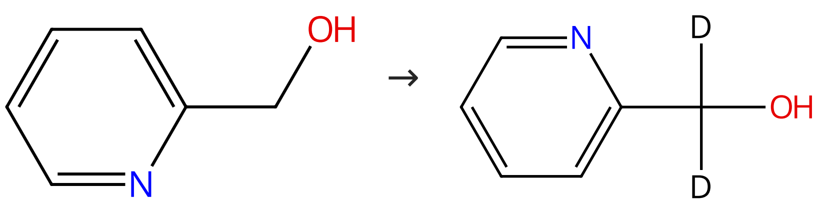
Ruthenium-Catalyzed Deuteration of Aromatic Carbonyl Compounds with a Catalytic Transient Directing Group

By: Kopf, Sara; et al

Chemistry - A European Journal (2021), 27(38), 9768-9773.

Scheme 8 (1 Reaction)

Steps: **1** Yield: **62%**



Suppliers (94)

31-116-CAS-5469679 Steps: **1** Yield: **62%**

1.1 **Reagents:** Water-d_2
Catalysts: Dichlorobis(triphenylphosphine)ruthenium; 30 min, 10 atm, 150 °C

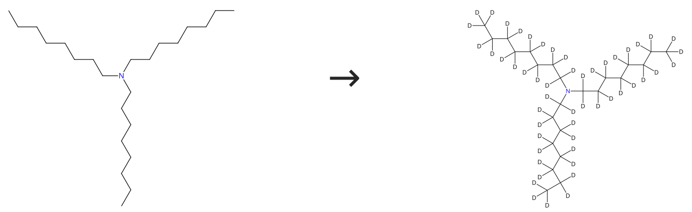
Ruthenium catalyzed deuterium labeling of α-carbon in primary alcohol and primary/secondary amine in D_2O

By: Takahashi, Masaaki; et al

Chemistry Letters (2005), 34(2), 192-193.

Scheme 9 (1 Reaction)

Steps: **1** Yield: **61%**



Suppliers (87)

31-614-CAS-40361327

Steps: **1** Yield: **61%**

1.1 **Reagents:** Water-d_2
Catalysts: Platinum, Ruthenium
Solvents: Isopropanol; 24 h, 120 °C

Experimental Protocols

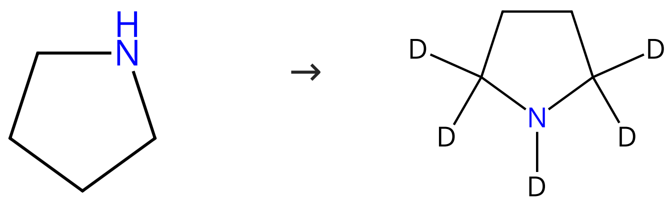
Unprecedented Regioselective Deuterium-Incorporation of Alkyltrimethylammonium Chlorides and Raman Analysis

By: Sawama, Yoshinari; et al

Asian Journal of Organic Chemistry (2023), 12(3), e202200710.

Scheme 10 (1 Reaction)

Steps: **1** Yield: **61%**



Suppliers (81)

31-116-CAS-16606105

Steps: **1** Yield: **61%**

1.1 **Catalysts:** Ruthenium, μ-chlorodichloro-μ-hydrobis[(1,2,3,4,5,6-η)-1-methyl-4-(1-methylethyl)benzene]di-, (*Ru-Ru*)
Solvents: 1,4-Dioxane, Water-d_2; 24 h, 135 °C

Experimental Protocols

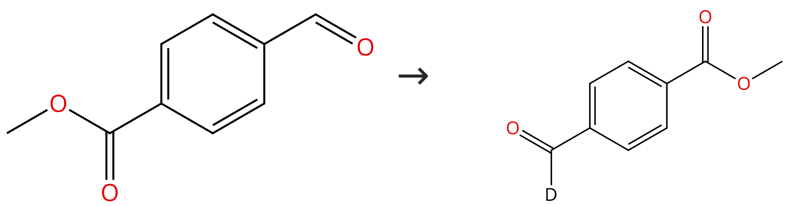
Selective α-Deuteration of Amines and Amino Acids Using D_2O

By: Chatterjee, Basujit; et al

Organic Letters (2016), 18(22), 5892-5895.

Scheme 11 (1 Reaction)

Steps: **1** Yield: **60%**



Suppliers (107)

31-116-CAS-18937441

Steps: **1** Yield: **60%**

1.1 **Reagents:** Water-d_2
Catalysts: Carbonylchlorohydrotris(triphenylphosphine) ruthenium
Solvents: Toluene; rt → 100 °C; 30 min, 100 °C

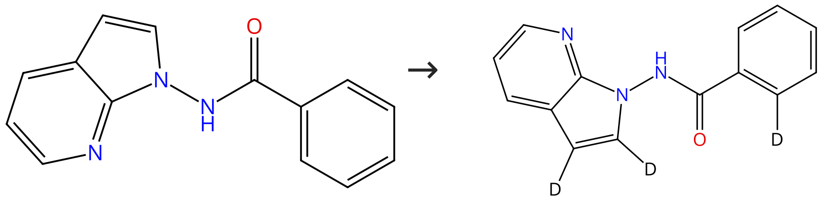
Catalytic Deuteration of Aldehydes with D 2 O

By: Isbrandt, Eric S.; et al

Synlett (2017), 28(20), 2851-2854.

Scheme 12 (1 Reaction)

Steps: **1** Yield: **60%**



31-116-CAS-20701820

Steps: **1** Yield: **60%**

1.1 **Reagents:** Cupric acetate, Silver hexafluoroantimonate
Catalysts: Bis(dichloro(η[6]-*p*-cymene)ruthenium)
Solvents: 1,2-Dichloroethane, Water-d_2; 16 h, 120 °C

Experimental Protocols

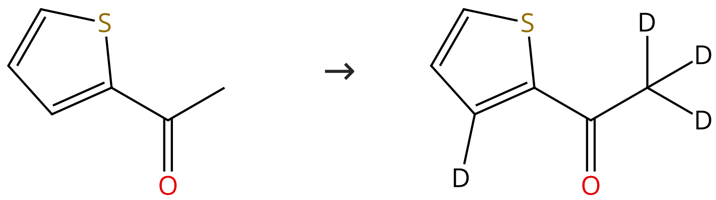
N-Amino-7-azaindole as the N,N'-Bidentate Directing Group: Ruthenium-Catalyzed Oxidative Annulation of N-(7-Azaindole) benzamides with Alkynes via C-H Bond Activation

By: Sagara, Prateep Singh; et al

Journal of Organic Chemistry (2019), 84(19), 12314-12323.

Scheme 13 (1 Reaction)

Steps: **1** Yield: **60%**



Suppliers (80)

31-116-CAS-24182115

Steps: **1** Yield: **60%**

1.1 **Reagents:** Water-d_2
Catalysts: 4-Chlorobenzoic acid, Silver hexafluoroantimonate, Bis(dichloro(η[6]-*p*-cymene)ruthenium), 2-Methyl-3-(trifluor omethyl)aniline
Solvents: 1,2-Dichloroethane; rt → 120 °C; 16 h, 120 °C

Experimental Protocols

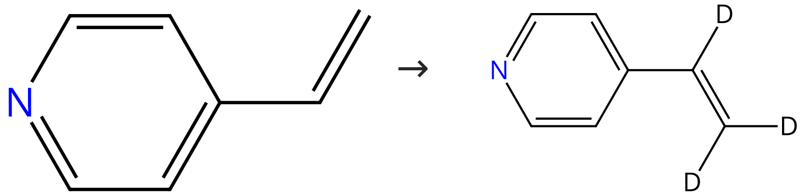
Ruthenium-Catalyzed Deuteration of Aromatic Carbonyl Compounds with a Catalytic Transient Directing Group

By: Kopf, Sara; et al

Chemistry - A European Journal (2021), 27(38), 9768-9773.

Scheme 14 (1 Reaction)

Steps: **1** Yield: **59%**



Suppliers (65)

Supplier (1)

31-116-CAS-14912359

Steps: **1** Yield: **59%**

1.1 **Reagents:** Water-d_2
Catalysts: (*OC*-6-34)-Carbonylchlorohydrotris(triphenyl phosphine)ruthenium
Solvents: 1,4-Dioxane; 69 h, 100 °C

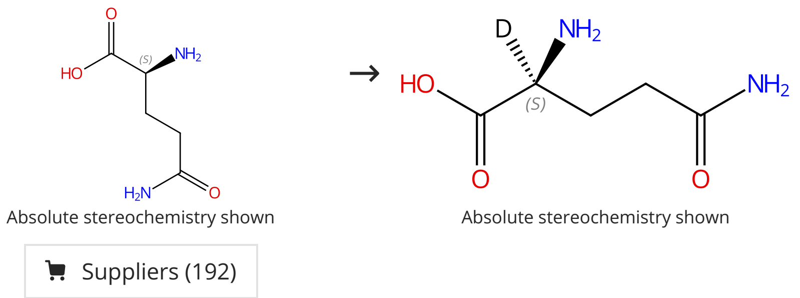
Experimental Protocols

Hydrogen/Deuterium Exchange Reactions of Olefins with Deuterium Oxide Mediated by the Carbonylchlorohydridotris (triphenylphosphine)ruthenium(II) Complex

By: Tse, Sunny Kai San; et al

Advanced Synthesis & Catalysis (2010), 352(9), 1512-1522.

Scheme 15 (1 Reaction) Steps: **1** Yield: **59%**



31-116-CAS-7005009 Steps: **1** Yield: **59%**

1.1 **Reagents:** Deuterium
Catalysts: Ruthenium
Solvents: Water-d_2; 36 h, 2 bar, 55 °C

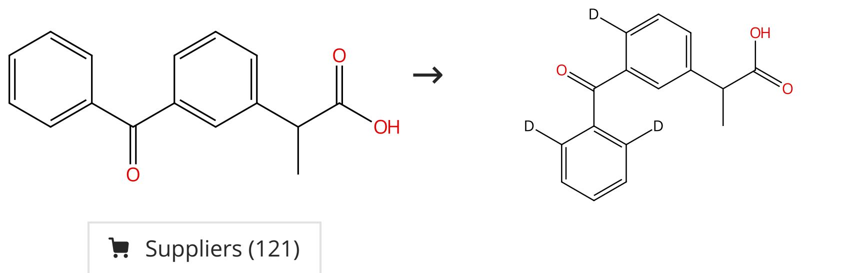
Experimental Protocols

Enantiospecific C-H activation using ruthenium nanocatalysts

By: Taglang, Celine; et al

Angewandte Chemie, International Edition (2015), 54(36), 10474-10477.

Scheme 16 (1 Reaction) Steps: **1** Yield: **58%**



31-116-CAS-24182293 Steps: **1** Yield: **58%**

1.1 **Reagents:** Water-d_2
Catalysts: 4-Chlorobenzoic acid, Silver hexafluoroantimonate, Bis(dichloro(η^6-*p*-cymene)ruthenium), 2-Methyl-3-(trifluoromethyl)aniline
Solvents: 1,2-Dichloroethane; rt → 120 °C; 16 h, 120 °C

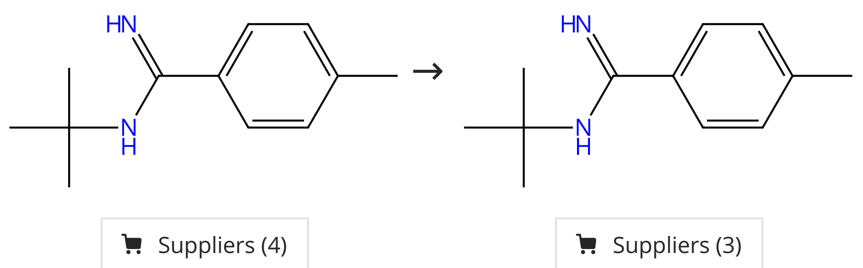
Experimental Protocols

Ruthenium-Catalyzed Deuteration of Aromatic Carbonyl Compounds with a Catalytic Transient Directing Group

By: Kopf, Sara; et al

Chemistry - A European Journal (2021), 27(38), 9768-9773.

Scheme 17 (1 Reaction) Steps: **1** Yield: **58%**



31-614-CAS-27039826 Steps: **1** Yield: **58%**

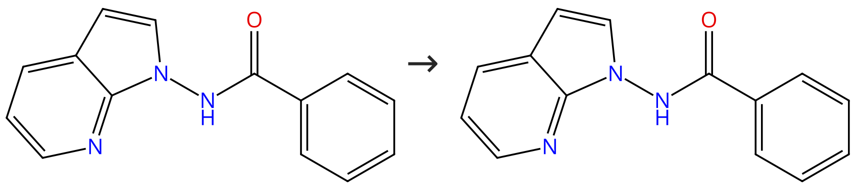
1.1 **Reagents:** Copper diacetate monohydrate
Catalysts: Potassium hexafluorophosphate, Bis(dichloro(η^6-*p*-cymene)ruthenium)
Solvents: 1,2-Dimethoxyethane, Water-d_2; 30 min, 120 °C

Amidines for versatile ruthenium(II)-catalyzed oxidative C-H activations with internal alkynes and acrylates

By: Li, Jie; et al

Chemistry - A European Journal (2014), 20(18), 5403-5408.

Scheme 18 (2 Reactions) Steps: **1** Yield: **52-57%**



31-614-CAS-26748514 Steps: **1** Yield: **57%**

1.1 **Reagents:** Copper diacetate monohydrate, Water-d_2
Catalysts: Silver hexafluoroantimonate, Bis(dichloro(η^6-*p*-cymene)ruthenium)
Solvents: 1,2-Dichloroethane; 12 h, 140 °C

Experimental Protocols

Ruthenium-Catalyzed Regioselective C(sp^2)-H Activation/Annulation of N-(7-Azaindole)amides with 1,3-Diynes Using N-Amino-7-azaindole as the N,N-Bidentate Directing Group

By: Pati, Bedadyuti Vedvyas; et al

Journal of Organic Chemistry (2021), 86(14), 9428-9443.

31-614-CAS-29381088 Steps: **1** Yield: **52%**

1.1 **Reagents:** Lithium carbonate (Li_2CO_3), Copper oxide (CuO), Water-d_2
Catalysts: Bis(dichloro(η^6-*p*-cymene)ruthenium)
Solvents: 1,2-Dichloroethane; 12 h, 140 °C

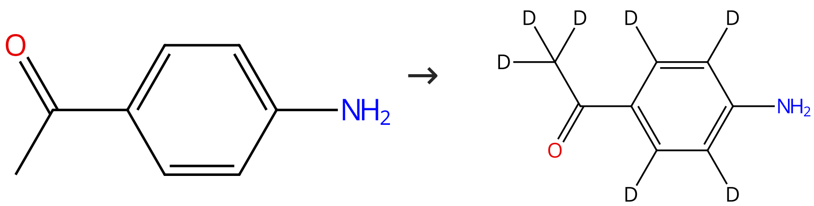
Experimental Protocols

Ruthenium-Catalyzed Cross Dehydrogenative Annulation of N-(7-Azaindole)benzamides with Maleimides: One-Step Access to Highly Functionalized Pyrroloisoquinoline

By: Pati, Bedadyuti Vedvyas; et al

Journal of Organic Chemistry (2021), 86(9), 6551-6565.

Scheme 19 (1 Reaction) Steps: **1** Yield: **57%**



Suppliers (113)   Suppliers (5)

31-116-CAS-24181591 Steps: **1** Yield: **57%**

1.1 **Reagents:** Water-d_2
Catalysts: 4-Chlorobenzoic acid, Silver hexafluoroantimonate, Bis(dichloro(η^6-*p*-cymene)ruthenium), 2-Methyl-3-(trifluoromethyl)aniline
Solvents: 1,2-Dichloroethane; rt → 120 °C; 16 h, 120 °C

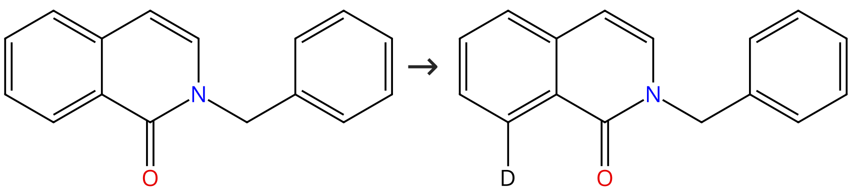
Experimental Protocols

Ruthenium-Catalyzed Deuteration of Aromatic Carbonyl Compounds with a Catalytic Transient Directing Group

By: Kopf, Sara; et al

Chemistry - A European Journal (2021), 27(38), 9768-9773.

Scheme 20 (1 Reaction) Steps: **1** Yield: **56%**



Suppliers (4)

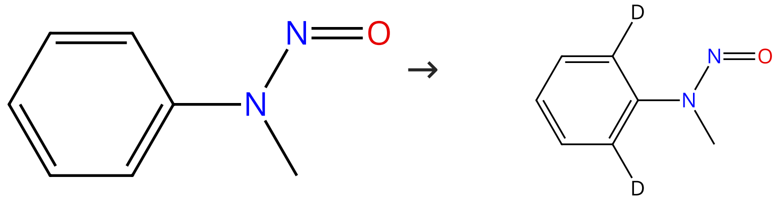
31-614-CAS-42624887	Steps: **1** Yield: **56%**
1.1	**Reagents:** Cupric acetate, Water-d_2 **Catalysts:** Silver hexafluoroantimonate, Bis(dichloro(η^6-*p*-cymene)ruthenium) **Solvents:** Dimethyl carbonate; 2 h, 80 °C
Experimental Protocols	

Ru(II)-Catalyzed C8 Alkenylation of Isoquinolones with Allyl Alcohol

By: Manisha; et al

Asian Journal of Organic Chemistry (2024), 13(12), e202400407.

Scheme 21 (1 Reaction) Steps: **1** Yield: **56%**



Suppliers (75)

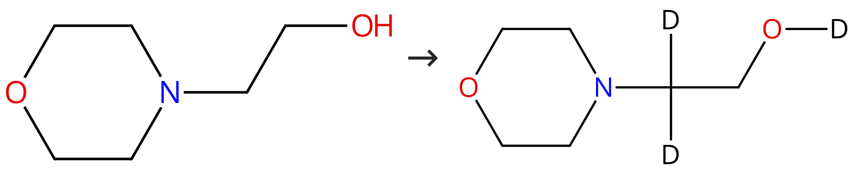
31-116-CAS-20975882	Steps: **1** Yield: **56%**
1.1	**Reagents:** Sodium acetate, Cupric acetate, Water-d_2, Potassium hexafluorophosphate **Catalysts:** Bis(dichloro(η^6-*p*-cymene)ruthenium) **Solvents:** Water; 24 h, 120 °C
Experimental Protocols	

Ruthenium(II)-Catalyzed C-H Bond [3+2] Annulation of N-Nitrosoanilines with Alkynes in Water

By: Chen, Xun; et al

Asian Journal of Organic Chemistry (2019), 8(12), 2209-2212.

Scheme 22 (1 Reaction) Steps: **1** Yield: **56%**



Suppliers (94)

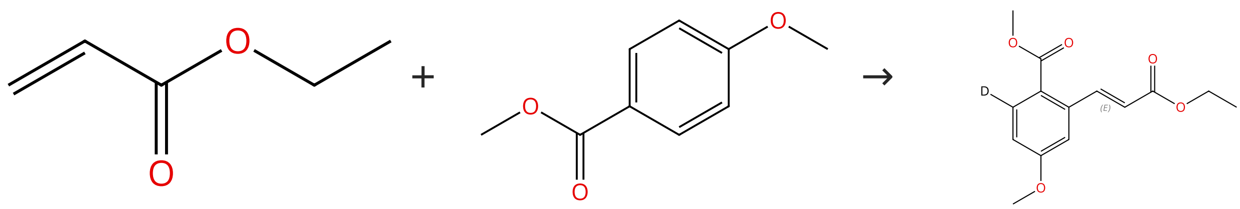
31-116-CAS-12970941	Steps: **1** Yield: **56%**
1.1	**Reagents:** Water-d_2 **Catalysts:** Potassium hydroxide, Ruthenium(1+), [2-(amino-κ*N*)ethanol-κ*O*]chloro[(1,2,3,4,5,6-η)-1-methyl-4-(1-methylethyl)benzene]-, chloride, compd. with [2-(amino-κ*N*)ethanolato-κ*O*]chloro[(1,2,3,4,5,6-η)-1-methyl-4-(1-methylethyl)benzene]ruthenium (1:1:1); 9.5 h, 80 °C
Experimental Protocols	

Ruthenium-Catalyzed Regioselective Deuteration of Alcohols at the β-Carbon Position with Deuterium Oxide

By: Tse, Sunny Kai San; et al

Chemistry - A European Journal (2011), 17(49), 13918-13925, S13918/1-S13918/12.

Scheme 23 (1 Reaction) Steps: **1** Yield: **55%**



Suppliers (76) Suppliers (91)

Double bond geometry shown

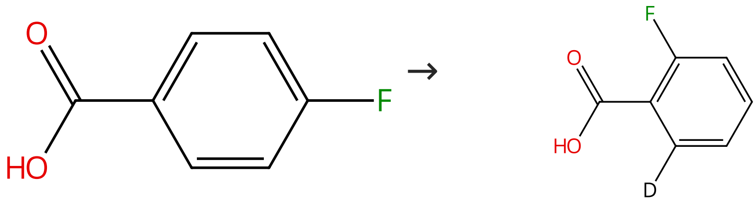
31-116-CAS-1647385	Steps: **1** Yield: **55%**
1.1 **Reagents:** Cupric acetate, Oxygen **Catalysts:** Silver hexafluoroantimonate, Bis(dichloro(η^6-*p*-cymene)ruthenium) **Solvents:** 1,2-Dichloroethane, Water-d_2; 5 min, rt; 16 h, 100 °C	
Experimental Protocols	

Oxidative Alkenylation of Aromatic Esters by Ruthenium-Catalyzed Twofold C-H Bond Cleavages

By: Graczyk, Karolina; et al

Organic Letters (2012), 14(16), 4110-4113.

Scheme 24 (1 Reaction) Steps: **1** Yield: **55%**



Suppliers (104)

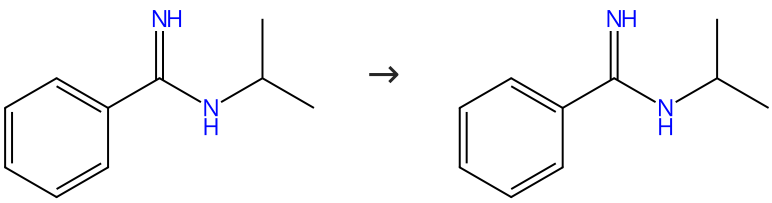
31-113-CAS-18489418	Steps: **1** Yield: **55%**
1.1 **Reagents:** Potassium carbonate, Water-d_2 **Catalysts:** Bis(dichloro(η^6-*p*-cymene)ruthenium); 23 h, 90 °C	
Experimental Protocols	

Mild Decarboxylative C-H Alkylation: Computational Insights for Solvent-Robust Ruthenium(II) Domino Manifold

By: Kumar, N. Y. Phani; et al

Chemistry - A European Journal (2017), 23(69), 17449-17453.

Scheme 25 (1 Reaction) Steps: **1** Yield: **55%**



Suppliers (10)

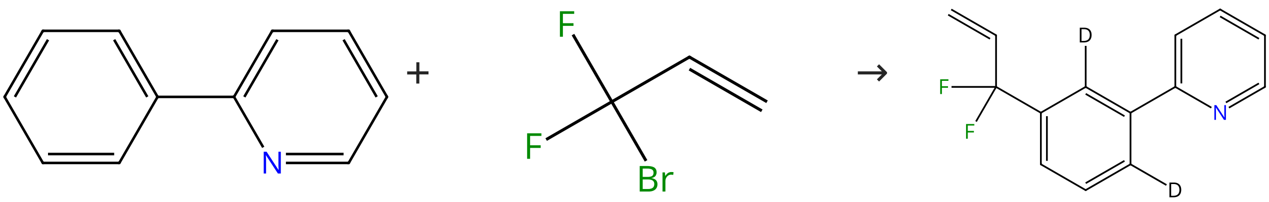
31-614-CAS-38401504	Steps: **1** Yield: **55%**
1.1 **Reagents:** Phenoxyacetic acid, Water-d_2 **Catalysts:** Silver hexafluoroantimonate, Bis(dichloro(η^6-*p*-cymene)ruthenium) **Solvents:** 1,2-Dichloroethane; 13 h, 40 °C	
Experimental Protocols	

Identification of novel 3-aryl-1-aminoisoquinolines-based KRA S^{G12C} inhibitors: rational drug design and expedient constr uction by C-H functionalization/annulation

By: Gong, Zirong; et al

Bioorganic Chemistry (2024), 142, 106954.

Scheme 26 (1 Reaction) Steps: **1** Yield: **54%**



Suppliers (93) Suppliers (48)

31-614-CAS-36702070 Steps: **1** Yield: **54%**

1.1 **Reagents:** Rubidium carbonate
Catalysts: 1-Adamantanecarboxylic acid, Bis(dichloro(η^6-*p*-cymene)ruthenium), 2934809-73-9
Solvents: Cyclohexane; 10 min, rt

1.2 **Reagents:** Water-d_2; 12 h, 70 °C

Experimental Protocols

Ruthenium-Catalyzed Ligand-Enabled Regiodivergent Difluoroallylation of Aryl C-H Bonds

By: Shi, Chang-Yun; et al

Organic Letters (2023), 25(21), 3870-3875.

Scheme 27 (1 Reaction) Steps: **1** Yield: **54%**

31-116-CAS-16606108 Steps: **1** Yield: **54%**

1.1 **Catalysts:** Ruthenium, μ-chlorodichloro-μ-hydrobis[(1,2,3,4,5,6-η)-1-methyl-4-(1-methylethyl)benzene]di-, (*Ru-Ru*)
Solvents: 1,4-Dioxane, Water-d_2; 24 h, 150 °C

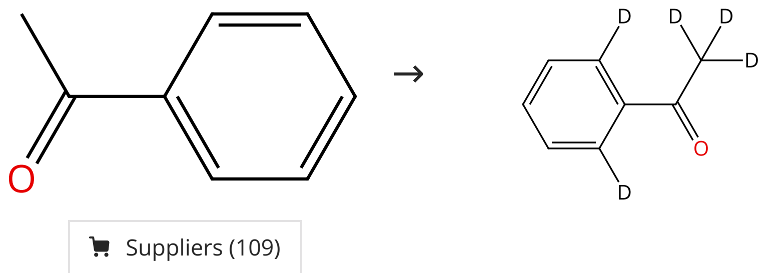
Experimental Protocols

Selective α-Deuteration of Amines and Amino Acids Using D_2O

By: Chatterjee, Basujit; et al

Organic Letters (2016), 18(22), 5892-5895.

Scheme 28 (1 Reaction) Steps: **1** Yield: **54%**



31-614-CAS-24175226 Steps: **1** Yield: **54%**

1.1 **Reagents:** Water-d_2
Catalysts: 4-Chlorobenzoic acid, Silver hexafluoroantimonate, Bis(dichloro(η^6-*p*-cymene)ruthenium), 2-Methyl-3-(trifluoromethyl)aniline
Solvents: 1,2-Dichloroethane; rt → 120 °C; 16 h, 120 °C

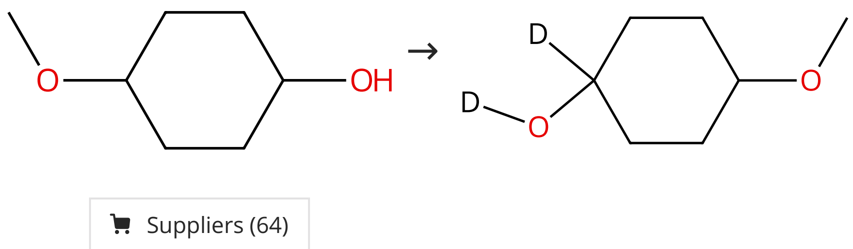
Experimental Protocols

Ruthenium-Catalyzed Deuteration of Aromatic Carbonyl Compounds with a Catalytic Transient Directing Group

By: Kopf, Sara; et al

Chemistry - A European Journal (2021), 27(38), 9768-9773.

Scheme 29 (1 Reaction) Steps: **1** Yield: **53%**



31-116-CAS-16030363 Steps: **1** Yield: **53%**

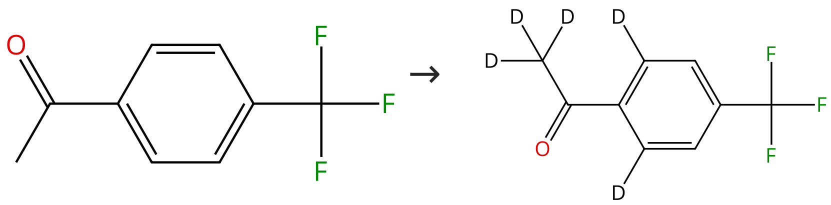
1.1 **Reagents:** Water-*d*$_2$
Catalysts: Ruthenium; 3 h, pH 7 - 12, 60 °C

Stereoretentive H/D Exchange via an Electroactivated Heterogeneous Catalyst at sp^3 C-H Sites Bearing Amines or Alcohols

By: Bhatia, Souful; et al

European Journal of Organic Chemistry (2016), 2016(24), 4230-4235.

Scheme 30 (1 Reaction) Steps: **1** Yield: **53%**



Suppliers (91)

31-116-CAS-24181727 Steps: **1** Yield: **53%**

1.1 **Reagents:** Water-*d*$_2$
Catalysts: 4-Chlorobenzoic acid, Silver hexafluoroantimonate, Bis(dichloro(η^6-*p*-cymene)ruthenium), 2-Methyl-3-(trifluoromethyl)aniline
Solvents: 1,2-Dichloroethane; rt → 120 °C; 16 h, 120 °C

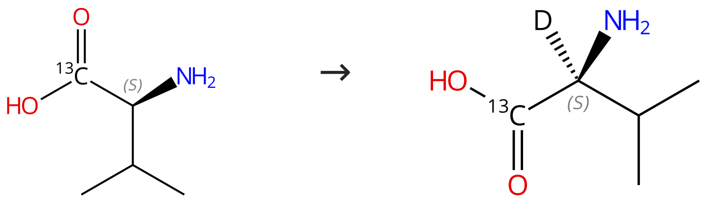
Experimental Protocols

Ruthenium-Catalyzed Deuteration of Aromatic Carbonyl Compounds with a Catalytic Transient Directing Group

By: Kopf, Sara; et al

Chemistry - A European Journal (2021), 27(38), 9768-9773.

Scheme 31 (1 Reaction) Steps: **1** Yield: **53%**



Absolute stereochemistry shown

Absolute stereochemistry shown

Suppliers (36)

31-116-CAS-20212407 Steps: **1** Yield: **53%**

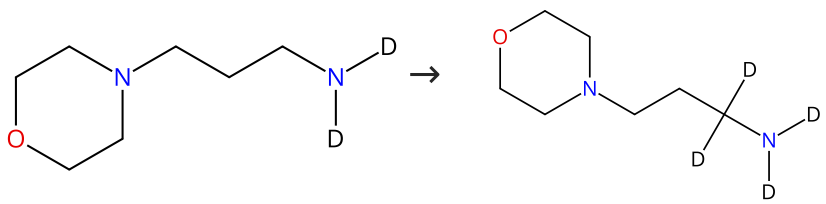
1.1 **Reagents:** Hydrogen, Water-*d*$_2$
Catalysts: Ruthenium carbide; 16 h, 1 atm, 80 °C

Late-stage deuteration of ^{13}C-enriched substrates for T_1 prolongation in hyperpolarized ^{13}C MRI

By: Taglang, Celine; et al

Chemical Communications (Cambridge, United Kingdom) (2018), 54(41), 5233-5236.

Scheme 32 (1 Reaction) Steps: **1** Yield: **52%**



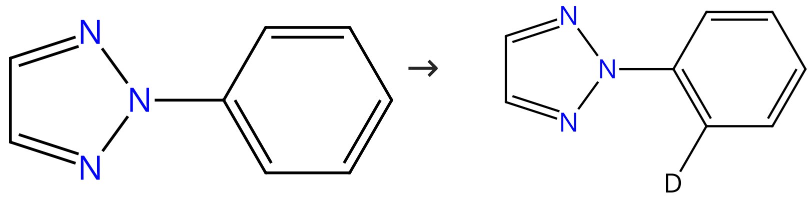
31-116-CAS-16606100	Steps: **1** Yield: **52%**
1.1 **Catalysts:** Ruthenium, μ-chlorodichloro-μ-hydrobis[(1,2,3,4,5,6-η)-1-methyl-4-(1-methylethyl)benzene]di-, (*Ru-Ru*) **Solvents:** 1,4-Dioxane, Water-d_2; 24 h, 150 °C	
Experimental Protocols	

Selective α-Deuteration of Amines and Amino Acids Using D_2O

By: Chatterjee, Basujit; et al

Organic Letters (2016), 18(22), 5892-5895.

Scheme 33 (1 Reaction) Steps: **1** Yield: **52%**



Suppliers (48)

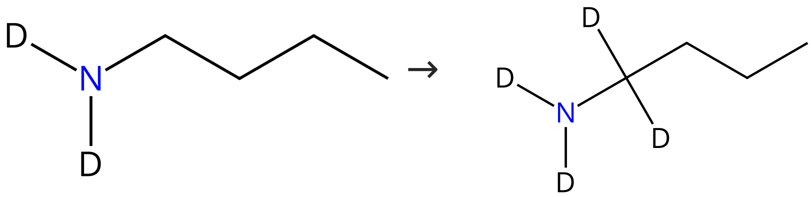
31-116-CAS-19035754	Steps: **1** Yield: **52%**
1.1 **Reagents:** Cupric acetate, Water-d_2 **Catalysts:** Bis(dichloro(η^6-*p*-cymene)ruthenium), [1,1,1-Trifluoro-*N*-[(trifluoromethyl)sulfonyl-κ*O*]methanesulfonamidato-κ*O*]silver **Solvents:** Water; 300 min, 120 °C	
Experimental Protocols	

Controlled mono-olefination versus diolefination of arenes via C-H activation in water: a key role of catalysts

By: Zhang, Hailong; et al

Green Chemistry (2018), 20(13), 3140-3146.

Scheme 34 (1 Reaction) Steps: **1** Yield: **51%**



Supplier (1)

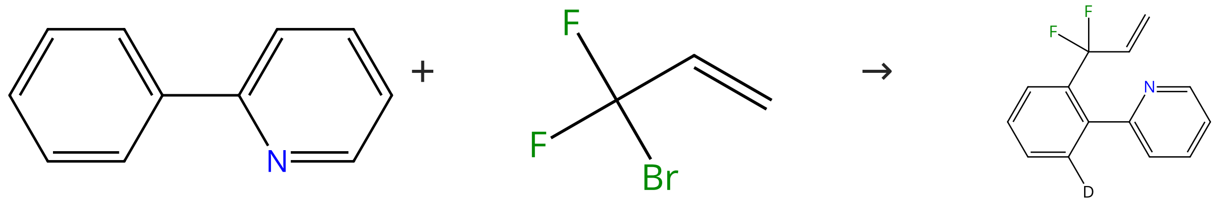
31-116-CAS-16606079	Steps: **1** Yield: **51%**
1.1 **Catalysts:** Ruthenium, μ-chlorodichloro-μ-hydrobis[(1,2,3,4,5,6-η)-1-methyl-4-(1-methylethyl)benzene]di-, (*Ru-Ru*) **Solvents:** 1,4-Dioxane, Water-d_2; 24 h, 135 °C	
Experimental Protocols	

Selective α-Deuteration of Amines and Amino Acids Using D_2O

By: Chatterjee, Basujit; et al

Organic Letters (2016), 18(22), 5892-5895.

Scheme 35 (1 Reaction) Steps: **1** Yield: **50%**



Suppliers (93) Suppliers (48)

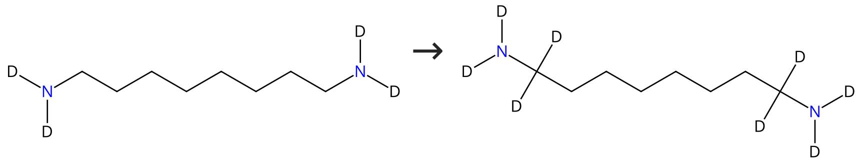
31-614-CAS-36702073	Steps: **1** Yield: **50%**
1.1	**Reagents:** 2,6-Lutidine **Catalysts:** Silver acetate, Dichlorotris(triphenylphosphine) ruthenium **Solvents:** 2-Methyltetrahydrofuran; 10 min, rt
1.2	**Reagents:** Water-d_2; 12 h, 110 °C
Experimental Protocols	

Ruthenium-Catalyzed Ligand-Enabled Regiodivergent Difluoroallylation of Aryl C-H Bonds

By: Shi, Chang-Yun; et al

Organic Letters (2023), 25(21), 3870-3875.

Scheme 36 (1 Reaction) Steps: **1** Yield: **49%**



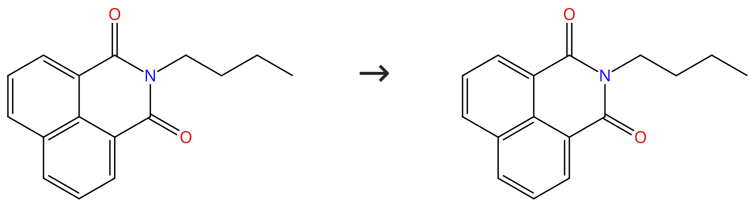
31-116-CAS-16606101	Steps: **1** Yield: **49%**
1.1	**Catalysts:** Ruthenium, μ-chlorodichloro-μ-hydrobis[(1,2,3,4,5,6-η)-1-methyl-4-(1-methylethyl)benzene]di-, (*Ru-Ru*) **Solvents:** 1,4-Dioxane, Water-d_2; 24 h, 135 °C
Experimental Protocols	

Selective α-Deuteration of Amines and Amino Acids Using D_2O

By: Chatterjee, Basujit; et al

Organic Letters (2016), 18(22), 5892-5895.

Scheme 37 (1 Reaction) Steps: **1** Yield: **49%**



Suppliers (10)

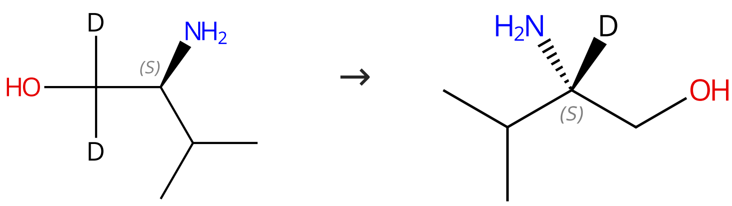
31-614-CAS-31532684	Steps: **1** Yield: **49%**
1.1	**Reagents:** Silver acetate, Water-d_2, Silver hexafluoro antimonate **Catalysts:** Bis(dichloro(η^6-*p*-cymene)ruthenium) **Solvents:** 1,2-Dichloroethane; 48 h, 100 °C
Experimental Protocols	

Ruthenium(II)-catalyzed C-H Alkenylation of 1,8-Naphtha limide with Cyclic Imide as a Weakly Coordi nating Directing Group

By: Thakur, Rekha; et al

Asian Journal of Organic Chemistry (2022), 11(3), e202100798.

Scheme 38 (1 Reaction) Steps: **1** Yield: **47%**



Absolute stereochemistry shown, Rotation (+)

Absolute stereochemistry shown

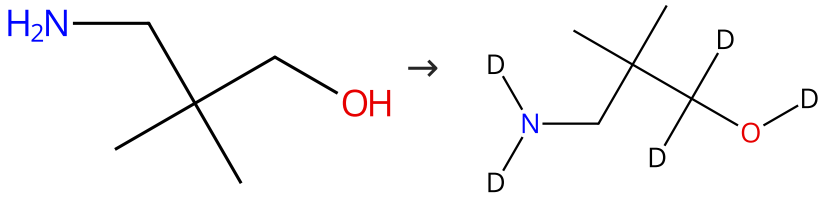
31-116-CAS-7658446	Steps: **1** Yield: **47%**
1.1	**Reagents:** Deuterium **Catalysts:** Ruthenium **Solvents:** Water-d_2; 36 h, 2 bar, 55 °C
Experimental Protocols	

Enantiospecific C-H activation using ruthenium nanocatalysts

By: Taglang, Celine; et al

Angewandte Chemie, International Edition (2015), 54(36), 10474-10477.

Scheme 39 (1 Reaction) Steps: **1** Yield: **47%**



Suppliers (77)

31-614-CAS-26083307 Steps: **1** Yield: **47%**

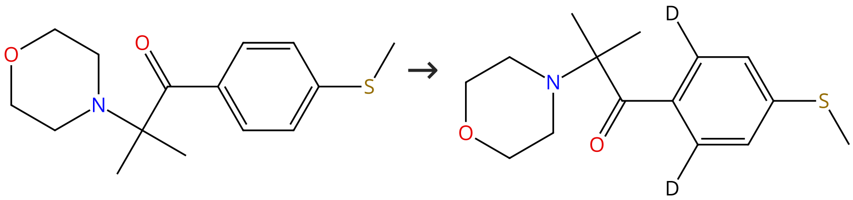
1.1 **Reagents:** Water-d_2
Catalysts: Ruthenium; 9 h, pH 12, 70 °C

Stereoretentive H/D Exchange via an Electroactivated Heterogeneous Catalyst at sp^3 C-H Sites Bearing Amines or Alcohols

By: Bhatia, Souful; et al

European Journal of Organic Chemistry (2016), 2016(24), 4230-4235.

Scheme 40 (1 Reaction) Steps: **1** Yield: **47%**



Suppliers (63)

31-116-CAS-24181421 Steps: **1** Yield: **47%**

1.1 **Reagents:** Water-d_2
Catalysts: 4-Chlorobenzoic acid, Silver hexafluoroantimonate, Bis(dichloro(η^6-*p*-cymene)ruthenium), 2-Methyl-3-(trifluoromethyl)aniline
Solvents: 1,2-Dichloroethane; rt → 120 °C; 16 h, 120 °C

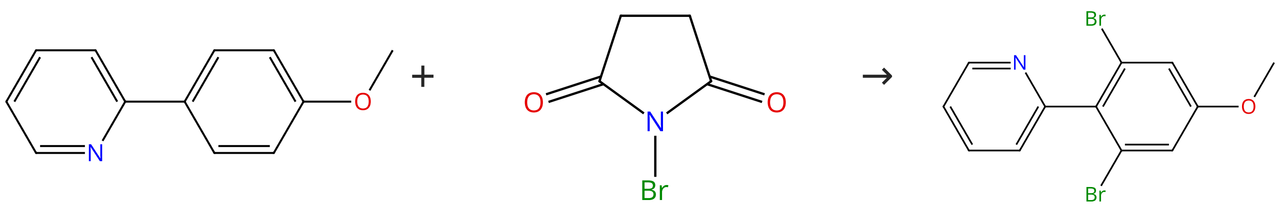
Experimental Protocols

Ruthenium-Catalyzed Deuteration of Aromatic Carbonyl Compounds with a Catalytic Transient Directing Group

By: Kopf, Sara; et al

Chemistry - A European Journal (2021), 27(38), 9768-9773.

Scheme 41 (1 Reaction) Steps: **1** Yield: **44%**



Suppliers (65) Suppliers (110)

31-084-CAS-22082363 Steps: **1** Yield: **44%**

1.1 **Reagents:** Bis(trifluoroacetoxy)iodobenzene
Catalysts: Ruthenium, di-μ-carbonyldicarbonylbis(η^5-2,4-cyclopentadien-1-yl)di-, (*Ru-Ru*)
Solvents: Toluene, Water-d_2; 5 h, 110 °C

1.2 **Reagents:** Sodium chloride
Solvents: Water

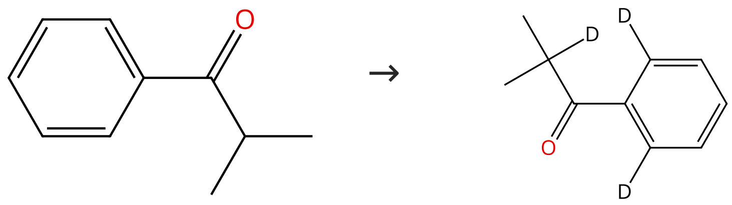
Experimental Protocols

Highly meta-selective halogenation of 2-phenylpyridine with a ruthenium(I) catalyst

By: Reddy, Ganapam Manohar; et al

Organic Chemistry Frontiers (2018), 5(7), 1118-1123.

Scheme 42 (1 Reaction) Steps: **1** Yield: **44%**



Suppliers (66)

31-116-CAS-24182218 Steps: **1** Yield: **44%**

1.1 **Reagents:** Water-*d*$_2$
Catalysts: 4-Chlorobenzoic acid, Silver hexafluoroantimonate, Bis(dichloro(η^6-*p*-cymene)ruthenium), 2-Methyl-3-(trifluor omethyl)aniline
Solvents: 1,2-Dichloroethane; rt → 120 °C; 16 h, 120 °C

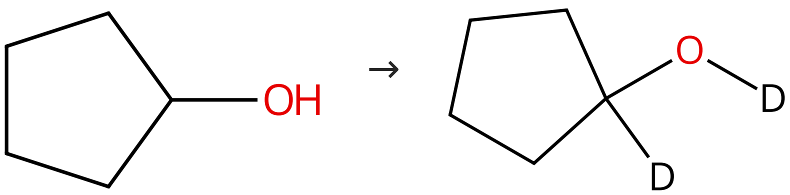
Experimental Protocols

Ruthenium-Catalyzed Deuteration of Aromatic Carbonyl Compounds with a Catalytic Transient Directing Group

By: Kopf, Sara; et al

Chemistry - A European Journal (2021), 27(38), 9768-9773.

Scheme 43 (1 Reaction) Steps: **1** Yield: **44%**



Suppliers (62)

31-116-CAS-16030361 Steps: **1** Yield: **44%**

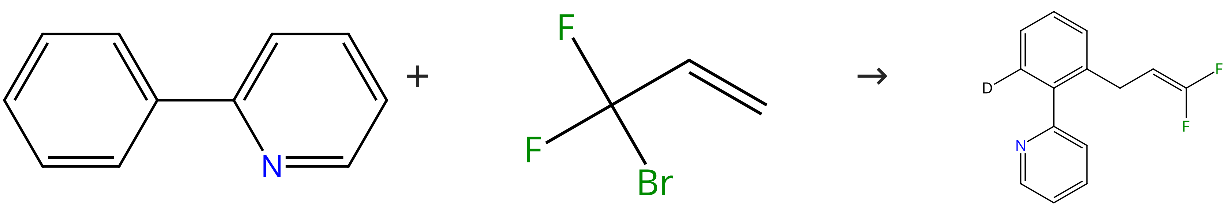
1.1 **Reagents:** Water-*d*$_2$
Catalysts: Ruthenium; 4 h, pH 7 - 12, 60 °C

Stereoretentive H/D Exchange via an Electroactivated Heterogeneous Catalyst at sp^3 C-H Sites Bearing Amines or Alcohols

By: Bhatia, Souful; et al

European Journal of Organic Chemistry (2016), 2016(24), 4230-4235.

Scheme 44 (1 Reaction) Steps: **1** Yield: **43%**



Suppliers (93) Suppliers (48)

31-614-CAS-36702071 Steps: **1** Yield: **43%**

1.1 **Reagents:** Tetrakis(acetonitrile)copper(1+) tetrafluoroborate
Catalysts: Silver phosphate, Bis(dichloro(η^6-*p*-cymene) ruthenium)
Solvents: 1,2-Dichloroethane, 1,1,1,3,3,3-Hexafluoro-2-propanol; 10 min, rt

1.2 **Reagents:** Water-*d*$_2$; 12 h, 75 °C

Experimental Protocols

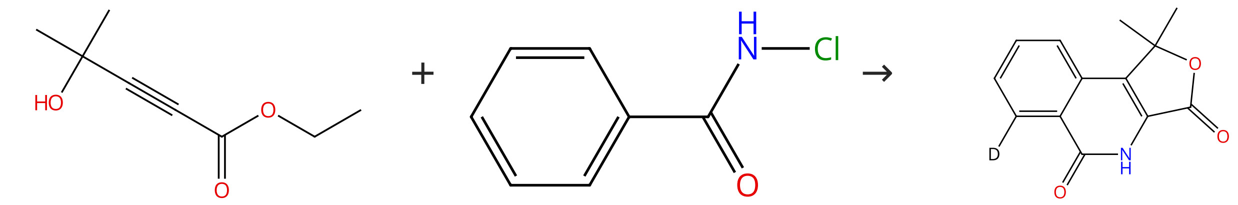
Ruthenium-Catalyzed Ligand-Enabled Regiodivergent Difluoroallylation of Aryl C-H Bonds

By: Shi, Chang-Yun; et al

Organic Letters (2023), 25(21), 3870-3875.

Scheme 45 (1 Reaction)

Steps: **1** Yield: **43%**



Suppliers (10)

Suppliers (5)

31-614-CAS-42385090

Steps: **1** Yield: **43%**

1.1 **Reagents:** Potassium acetate, Water-d_2
Catalysts: Bis(dichloro(η^6-*p*-cymene)ruthenium)
Solvents: Water; 5 min, rt

Experimental Protocols

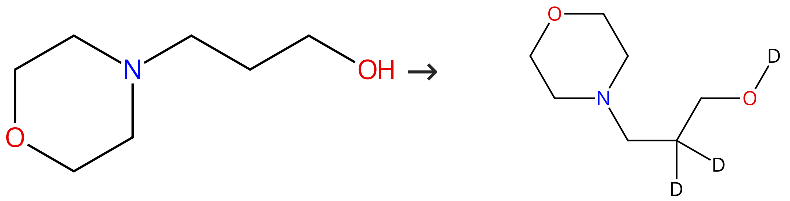
Ru-Catalyzed Redox-Neutral Coupling of N-Chlorobenzamides with Unsymmetrical Alkynes in Water

By: Saha, Sharajit; et al

Journal of Organic Chemistry (2024), 89(22), 16850-16864.

Scheme 46 (1 Reaction)

Steps: **1** Yield: **42%**



Suppliers (72)

31-116-CAS-10512281

Steps: **1** Yield: **42%**

1.1 **Reagents:** Water-d_2
Catalysts: Potassium hydroxide, Ruthenium(1+), [2-(amino-κ*N*)ethanol-κ*O*]chloro[(1,2,3,4,5,6-η)-1-methyl-4-(1-methylethyl)benzene]-, chloride, compd. with [2-(amino-κ*N*)ethanolato-κ*O*]chloro[(1,2,3,4,5,6-η)-1-methyl-4-(1-methylethyl)benzene]ruthenium (1:1:1); 8 h, 80 °C

Experimental Protocols

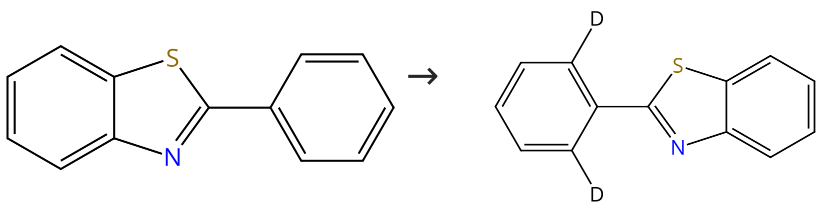
Ruthenium-Catalyzed Regioselective Deuteration of Alcohols at the β-Carbon Position with Deuterium Oxide

By: Tse, Sunny Kai San; et al

Chemistry - A European Journal (2011), 17(49), 13918-13925, S13918/1-S13918/12.

Scheme 47 (1 Reaction)

Steps: **1** Yield: **42%**



Suppliers (77)

31-614-CAS-39940575

Steps: **1** Yield: **42%**

1.1 **Reagents:** Potassium acetate, Water-d_2
Catalysts: Ruthenium(2+), aquapentakis(2,2-dimethylpropanenitrile)-, (*OC*-6-22)-, tetrafluoroborate(1-) (1:2)
Solvents: Tetrahydrofuran; 24 h, 40 °C

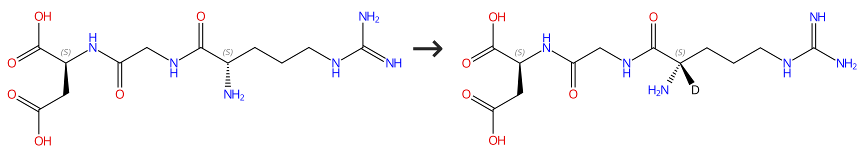
Experimental Protocols

An air- and moisture-stable ruthenium precatalyst for diverse reactivity

By: McArthur, Gillian; et al

Nature Chemistry (2024), 16(7), 1141-1150.

Scheme 48 (1 Reaction)
Steps: **1** Yield: **42%**



Absolute stereochemistry shown, Rotation (+)

Absolute stereochemistry shown

Suppliers (65)

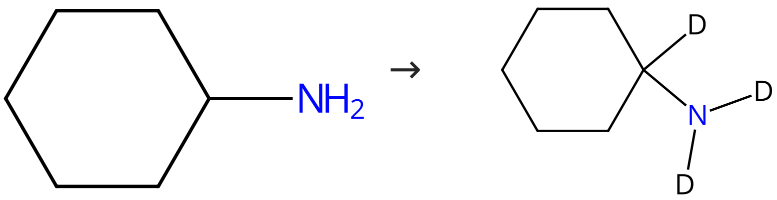
31-116-CAS-4933151	Steps: **1** Yield: **42%**
1.1	**Reagents:** Deuterium **Catalysts:** Ruthenium **Solvents:** Water-d_2; 36 h, 2 bar, 55 °C
Experimental Protocols	

Enantiospecific C-H activation using ruthenium nanocatalysts

By: Taglang, Celine; et al

Angewandte Chemie, International Edition (2015), 54(36), 10474-10477.

Scheme 49 (1 Reaction)
Steps: **1** Yield: **41%**



Suppliers (84)

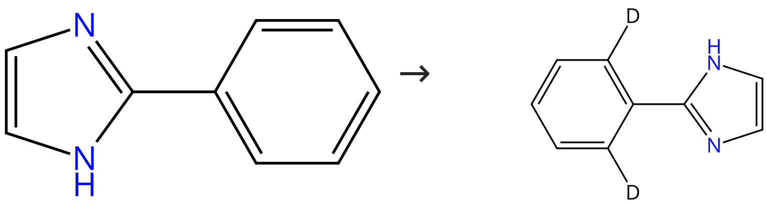
31-116-CAS-16030359	Steps: **1** Yield: **41%**
1.1	**Reagents:** Water-d_2 **Catalysts:** Ruthenium; 8 h, pH 7 - 12, 60 °C

Stereoretentive H/D Exchange via an Electroa ctivated Heterog eneous Catalyst at sp[3] C-H Sites Bearing Amines or Alcohols

By: Bhatia, Souful; et al

European Journal of Organic Chemistry (2016), 2016(24), 4230-4235.

Scheme 50 (1 Reaction)
Steps: **1** Yield: **41%**



Suppliers (94)

31-116-CAS-20984010	Steps: **1** Yield: **41%**
1.1	**Reagents:** Zinc, Water-d_2 **Catalysts:** Cuprous iodide, Dichlorotris(triphenylphosphine) ruthenium **Solvents:** 1,4-Dioxane; 16 h, 80 °C
Experimental Protocols	

Mild, Selective Ru-Catalyzed Deuteration Using D_2O as a Deuterium Source

By: Eisele, Pascal; et al

Chemistry - A European Journal (2019), 25(72), 16550-16554.

Scheme 51 (1 Reaction) Steps: **1** Yield: **41%**

Suppliers (103)

31-614-CAS-28602779 Steps: **1** Yield: **41%**

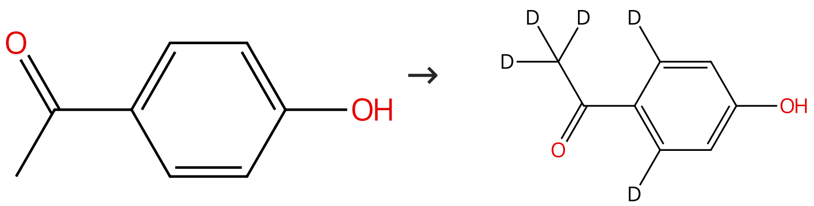
1.1 **Reagents:** Water-d_2
Catalysts: Ruthenium; 5 h, pH 7 - 12, 60 °C

Stereoretentive H/D Exchange via an Electroactivated Heterogeneous Catalyst at sp^3 C-H Sites Bearing Amines or Alcohols

By: Bhatia, Souful; et al

European Journal of Organic Chemistry (2016), 2016(24), 4230-4235.

Scheme 52 (1 Reaction) Steps: **1** Yield: **41%**



Suppliers (135)

31-116-CAS-24182357 Steps: **1** Yield: **41%**

1.1 **Reagents:** Water-d_2
Catalysts: 4-Chlorobenzoic acid, Silver hexafluoroantimonate, Bis(dichloro(η^6-*p*-cymene)ruthenium), 2-Methyl-3-(trifluoromethyl)aniline
Solvents: 1,2-Dichloroethane; rt → 120 °C; 16 h, 120 °C

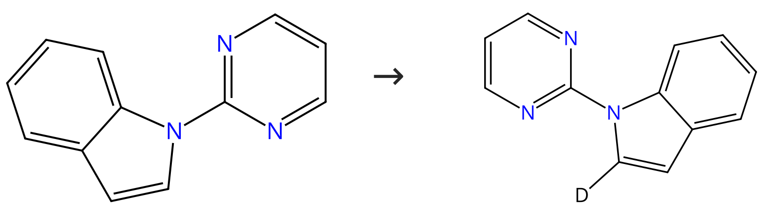
Experimental Protocols

Ruthenium-Catalyzed Deuteration of Aromatic Carbonyl Compounds with a Catalytic Transient Directing Group

By: Kopf, Sara; et al

Chemistry - A European Journal (2021), 27(38), 9768-9773.

Scheme 53 (1 Reaction) Steps: **1** Yield: **40%**



Suppliers (59) Suppliers (3)

31-116-CAS-18494173 Steps: **1** Yield: **40%**

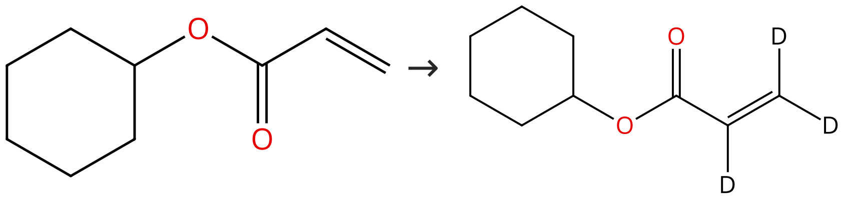
1.1 **Reagents:** Sodium acetate, 1-[[Tris(1-methylethyl)silyl]ethynyl]-1,2-benziodoxol-3(1*H*)-one
Catalysts: Silver hexafluoroantimonate, Bis(dichloro(η^6-*p*-cymene)ruthenium)
Solvents: 1,2-Dichloroethane, Water-d_2; 24 h, 80 °C

Ruthenium(II)-Catalyzed C-H Alkynylation of Heterocycles under Chelation Assistance

By: Liu, Yanping; et al

Synlett (2018), 29(5), 658-662.

Scheme 54 (1 Reaction) Steps: **1** Yield: **40%**



Suppliers (50)

31-116-CAS-21608637 Steps: **1** Yield: **40%**

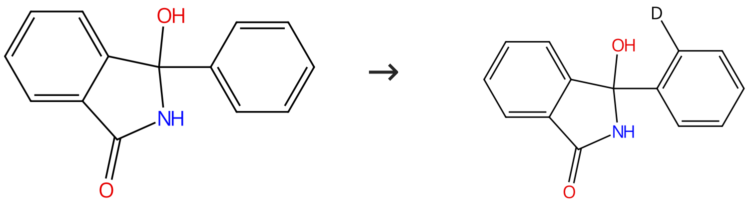
1.1 **Reagents:** 3-(Trifluoromethyl)benzoic acid, Water-d_2, Methanol, 1,1,1-trifluoro-, 1-benzoate
Catalysts: Bis(dichloro(η^6-*p*-cymene)ruthenium); 18 h, 80 °C

Rh(III)-Catalyzed Reaction of α-Carbonyl Sulfoxonium Ylides and Alkenes: Synthesis of Indanones via [4 + 1] Cycloaddition

By: Kommagalla, Yadagiri; et al

Organic Letters (2020), 22(4), 1375-1379.

Scheme 55 (1 Reaction) Steps: **1** Yield: **40%**



Suppliers (7)

31-614-CAS-38556410 Steps: **1** Yield: **40%**

1.1 **Reagents:** Water-d_2
Catalysts: Diphenyl phosphate, Silver hexafluoroantimonate, Bis(dichloro(η^6-*p*-cymene)ruthenium)
Solvents: 1,2-Dichloroethane; 18 h, 130 °C

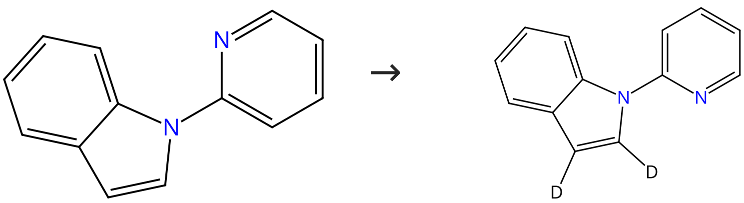
Experimental Protocols

Synthesis of Spiroisoindolinones via Ru(II)-Catalyzed Spiroannulation of N-Acyl Ketimines with Aryl Isocyanates/Isothiocyanates through Aromatic C-H Bond Activation

By: Khan, Zahid Ahmad; et al

Journal of Organic Chemistry (2023), 88(24), 17438-17449.

Scheme 56 (1 Reaction) Steps: **1** Yield: **38%**



Suppliers (36)

31-116-CAS-8518420 Steps: **1** Yield: **38%**

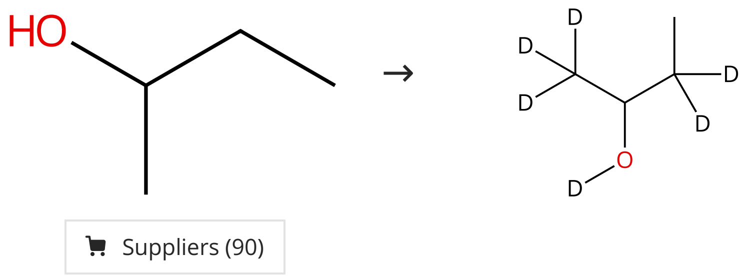
1.1 **Reagents:** Water-d_2, Silver oxide (Ag_2O), Copper(II) triflate
Catalysts: Bis(dichloro(η^6-*p*-cymene)ruthenium)
Solvents: 1,4-Dioxane; 14 h, rt → 100 °C

Ruthenium-Catalyzed Heteroatom-Directed Regioselective C-H Arylation of Indoles Using a Removable Tether

By: Tiwari, Virendra Kumar; et al

Organic Letters (2015), 17(7), 1766-1769.

Scheme 57 (1 Reaction) Steps: **1** Yield: **38%**



31-116-CAS-10240360 Steps: **1** Yield: **38%**

1.1 **Reagents:** Water-*d*2
Catalysts: Ethanolamine, Potassium hydroxide, Bis(dichloro (η^6-*p*-cymene)ruthenium); 5.5 h, 80 °C

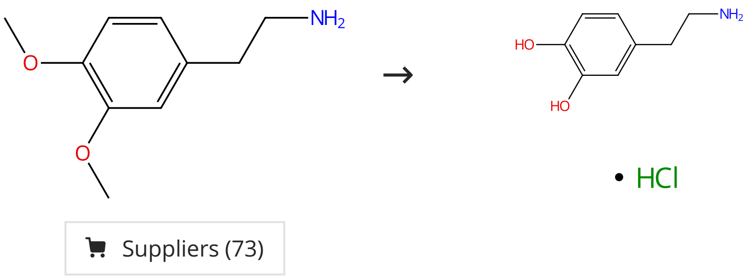
Experimental Protocols

Ruthenium-Catalyzed Regioselective Deuteration of Alcohols at the β-Carbon Position with Deuterium Oxide

By: Tse, Sunny Kai San; et al

Chemistry - A European Journal (2011), 17(49), 13918-13925, S13918/1-S13918/12.

Scheme 58 (1 Reaction) Steps: **1** Yield: **36%**



31-614-CAS-26506593 Steps: **1** Yield: **36%**

1.1 **Reagents:** Water-*d*2
Catalysts: Ruthenium(1+), hydro[*N*-methyl-*N*-(6-methyl-2-pyridinyl-κ*N*)-1-[(6-methyl-2-pyridinyl-κ*N*)imino]-1*H*-isoindol-3-amine-κ*N*2](1,1,1-trifluoromethanesulfonato-κ*O*)(triphenyl phosphine)-, (*OC*-6-26)-, 1,1,1-trifluoromethanesulfonate (1:1)
Solvents: 2-Methyltetrahydrofuran; 20 h, 110 °C

1.2 **Reagents:** Deuterium chloride
Solvents: Water-*d*2; 48 h, 110 °C

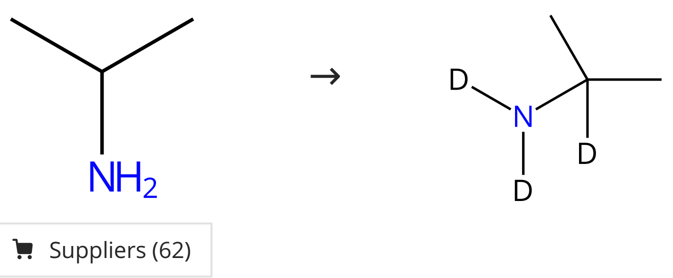
Experimental Protocols

Stereoretentive Deuteration of α-Chiral Amines with D_2O

By: Hale, Lillian V. A.; et al

Journal of the American Chemical Society (2016), 138(41), 13489-13492.

Scheme 59 (1 Reaction) Steps: **1** Yield: **35%**



31-116-CAS-16030356 Steps: **1** Yield: **35%**

1.1 **Reagents:** Water-*d*2
Catalysts: Ruthenium; 5 h, pH 7 - 12, 60 °C

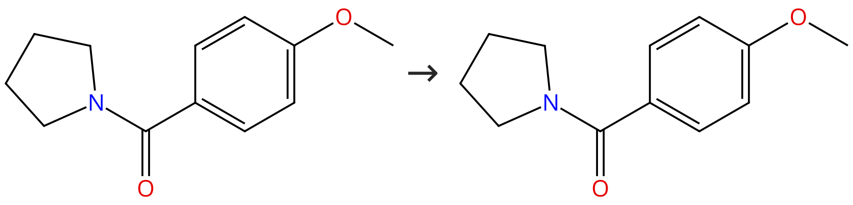
Stereoretentive H/D Exchange via an Electroactivated Heterogeneous Catalyst at sp^3 C-H Sites Bearing Amines or Alcohols

By: Bhatia, Souful; et al

European Journal of Organic Chemistry (2016), 2016(24), 4230-4235.

Scheme 60 (1 Reaction)

Steps: **1** Yield: **33%**



Suppliers (17)

31-614-CAS-25664628

Steps: **1** Yield: **33%**

1.1 **Reagents:** Oxygen, Water-d_2
Catalysts: Silver hexafluoroantimonate, Bis(dichloro(η^6-*p*-cymene)ruthenium)
Solvents: Tetrahydrofuran; rt; 6 h, 120 °C

Experimental Protocols

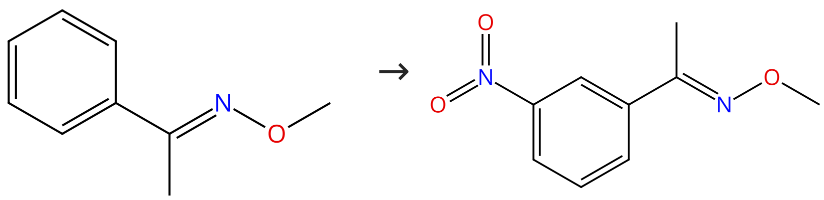
Ruthenium(II)-Catalyzed Regioselective C-H Arylation of Cyclic and N,N-Dialkyl Benzamides with Boronic Acids by Weak Coordination

By: Nareddy, Pradeep; et al

ACS Catalysis (2016), 6(7), 4755-4759.

Scheme 61 (1 Reaction)

Steps: **1** Yield: **32%**



Suppliers (4)

31-614-CAS-29093673

Steps: **1** Yield: **32%**

1.1 **Reagents:** Bis(trifluoroacetoxy)iodobenzene, Silver nitrate, Oxygen, Water-d_2
Catalysts: Triruthenium dodecacarbonyl
Solvents: 1,2-Dichloroethane; 24 h, 100 °C

Experimental Protocols

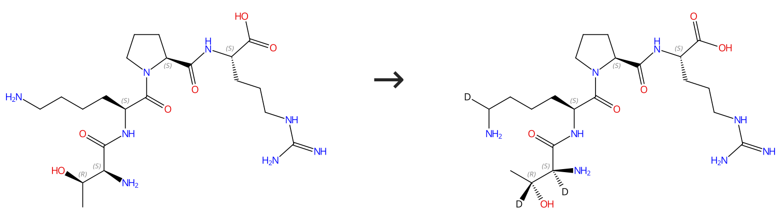
Monomeric Octahedral Ruthenium(II) Complex Enabled meta-C-H Nitration of Arenes with Removable Auxiliaries

By: Fan, Zhoulong; et al

Organic Letters (2017), 19(12), 3199-3202.

Scheme 62 (1 Reaction)

Steps: **1** Yield: **32%**



Absolute stereochemistry shown

Absolute stereochemistry shown

Suppliers (37)

31-116-CAS-6992929

Steps: **1** Yield: **32%**

1.1 **Reagents:** Deuterium
Catalysts: Ruthenium
Solvents: Water-d_2; 36 h, 2 bar, 55 °C

Experimental Protocols

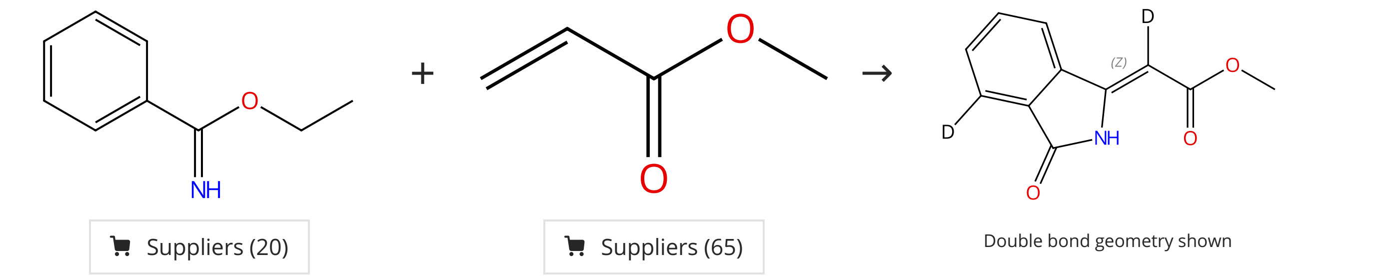
Enantiospecific C-H activation using ruthenium nanocatalysts

By: Taglang, Celine; et al

Angewandte Chemie, International Edition (2015), 54(36), 10474-10477.

Scheme 63 (1 Reaction)

Steps: **1** Yield: **31%**



31-116-CAS-9231264

Steps: **1** Yield: **31%**

1.1 **Reagents:** Cupric acetate
Catalysts: Potassium hexafluorophosphate, Bis(dichloro(η^6-*p*-cymene)ruthenium)
Solvents: 1,2-Dichloroethane, Water-d_2; 12 h, 100 °C

Experimental Protocols

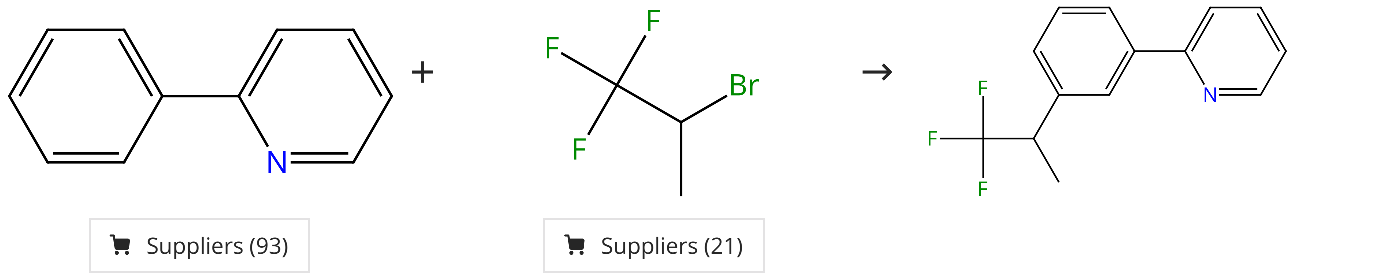
Oxidative Alkenylation/Annulation of Benzimidates via Ruthenium(II)-Catalyzed C-H Activation to Generate 3-Methyleneisoindolin-1-ones

By: Li, Xing Guang; et al

Advanced Synthesis & Catalysis (2015), 357(2-3), 395-399.

Scheme 64 (1 Reaction)

Steps: **1** Yield: **30%**



31-614-CAS-40645441

Steps: **1** Yield: **30%**

1.1 **Reagents:** Potassium carbonate, Water-d_2
Catalysts: 2,4,6-Trimethylbenzoic acid, Tris[4-(trifluoromethyl)phenyl]phosphine, Bis(dichloro(η^6-*p*-cymene)ruthenium)
Solvents: 1,4-Dioxane; 6 h, 70 °C

Experimental Protocols

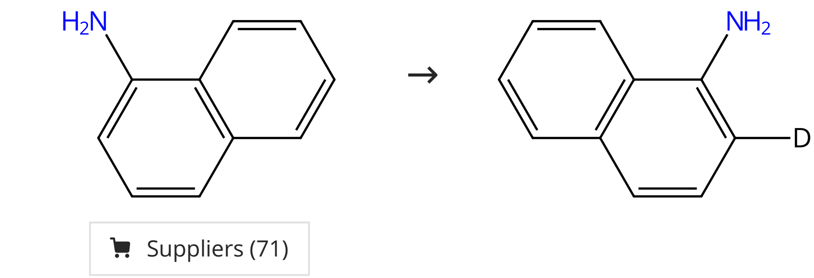
Ruthenium-Catalyzed Meta-Selective Trifluoroisopropylation of Arenes

By: Han, Shuxiong; et al

Journal of Organic Chemistry (2024), 89(12), 8601-8609.

Scheme 65 (1 Reaction)

Steps: **1** Yield: **30%**



31-116-CAS-22269785

Steps: **1** Yield: **30%**

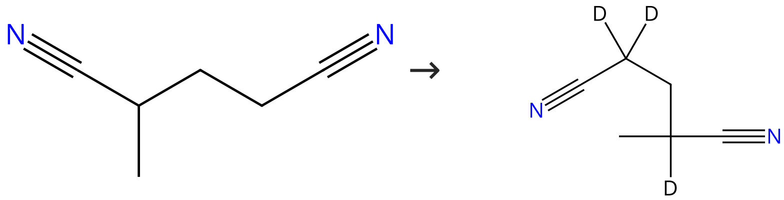
1.1 **Reagents:** Water-d_2
Catalysts: Cesium acetate, Bis(dichloro(η^6-*p*-cymene)ruthenium)
Solvents: Methanol-d_4; 16 h, 65 °C

Ruthenium(II)-Catalyzed Ortho-C-H Alkylation of Naphthylamines with Diazo Compounds for Synthesis of 2, 2-Disubstituted π-Extended 3-Oxindoles in Water

By: Wang, Xiaogang; et al

Organic Letters (2020), 22(13), 5187-5192.

Scheme 66 (1 Reaction) Steps: **1** Yield: **29%**



Suppliers (55)

31-116-CAS-19660658 Steps: **1** Yield: **29%**

1.1 **Reagents:** Potassium *tert*-butoxide, Water-d_2
Catalysts: (*OC*-6-52)-Carbonylchloro[2-(diphenylphosphino-κ*P*)-*N*-[2-(diphenylphosphino-κ*P*)ethyl]ethanamine-κ*N*]hydroruthenium; 24 h, 70 °C

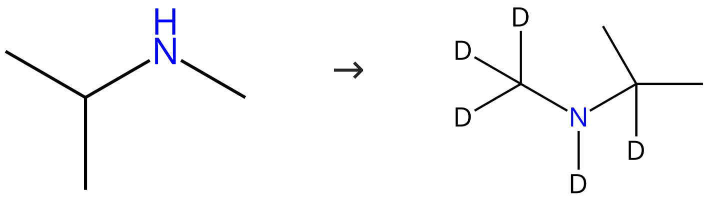
Experimental Protocols

Ruthenium-catalyzed selective α-deuteration of aliphatic nitriles using D_2O

By: Krishnakumar, Varadhan; et al

Chemical Communications (Cambridge, United Kingdom) (2018), 54(63), 8705-8708.

Scheme 67 (1 Reaction) Steps: **1** Yield: **28%**



Suppliers (47)

31-116-CAS-16030357 Steps: **1** Yield: **28%**

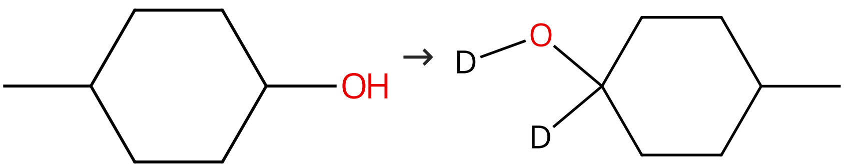
1.1 **Reagents:** Water-d_2
Catalysts: Ruthenium; 5 h, pH 7 - 12, 60 °C

Stereoretentive H/D Exchange via an Electroactivated Heterogeneous Catalyst at sp^3 C-H Sites Bearing Amines or Alcohols

By: Bhatia, Souful; et al

European Journal of Organic Chemistry (2016), 2016(24), 4230-4235.

Scheme 68 (1 Reaction) Steps: **1** Yield: **27%**



Suppliers (75)

31-116-CAS-16030362 Steps: **1** Yield: **27%**

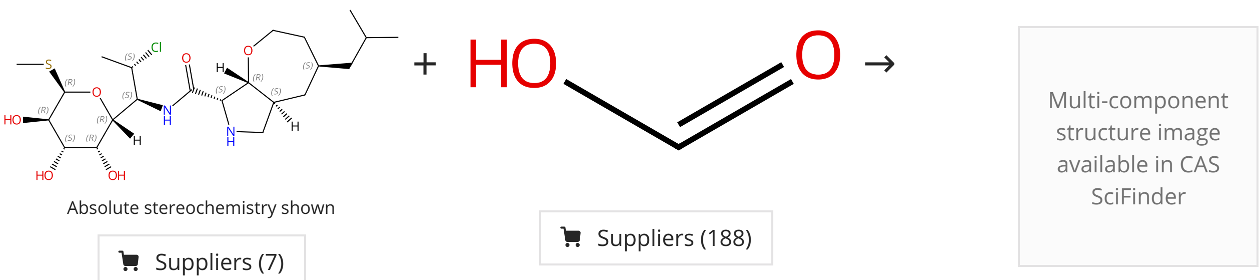
1.1 **Reagents:** Water-d_2
Catalysts: Ruthenium; 2.5 h, pH 7 - 12, 60 °C

Stereoretentive H/D Exchange via an Electroactivated Heterogeneous Catalyst at sp^3 C-H Sites Bearing Amines or Alcohols

By: Bhatia, Souful; et al

European Journal of Organic Chemistry (2016), 2016(24), 4230-4235.

Scheme 69 (1 Reaction) Steps: **1** Yield: **26%**



31-614-CAS-37656693	Steps: **1** Yield: **26%**
1.1	**Reagents:** Water-d_2 **Catalysts:** Ruthenium; 18 h, 80 °C
1.2	**Solvents:** Acetonitrile, Water

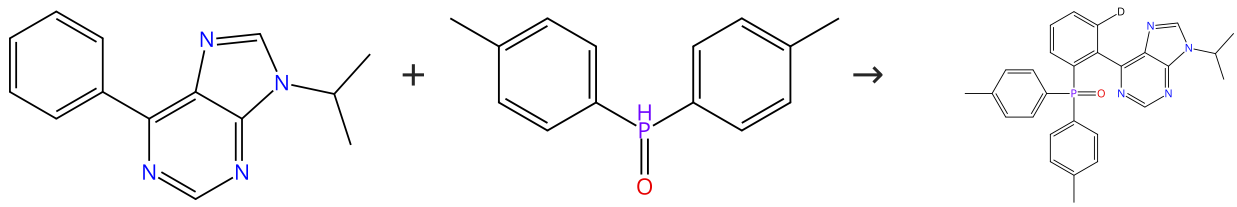
Experimental Protocols

A method for tritiation of iboxamycin permits measur ement of its ribosomal binding

By: Wu, Kelvin J. Y.; et al

Bioorganic & Medicinal Chemistry Letters (2023), 91, 129364.

Scheme 70 (1 Reaction) Steps: **1** Yield: **24%**



Suppliers (5) Suppliers (66)

31-614-CAS-43627525	Steps: **1** Yield: **24%**
1.1	**Reagents:** Sodium acetate, Water-d_2 **Catalysts:** (Acetato-κ*O*)(acetato-κ*O*,κ*O'*)[(1,2,3,4,5,6-η)-1-methyl-4-(1-methylethyl)benzene]ruthenium **Solvents:** 1,1,1,3,3,3-Hexafluoro-2-propanol; 10 min, rt; 24 h, 65 °C

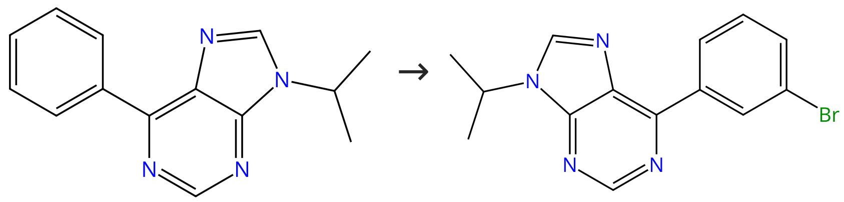
Experimental Protocols

Ruthenaelectro-catalyzed C-H phosphorylation: ortho to para position-selectivity switch

By: Gou, Xue-Ya; et al

Chemical Science (2025), 16(2), 824-833.

Scheme 71 (1 Reaction) Steps: **1** Yield: **24%**



Suppliers (5)

31-084-CAS-16530624	Steps: **1** Yield: **24%**
1.1	**Reagents:** *N*-Bromosuccinimide **Catalysts:** Ruthenium trichloride **Solvents:** Dimethylacetamide, Water-d_2; 20 h, 80 °C; 80 °C → rt
1.2	**Reagents:** Hydrochloric acid **Solvents:** Water; 30 min, rt

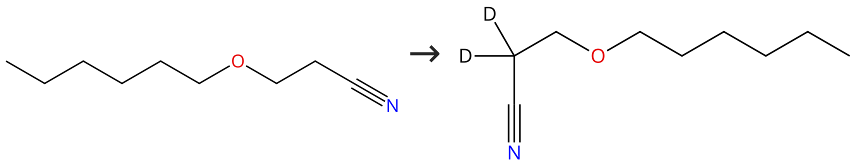
meta-C-H Bromination on Purine Bases by Heterog eneous Ruthenium Catalysis

By: Warratz, Svenja; et al

Angewandte Chemie, International Edition (2017), 56(6), 1557-1560.

Scheme 72 (1 Reaction)

Steps: **1** Yield: **23%**



Suppliers (12)

31-116-CAS-19660661

Steps: **1** Yield: **23%**

1.1 **Reagents:** Potassium *tert*-butoxide, Water-d_2
Catalysts: (*OC*-6-52)-Carbonylchloro[2-(diphenylphosphino-κ*P*)-*N*-[2-(diphenylphosphino-κ*P*)ethyl]ethanamine-κ*N*]hydroruthenium; 24 h, 70 °C

Experimental Protocols

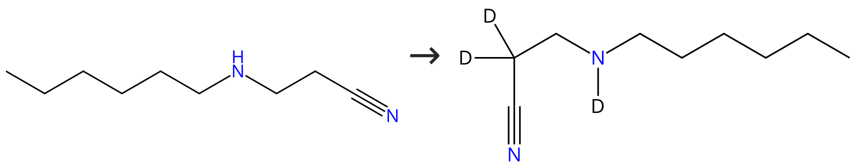
Ruthenium-catalyzed selective α-deuteration of aliphatic nitriles using D_2O

By: Krishnakumar, Varadhan; et al

Chemical Communications (Cambridge, United Kingdom) (2018), 54(63), 8705-8708.

Scheme 73 (1 Reaction)

Steps: **1** Yield: **22%**



Suppliers (50)

31-116-CAS-19660667

Steps: **1** Yield: **22%**

1.1 **Reagents:** Potassium *tert*-butoxide, Water-d_2
Catalysts: (*OC*-6-52)-Carbonylchloro[2-(diphenylphosphino-κ*P*)-*N*-[2-(diphenylphosphino-κ*P*)ethyl]ethanamine-κ*N*]hydroruthenium; 24 h, 70 °C

Experimental Protocols

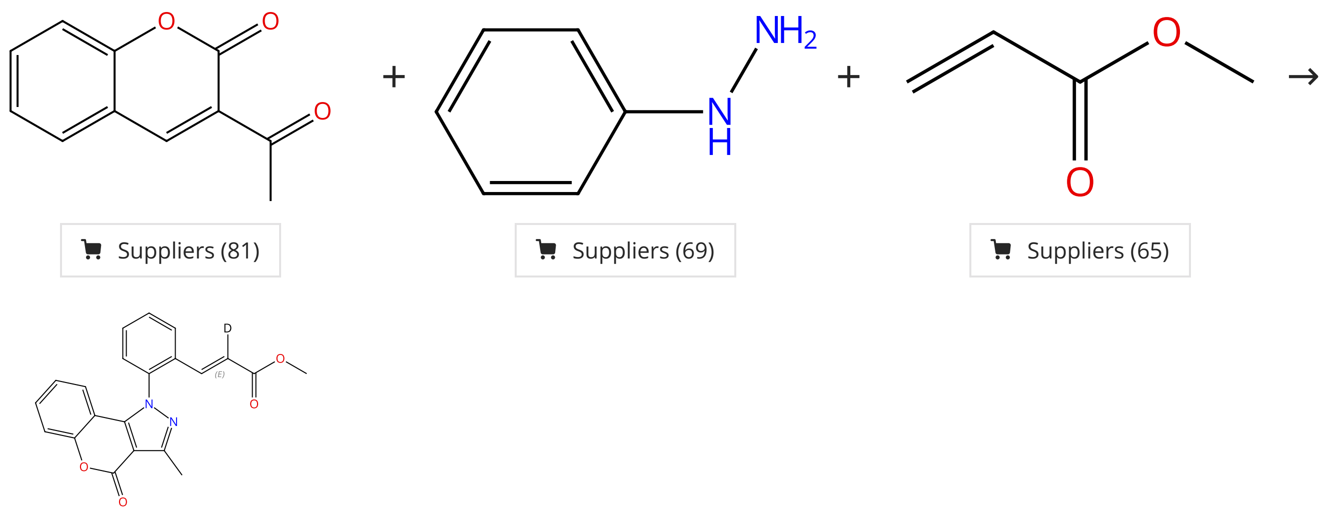
Ruthenium-catalyzed selective α-deuteration of aliphatic nitriles using D_2O

By: Krishnakumar, Varadhan; et al

Chemical Communications (Cambridge, United Kingdom) (2018), 54(63), 8705-8708.

Scheme 74 (1 Reaction)

Steps: **1** Yield: **20%**



Suppliers (81) Suppliers (69) Suppliers (65)

Double bond geometry shown

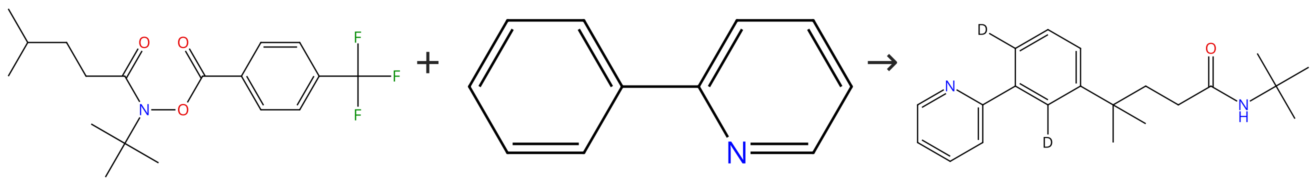
31-614-CAS-35212742	Steps: **1** Yield: **20%**
1.1 **Reagents:** Cupric acetate, Water-d_2 **Catalysts:** Bis(dichloro(η^6-*p*-cymene)ruthenium) **Solvents:** 1,2-Dichloroethane; 2 h, 120 °C	
1.2 **Reagents:** Dichloromethane	
Experimental Protocols	

One-Pot Cascade Access to Ru(II)-Catalyzed Regioselective C (sp^2)-H Activation/Alkenylation of Chromeno[4,3-c]pyrazol-4-ones and Their Emission Solvatochromic Studies

By: Singla, Dinesh; et al

Journal of Organic Chemistry (2022), 87(24), 16436-16448.

Scheme 75 (1 Reaction) Steps: **1** Yield: **19%**



Suppliers (93)

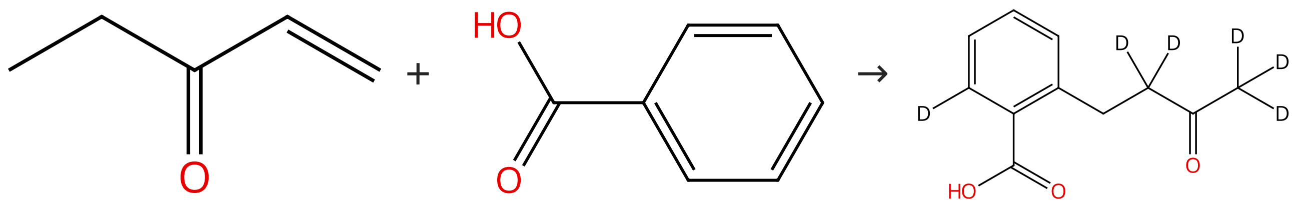
31-614-CAS-32015499	Steps: **1** Yield: **19%**
1.1 **Reagents:** Potassium carbonate, Water-d_2 **Catalysts:** 2,4,6-Trimethylbenzoic acid, Tris[4-(trifluoromethyl)phenyl]phosphine, Bis(dichloro(η^6-*p*-cymene)ruthenium), Tris[2-(2-pyridinyl-κ*N*)phenyl-κ*C*]iridium **Solvents:** 1,4-Dioxane; 10 min, rt; 6 h, 60 °C	
Experimental Protocols	

Site-selective coupling of remote C(sp^3)-H/meta-C(sp^2)-H bonds enabled by Ru/photoredox dual catalysis and mechanistic studies

By: Liu, Hong-Chao; et al

Chemical Science (2022), 13(18), 5382-5389.

Scheme 76 (1 Reaction) Steps: **1** Yield: **18%**



Suppliers (34) Suppliers (192)

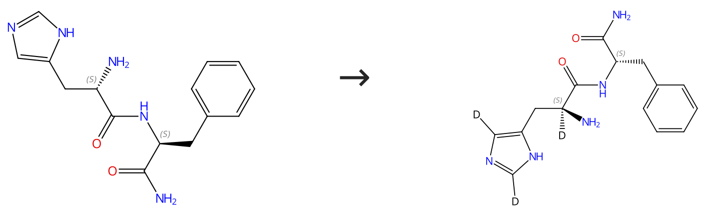
31-085-CAS-18801525	Steps: **1** Yield: **18%**
1.1 **Reagents:** Oxygen, Water-d_2 **Catalysts:** Bis(dichloro(η^6-*p*-cymene)ruthenium); 12 h, 95 °C	
Experimental Protocols	

Carboxyl-Directed Conjugate Addition of C-H Bonds to α,β-Unsaturated Ketones in Air and Water

By: Han, Wen-Jing; et al

Advanced Synthesis & Catalysis (2018), 360(7), 1358-1363.

Scheme 77 (1 Reaction) Steps: **1** Yield: **18%**



Absolute stereochemistry shown　　Absolute stereochemistry shown

31-116-CAS-597807 Steps: **1** Yield: **18%**

1.1 **Reagents:** Deuterium
Catalysts: Ruthenium
Solvents: Water-d_2; 36 h, 2 bar, 55 °C

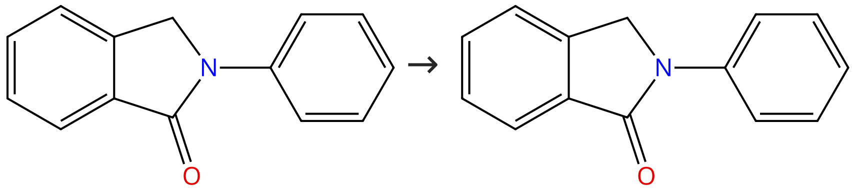
Experimental Protocols

Enantiospecific C-H activation using ruthenium nanocatalysts

By: Taglang, Celine; et al

Angewandte Chemie, International Edition (2015), 54(36), 10474-10477.

Scheme 78 (1 Reaction) Steps: **1** Yield: **17%**



Suppliers (57)

31-614-CAS-35763891 Steps: **1** Yield: **17%**

1.1 **Reagents:** Water-d_2
Catalysts: Pivalic acid, Silver hexafluoroantimonate, Bis (dichloro(η^6-*p*-cymene)ruthenium)
Solvents: 2,2,2-Trifluoroethanol; 20 h, 25 °C → 40 °C

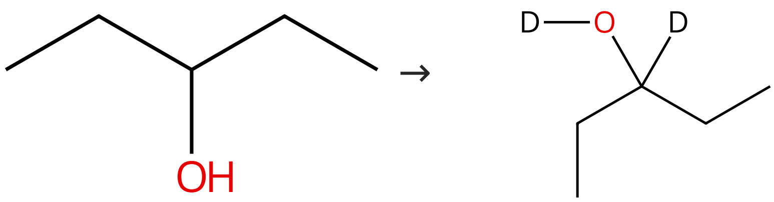
Experimental Protocols

Precise control of the site selectivity in ruthenium-catalyzed C-H bond amidations using cyclic amides as powerful directing groups

By: Yuan, Yu-Chao; et al

Organic Chemistry Frontiers (2023), 10(1), 42-53.

Scheme 79 (1 Reaction) Steps: **1** Yield: **16%**



Suppliers (80)

31-116-CAS-16030360 Steps: **1** Yield: **16%**

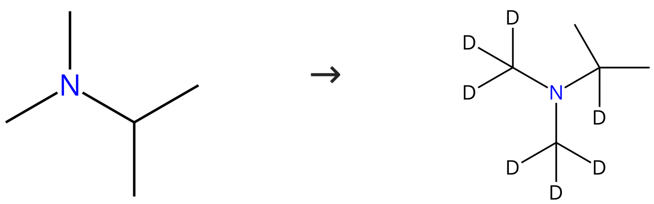
1.1 **Reagents:** Water-d_2
Catalysts: Ruthenium; 8 h, pH 7 - 12, 60 °C

Stereoretentive H/D Exchange via an Electroactivated Heterogeneous Catalyst at sp^3 C-H Sites Bearing Amines or Alcohols

By: Bhatia, Souful; et al

European Journal of Organic Chemistry (2016), 2016(24), 4230-4235.

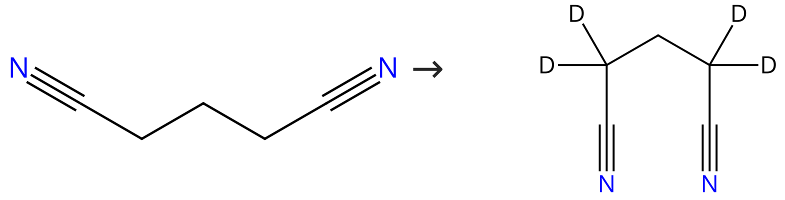
Scheme 80 (1 Reaction) Steps: **1** Yield: **16%**



Suppliers (47)

31-116-CAS-16030358	Steps: **1** Yield: **16%**	**Stereoretentive H/D Exchange via an Electroactivated Heterogeneous Catalyst at sp[3] C-H Sites Bearing Amines or Alcohols**
1.1 **Reagents:** Water-d_2 **Catalysts:** Ruthenium; 5 h, pH 7 - 12, 60 °C		By: Bhatia, Souful; et al European Journal of Organic Chemistry (2016), 2016(24), 4230-4235.

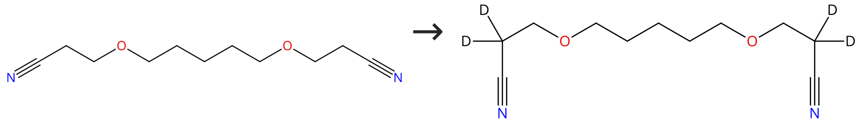
Scheme 81 (1 Reaction) Steps: **1** Yield: **15%**



Suppliers (52)

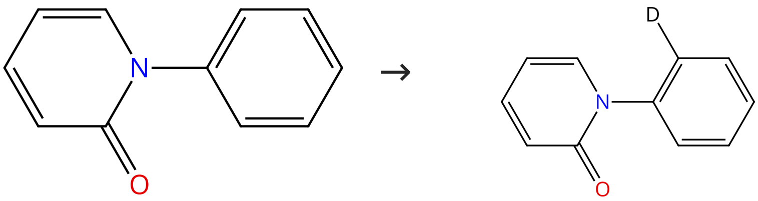
31-116-CAS-19660656	Steps: **1** Yield: **15%**	**Ruthenium-catalyzed selective α-deuteration of aliphatic nitriles using D_2O**
1.1 **Reagents:** Potassium *tert*-butoxide, Water-d_2 **Catalysts:** (*OC*-6-52)-Carbonylchloro[2-(diphenylphosphino-κ*P*)-*N*-[2-(diphenylphosphino-κ*P*)ethyl]ethanamine-κ*N*]hydroruthenium; 24 h, 70 °C		By: Krishnakumar, Varadhan; et al Chemical Communications (Cambridge, United Kingdom) (2018), 54(63), 8705-8708.
Experimental Protocols		

Scheme 82 (1 Reaction) Steps: **1** Yield: **15%**



31-116-CAS-19660664	Steps: **1** Yield: **15%**	**Ruthenium-catalyzed selective α-deuteration of aliphatic nitriles using D_2O**
1.1 **Reagents:** Potassium *tert*-butoxide, Water-d_2 **Catalysts:** (*OC*-6-52)-Carbonylchloro[2-(diphenylphosphino-κ*P*)-*N*-[2-(diphenylphosphino-κ*P*)ethyl]ethanamine-κ*N*]hydroruthenium; 24 h, 70 °C		By: Krishnakumar, Varadhan; et al Chemical Communications (Cambridge, United Kingdom) (2018), 54(63), 8705-8708.
Experimental Protocols		

Scheme 83 (1 Reaction) Steps: **1** Yield: **13%**



Suppliers (34)

31-614-CAS-31847602	Steps: **1** Yield: **13%**
1.1	**Reagents:** Cupric acetate, Water-d_2 **Catalysts:** Silver hexafluoroantimonate, Bis(dichloro(η^6-*p*-cymene)ruthenium) **Solvents:** Tetrahydrofuran; 1 h, 100 °C
Experimental Protocols	

Pyridone Directed Ru-Catalyzed Olefination of sp^2(C-H) Bond using Michael Acceptors: Creation of drug analogues

By: Mohanty, Smruti Ranjan; et al

Journal of Organic Chemistry (2022), 87(9), 6189-6201.

Scheme 84 (1 Reaction) Steps: **1** Yield: **13%**

Multi-component structure image available in CAS SciFinder → Multi-component structure image available in CAS SciFinder

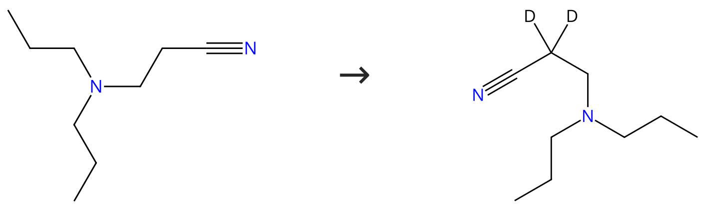
31-614-CAS-37656694	Steps: **1** Yield: **13%**
1.1	**Reagents:** Water-d_2 **Catalysts:** Ruthenium; 18 h, 80 °C
Experimental Protocols	

A method for tritiation of iboxamycin permits measur ement of its ribosomal binding

By: Wu, Kelvin J. Y.; et al

Bioorganic & Medicinal Chemistry Letters (2023), 91, 129364.

Scheme 85 (1 Reaction) Steps: **1** Yield: **9%**



Suppliers (42)

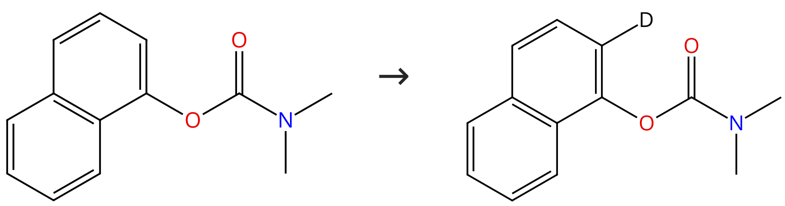
31-116-CAS-19660670	Steps: **1** Yield: **9%**
1.1	**Reagents:** Potassium *tert*-butoxide, Water-d_2 **Catalysts:** (*OC*-6-52)-Carbonylchloro[2-(diphenylphosphino-κ*P*)-*N*-[2-(diphenylphosphino-κ*P*)ethyl]ethanamine-κ*N*]hydrorut henium; 24 h, 70 °C
Experimental Protocols	

Ruthenium-catalyzed selective α-deuteration of aliphatic nitriles using D_2O

By: Krishnakumar, Varadhan; et al

Chemical Communications (Cambridge, United Kingdom) (2018), 54(63), 8705-8708.

Scheme 86 (1 Reaction) Steps: **1** Yield: **9%**



Suppliers (5)

31-116-CAS-15092724 Steps: **1** Yield: **9%**

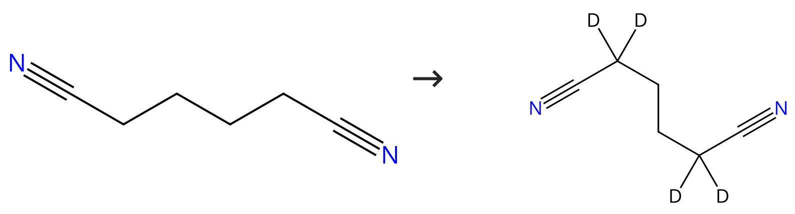
1.1 **Reagents:** Silver acetate, Silver hexafluoroantimonate
Catalysts: Bis(dichloro(η6-*p*-cymene)ruthenium)
Solvents: Tetrahydropyran, Water-*d*2; 12 h, 110 °C; 110 °C → rt

Regio- and stereoselective olefination of phenol carbamates through C-H bond functionalization

By: Li, Bin; et al

European Journal of Organic Chemistry (2013), 2013(10), 1950-1962.

Scheme 87 (1 Reaction) Steps: **1** Yield: **8%**



Suppliers (59) Suppliers (2)

31-116-CAS-19660657 Steps: **1** Yield: **8%**

1.1 **Reagents:** Potassium *tert*-butoxide, Water-*d*2
Catalysts: (*OC*-6-52)-Carbonylchloro[2-(diphenylphosphino-κ*P*)-*N*-[2-(diphenylphosphino-κ*P*)ethyl]ethanamine-κ*N*]hydroruthenium; 24 h, 70 °C

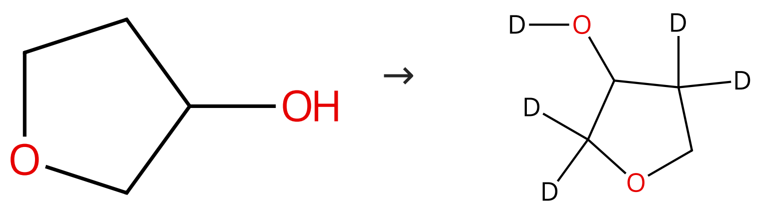
Experimental Protocols

Ruthenium-catalyzed selective α-deuteration of aliphatic nitriles using D_2O

By: Krishnakumar, Varadhan; et al

Chemical Communications (Cambridge, United Kingdom) (2018), 54(63), 8705-8708.

Scheme 88 (1 Reaction) Steps: **1** Yield: **8%**



Suppliers (97)

31-116-CAS-12624331 Steps: **1** Yield: **8%**

1.1 **Reagents:** Water-*d*2
Catalysts: Potassium hydroxide, Ruthenium(1+), [2-(amino-κ*N*)ethanol-κ*O*]chloro[(1,2,3,4,5,6-η)-1-methyl-4-(1-methylethyl)benzene]-, chloride, compd. with [2-(amino-κ*N*)ethanolato-κ*O*]chloro[(1,2,3,4,5,6-η)-1-methyl-4-(1-methylethyl)benzene]ruthenium (1:1:1); 8.5 h, 80 °C

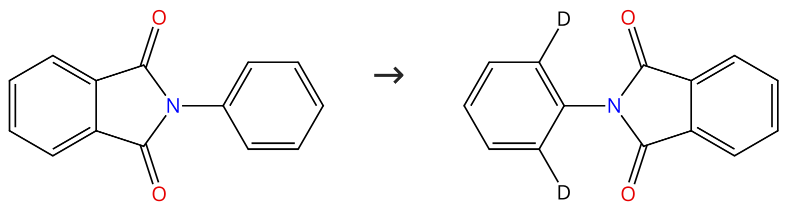
Experimental Protocols

Ruthenium-Catalyzed Regioselective Deuteration of Alcohols at the β-Carbon Position with Deuterium Oxide

By: Tse, Sunny Kai San; et al

Chemistry - A European Journal (2011), 17(49), 13918-13925, S13918/1-S13918/12.

Scheme 89 (1 Reaction) Steps: **1** Yield: **8%**



Suppliers (68)

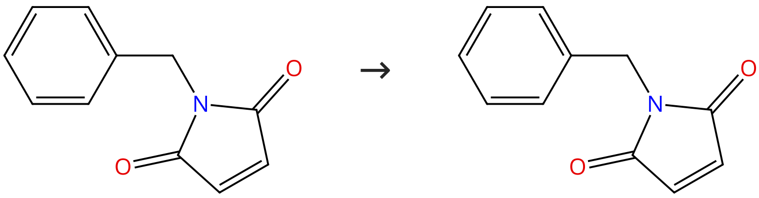
31-116-CAS-20460598	Steps: **1** Yield: **8%**
1.1 **Reagents:** Cupric acetate, Water-d_2 **Catalysts:** Silver hexafluoroantimonate, Bis(dichloro(η^6-*p*-cymene)ruthenium) **Solvents:** 2-Methyltetrahydrofuran; 15 h, rt → 100 °C	

Site-selective Ru-catalyzed C-H bond alkenylation with biologically relevant isoindolinones: a case of catalyst performance controlled by subtle stereo-electronic effects of the weak directing group

By: Yuan, Yu-Chao; et al

Catalysis Science & Technology (2019), 9(17), 4711-4717.

Scheme 90 (1 Reaction) Steps: **1** Yield: **7%**



Suppliers (100)

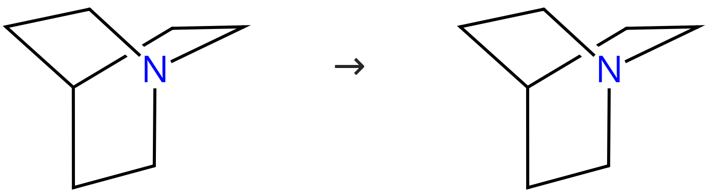
31-614-CAS-25074989	Steps: **1** Yield: **7%**
1.1 **Catalysts:** 3,5-Dimethylbenzoic acid, Potassium carbonate, Bis(dichloro(η^6-*p*-cymene)ruthenium) **Solvents:** Water-d_2; 24 h, rt	
Experimental Protocols	

Ru(II)-Catalyzed C-H Functionalization on Maleimides with Electrophiles: A Demonstration of Umpolung Strategy

By: Dana, Suman; et al

Organic Letters (2017), 19(7), 1902-1905.

Scheme 91 (1 Reaction) Steps: **1** Yield: **5%**



Suppliers (61)

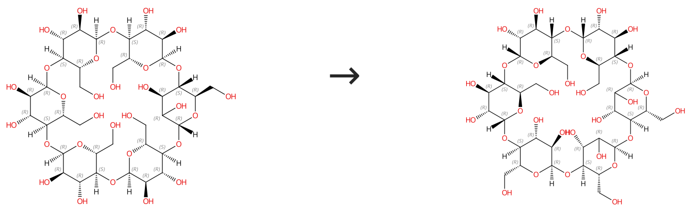
31-614-CAS-26193529	Steps: **1** Yield: **5%**
1.1 **Reagents:** Water-d_2 **Catalysts:** Ruthenium; 10 h, pH 7 - 12, 80 °C	

Stereoretentive H/D Exchange via an Electroactivated Heterogeneous Catalyst at sp^3 C-H Sites Bearing Amines or Alcohols

By: Bhatia, Souful; et al

European Journal of Organic Chemistry (2016), 2016(24), 4230-4235.

Scheme 92 (1 Reaction) Steps: **1**



Absolute stereochemistry shown → Absolute stereochemistry shown

Suppliers (108)

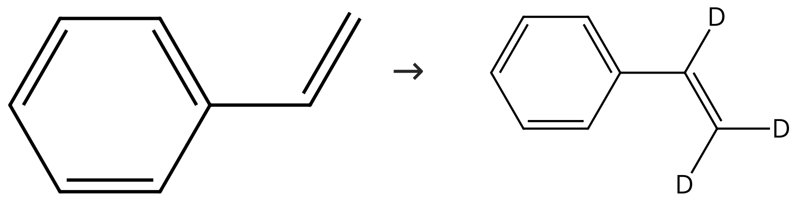
31-614-CAS-28061363	Steps: **1**
1.1 **Reagents:** Hydrogen **Catalysts:** Ruthenium **Solvents:** Water-*d*$_2$; rt; 24 h, 80 °C; 80 °C → rt	
Experimental Protocols	

NMR Spectroscopic Study of the Complexation Behaviors of Deuterated Cyclodextrins and [60]Fullerene

By: Ikeda, Atsushi; et al

Organic Letters (2013), 15(24), 6194-6197.

Scheme 93 (1 Reaction) Steps: **1**



Suppliers (120) Suppliers (23)

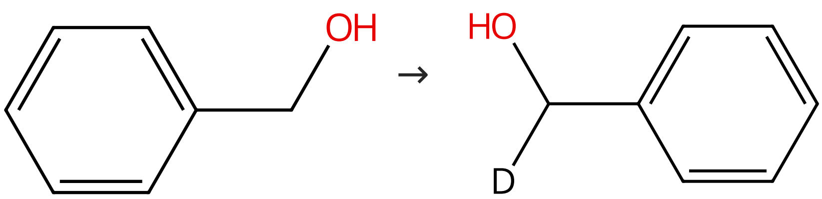
31-116-CAS-756169	Steps: **1**
1.1 **Reagents:** Water-*d*$_2$ **Catalysts:** (*OC*-6-34)-Carbonylchlorohydrotris(triphenyl phosphine)ruthenium **Solvents:** 1,4-Dioxane; 1 h, 100 °C	
Experimental Protocols	

Hydrogen/Deuterium Exchange Reactions of Olefins with Deuterium Oxide Mediated by the Carbonylchlorohydridotris (triphenylphosphine)ruthenium(II) Complex

By: Tse, Sunny Kai San; et al

Advanced Synthesis & Catalysis (2010), 352(9), 1512-1522.

Scheme 94 (1 Reaction) Steps: **1**



Suppliers (161)

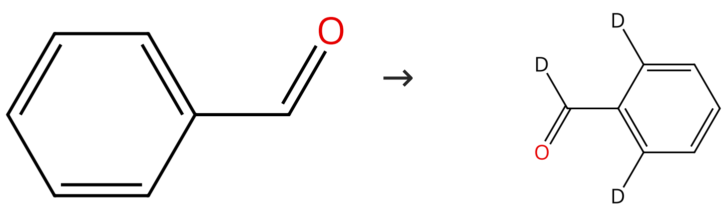
31-116-CAS-11071440	Steps: **1**
1.1 **Reagents:** Water-*d*$_2$ **Catalysts:** Dichlorotris(triphenylphosphine)ruthenium	

Oxidation of [1-^{2}H]-alcohols, using ceric trihydroxy hydrope roxide [$Ce(OH)_3O_2H$] - a pronounced deuterium isotope effect

By: Saljoughian, M.; et al

Synthetic Communications (1985), 15(9), 765-8.

Scheme 95 (1 Reaction) Steps: **1**



Suppliers (80)

31-116-CAS-5336062 Steps: **1**

1.1 **Reagents:** Water-*d*$_2$
Catalysts: Stereoisomer of dihydro[(1,2,3,3a,7a-η)-1-phenyl-1*H*-inden-1-yl](triethylsilyl)(triphenylphosphine)ruthenium
Solvents: Toluene; 16 h, 110 atm

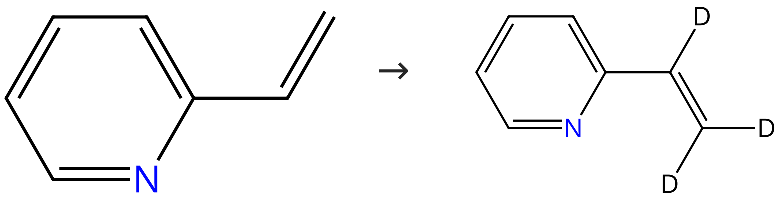
Experimental Protocols

Regioselective ruthenium catalysed H-D exchange using D_2O as the deuterium source

By: Piola, Lorenzo; et al

Organic & Biomolecular Chemistry (2014), 12(43), 8683-8688.

Scheme 96 (1 Reaction) Steps: **1**



Suppliers (78) Suppliers (3)

31-116-CAS-5400647 Steps: **1**

1.1 **Reagents:** Water-*d*$_2$
Catalysts: Stereoisomer of dihydro[(1,2,3,3a,7a-η)-1-phenyl-1*H*-inden-1-yl](triethylsilyl)(triphenylphosphine)ruthenium
Solvents: Toluene; 16 h, 110 atm

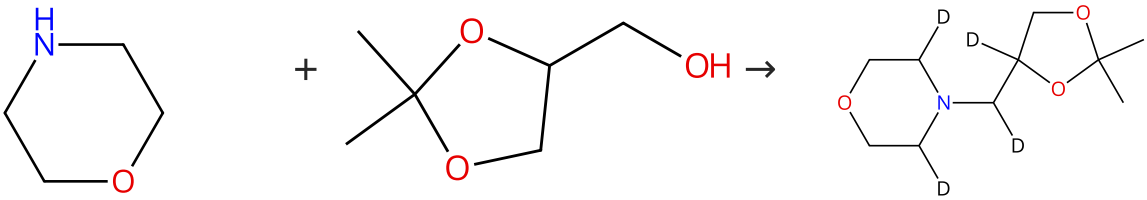
Experimental Protocols

Regioselective ruthenium catalysed H-D exchange using D_2O as the deuterium source

By: Piola, Lorenzo; et al

Organic & Biomolecular Chemistry (2014), 12(43), 8683-8688.

Scheme 97 (1 Reaction) Steps: **1**



Suppliers (96) Suppliers (107)

31-032-CAS-16200508 Steps: **1**

1.1 **Reagents:** Water-*d*$_2$
Catalysts: Bis(dichloro(η^6-*p*-cymene)ruthenium), Bis[2-(diphenylphosphino)phenyl] ether
Solvents: Toluene; 5 min, rt; 48 h, 130 °C

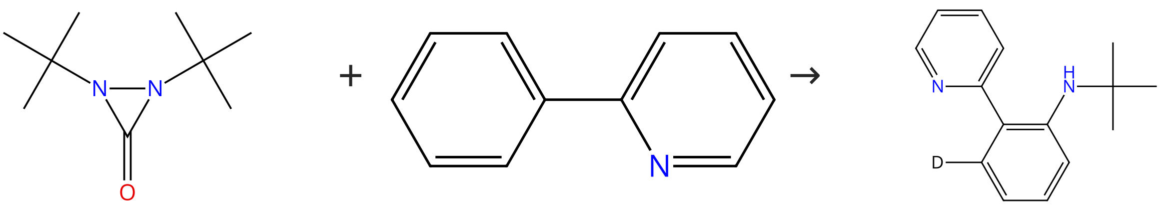
Experimental Protocols

Glycerol Upgrading via Hydrogen Borrowing: Direct Ruthenium-Catalyzed Amination of the Glycerol Derivative Solketal

By: Said Staalsmeden, Anna; et al

ACS Sustainable Chemistry & Engineering (2016), 4(10), 5730-5736.

Scheme 98 (1 Reaction) Steps: **1**



Suppliers (8) Suppliers (93)

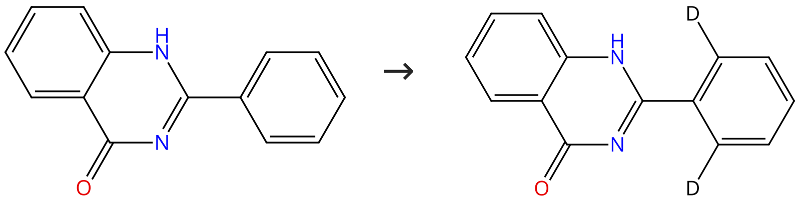
31-080-CAS-20053670	Steps: **1**
1.1 **Reagents:** Water-d_2, Benzoic acid, 2,4,6-trimethyl-, potassium salt (1:1) **Catalysts:** Triruthenium dodecacarbonyl **Solvents:** Toluene; 24 h, 140 °C	
Experimental Protocols	

Ruthenium-catalyzed ortho-selective C_{Ar}–H amination of heteroaryl arenes with di-tert-butyldiaziridinone

By: Gou, Xue-Ya; et al

Chemical Communications (Cambridge, United Kingdom) (2019), 55(38), 5487-5490.

Scheme 99 (1 Reaction) Steps: **1**



Suppliers (72)

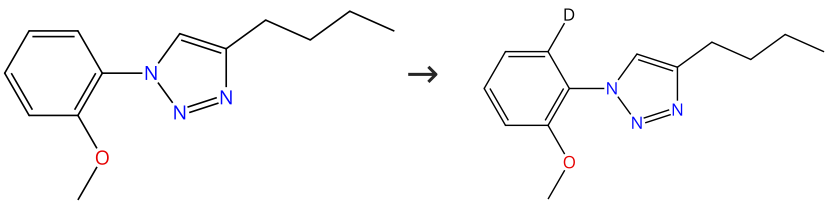
31-614-CAS-39746881	Steps: **1**
1.1 **Reagents:** Sodium acetate, Water-d_2 **Catalysts:** Bis(dichloro(η^6-*p*-cymene)ruthenium); 1 h, 60 °C	
Experimental Protocols	

Regioselective [3+2]-Spiroannulation and [4+n]-Annulation Approaches through Activation of C-H Bond Facilitated by Ru(II) as Catalyst: Role of Solvent Selectivity

By: Dev Mandal, Rahul; et al

Advanced Synthesis & Catalysis (2024), 366(8), 1863-1876.

Scheme 100 (1 Reaction) Steps: **1**



Suppliers (2)

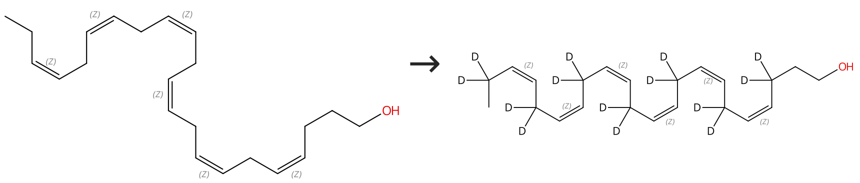
31-614-CAS-40494861	Steps: **1**
1.1 **Reagents:** Potassium acetate, Water-d_2 **Catalysts:** Bis(dichloro(η^6-*p*-cymene)ruthenium) **Solvents:** Toluene; 24 h, 100 °C	
Experimental Protocols	

Ruthenium(II)-Catalyzed Late-Stage Incorporation of N-Aryl Triazoles and Tetrazoles with Sulfonium Salts via C-H Activation

By: Simon, Hendrik; et al

Angewandte Chemie, International Edition (2024), 63(26), e202402060.

Scheme 101 (1 Reaction) Steps: **1**



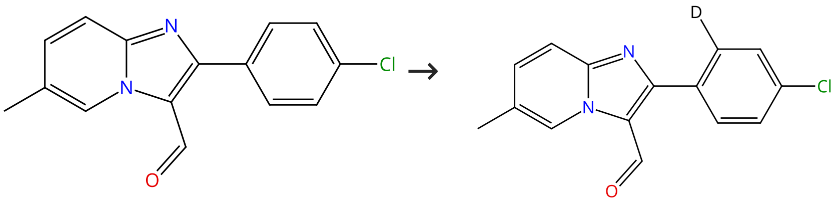
Double bond geometry shown

Double bond geometry shown

Suppliers (15)

31-116-CAS-17923456	Steps: **1**	Site-Specific Deuteration of Polyunsaturated Alkenes
1.1 **Reagents:** Water-d_2 **Catalysts:** Ruthenium(1+), tris(acetonitrile)(η5-2,4-cyclopen tadien-1-yl)-, hexafluorophosphate(1-) (1:1) **Solvents:** Acetone-d_6; 18 h, rt		By: Smarun, A. V.; et al Journal of Organic Chemistry (2017), 82(24), 13115-13120.
Experimental Protocols		

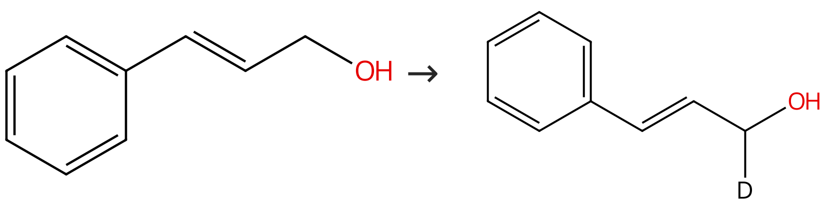
Scheme 102 (1 Reaction) Steps: **1**



Suppliers (2)

31-614-CAS-36477321	Steps: **1**	Ru(II)-Catalyzed Synthesis of Fused Imidazo[1,2-a]pyridine-chromenones and Methylene-Tethered Bis-imidazo[1,2-a] pyridines and Regioselective O-Acetoxylation of Imidazo[1,2-a]pyridines
1.1 **Reagents:** Silver carbonate, Water-d_2 **Catalysts:** Bis(dichloro(η6-*p*-cymene)ruthenium) **Solvents:** Acetic acid; rt; 24 h, 120 °C		By: Tali, Javeed Ahmad; et al Organic Letters (2023), 25(18), 3200-3205.
Experimental Protocols		

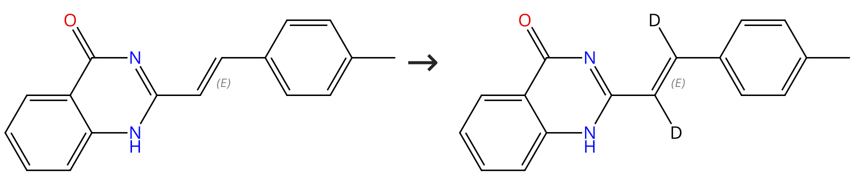
Scheme 103 (1 Reaction) Steps: **1**



Suppliers (95)

31-116-CAS-15337238	Steps: **1**	Oxidation of [1-^{2}H]-alcohols, using ceric trihydroxy hydrope roxide [$Ce(OH)_3O_2H$] - a pronounced deuterium isotope effect
1.1 **Reagents:** Water-d_2 **Catalysts:** Dichlorotris(triphenylphosphine)ruthenium		By: Saljoughian, M.; et al Synthetic Communications (1985), 15(9), 765-8.

Scheme 104 (1 Reaction) Steps: **1**



Double bond geometry shown

Double bond geometry shown

Suppliers (6)

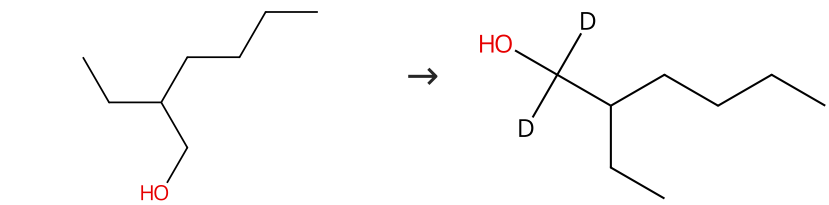
31-116-CAS-15878322	Steps: **1**
1.1	**Reagents:** Trifluoroacetic acid, Cupric acetate, Water- d_2 **Catalysts:** Silver acetate, Bis(dichloro(η^6-*p*-cymene)ruthenium) **Solvents:** 1,4-Dioxane; 24 h, 100 °C
Experimental Protocols	

Merging C-H Bond Functionalization with Amide Alcoholysis: En Route to 2-Aminopyridines

By: Kumar, Dinesh; et al

ACS Catalysis (2016), 6(6), 3531-3536.

Scheme 105 (1 Reaction) Steps: **1**



Suppliers (84)

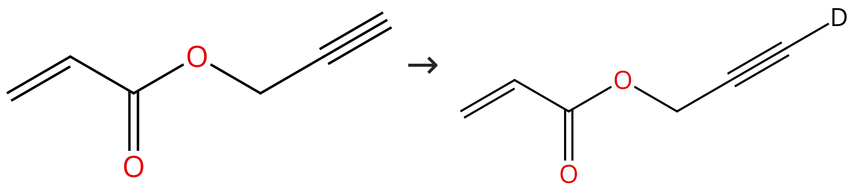
31-116-CAS-15575767	Steps: **1**
1.1	**Reagents:** Sodium hydroxide, Water- d_2 **Catalysts:** (*OC*-6-52)-Carbonylchloro[2-(diphenylphosphino-κ*P*)-*N*-[2-(diphenylphosphino-κ*P*)ethyl]ethanamine-κ*N*]hydroruthenium; 0.5 h, 120 °C
Experimental Protocols	

Efficient deuterium labelling of alcohols in deuterated water catalyzed by ruthenium pincer complexes

By: Zhang, Lei; et al

Catalysis Communications (2016), 84, 67-70.

Scheme 106 (1 Reaction) Steps: **1**



Suppliers (46)

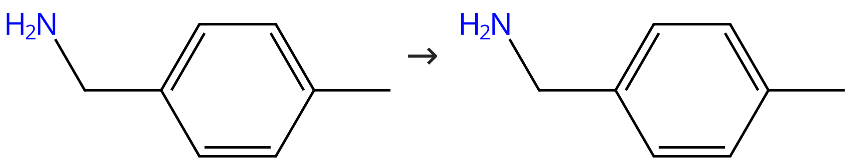
31-116-CAS-1716307	Steps: **1**
1.1	**Reagents:** Potassium *tert*-butoxide, Water- d_2 **Catalysts:** (*OC*-6-52)-Carbonylchloro[2-(diphenylphosphino-κ*P*)-*N*-[2-(diphenylphosphino-κ*P*)ethyl]ethanamine-κ*N*]hydroruthenium **Solvents:** 1,2-Dimethoxyethane; 24 h, 75 °C
Experimental Protocols	

The ruthenium-catalysed selective synthesis of mono-deuterated terminal alkynes

By: Chatterjee, Basujit; et al

Chemical Communications (Cambridge, United Kingdom) (2016), 52(24), 4509-4512.

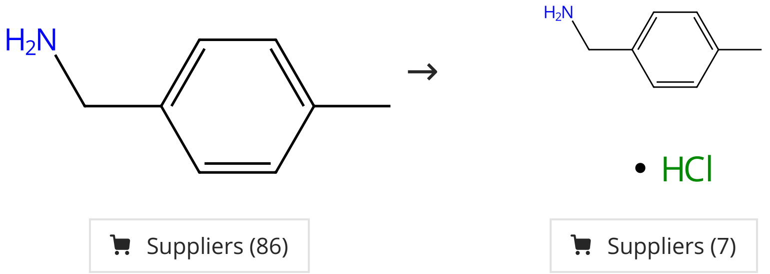
Scheme 107 (1 Reaction) Steps: **1**



Suppliers (86)

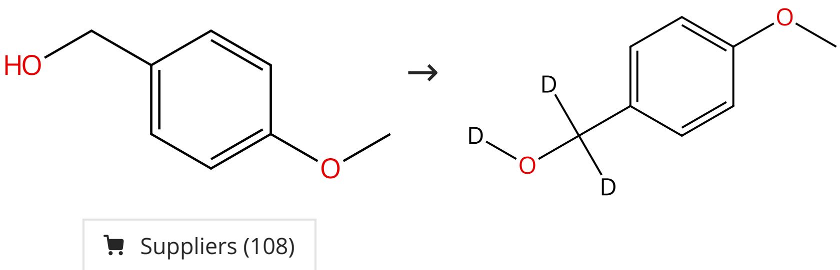
31-614-CAS-29832527	Steps: 1	Stereoretentive Deuteration of α-Chiral Amines with D_2O
1.1	**Reagents:** Water-*d*$_2$ **Catalysts:** Ruthenium(1+), hydro[*N*-methyl-*N*-(6-methyl-2-pyridinyl-κ*N*)-1-[(6-methyl-2-pyridinyl-κ*N*)imino]-1*H*-isoindol-3-amine-κ*N*^{2}](1,1,1-trifluoromethanesulfonato-κ*O*)(triphenyl phosphine)-, (*OC*-6-26)-, 1,1,1-trifluoromethanesulfonate (1:1) **Solvents:** 2-Methyltetrahydrofuran; 20 h, 110 °C	By: Hale, Lillian V. A.; et al Journal of the American Chemical Society (2016), 138(41), 13489-13492.
Experimental Protocols		

Scheme 108 (1 Reaction) Steps: **1**



31-575-CAS-16271196	Steps: 1	Stereoretentive Deuteration of α-Chiral Amines with D_2O
1.1	**Reagents:** Water-*d*$_2$ **Catalysts:** Ruthenium(1+), hydro[*N*-methyl-*N*-(6-methyl-2-pyridinyl-κ*N*)-1-[(6-methyl-2-pyridinyl-κ*N*)imino]-1*H*-isoindol-3-amine-κ*N*^{2}](1,1,1-trifluoromethanesulfonato-κ*O*)(triphenyl phosphine)-, (*OC*-6-26)-, 1,1,1-trifluoromethanesulfonate (1:1) **Solvents:** 2-Methyltetrahydrofuran; 20 h, 110 °C	By: Hale, Lillian V. A.; et al Journal of the American Chemical Society (2016), 138(41), 13489-13492.
1.2	**Reagents:** Deuterium chloride **Solvents:** Water-*d*$_2$	
Experimental Protocols		

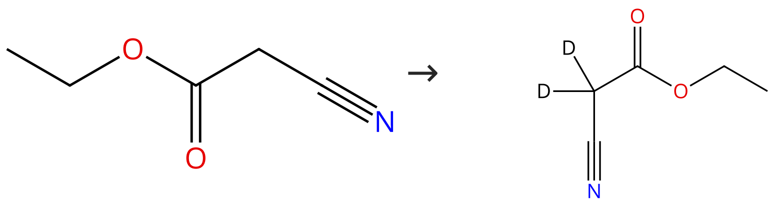
Scheme 109 (1 Reaction) Steps: **1**



31-116-CAS-13573841	Steps: 1	Ruthenium Catalyzed Selective α- and α,β-Deuteration of Alcohols Using D_2O
1.1	**Reagents:** Potassium *tert*-butoxide **Catalysts:** (*OC*-6-52)-Carbonylchloro[2-(diphenylphosphino-κ*P*)-*N*-[2-(diphenylphosphino-κ*P*)ethyl]ethanamine-κ*N*]hydroruthenium **Solvents:** Water-*d*$_2$; 18 h, 80 °C	By: Chatterjee, Basujit; et al Organic Letters (2015), 17(19), 4794-4797.
Experimental Protocols		

Scheme 110 (1 Reaction)

Steps: 1



Suppliers (75)

Suppliers (7)

31-116-CAS-19660659

Steps: 1

1.1 **Reagents:** Potassium *tert*-butoxide, Water-d_2
Catalysts: (*OC*-6-52)-Carbonylchloro[2-(diphenylphosphino-κ*P*)-*N*-[2-(diphenylphosphino-κ*P*)ethyl]ethanamine-κ*N*]hydroruthenium; 24 h, 70 °C

Experimental Protocols

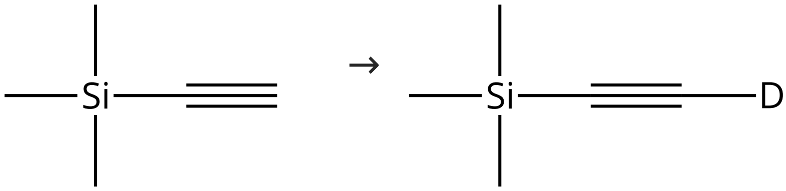
Ruthenium-catalyzed selective α-deuteration of aliphatic nitriles using D_2O

By: Krishnakumar, Varadhan; et al

Chemical Communications (Cambridge, United Kingdom) (2018), 54(63), 8705-8708.

Scheme 111 (1 Reaction)

Steps: 1



Suppliers (108)

Suppliers (9)

31-116-CAS-3137974

Steps: 1

1.1 **Reagents:** Potassium *tert*-butoxide, Water-d_2
Catalysts: (*OC*-6-52)-Carbonylchloro[2-(diphenylphosphino-κ*P*)-*N*-[2-(diphenylphosphino-κ*P*)ethyl]ethanamine-κ*N*]hydroruthenium
Solvents: 1,2-Dimethoxyethane; 24 h, 50 °C

Experimental Protocols

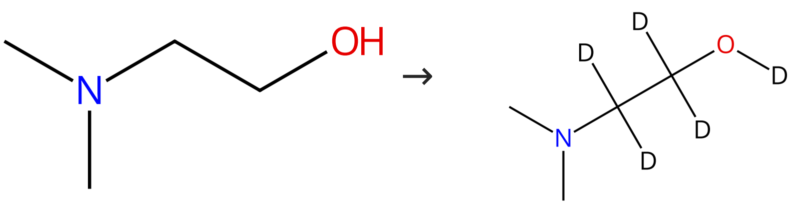
The ruthenium-catalysed selective synthesis of mono-deuterated terminal alkynes

By: Chatterjee, Basujit; et al

Chemical Communications (Cambridge, United Kingdom) (2016), 52(24), 4509-4512.

Scheme 112 (1 Reaction)

Steps: 1



Suppliers (81)

31-116-CAS-15654118

Steps: 1

1.1 **Reagents:** Sodium hydroxide, Water-d_2
Catalysts: (*OC*-6-52)-Carbonylchloro[2-(diphenylphosphino-κ*P*)-*N*-[2-(diphenylphosphino-κ*P*)ethyl]ethanamine-κ*N*]hydroruthenium; 5 h, 120 °C

Experimental Protocols

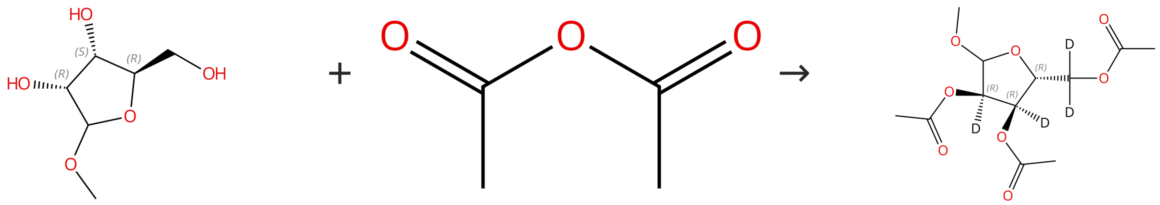
Efficient deuterium labelling of alcohols in deuterated water catalyzed by ruthenium pincer complexes

By: Zhang, Lei; et al

Catalysis Communications (2016), 84, 67-70.

Scheme 113 (1 Reaction)

Steps: **1**



Absolute stereochemistry shown

Suppliers (54)

Suppliers (90)

Absolute stereochemistry shown

31-116-CAS-22751181

Steps: **1**

1.1 **Reagents:** Sodium hydroxide, Hydrogen, Water- *d*$_2$
Catalysts: Ruthenium; 80 °C

1.2 **Solvents:** Pyridine

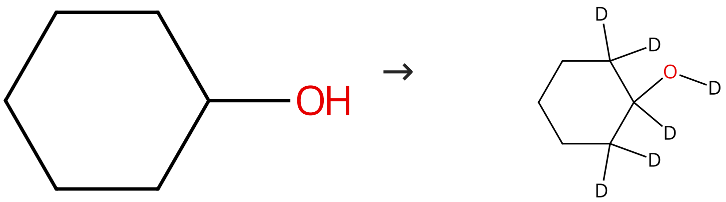
Synthesis of the deuterated thymidine-d$_9$ and deuterated oligonucleotides

By: Taniguchi, Yosuke; et al

Tetrahedron Letters (2019), 60(38), 151037.

Scheme 114 (1 Reaction)

Steps: **1**



Suppliers (83)

31-116-CAS-430901

Steps: **1**

1.1 **Reagents:** Potassium *tert*-butoxide
Catalysts: (*OC*-6-52)-Carbonylchloro[2-(diphenylphosphino-κ*P*)-*N*-[2-(diphenylphosphino-κ*P*)ethyl]ethanamine-κ*N*]hydroruthenium
Solvents: Water-*d*$_2$; 10 h, 80 °C

Experimental Protocols

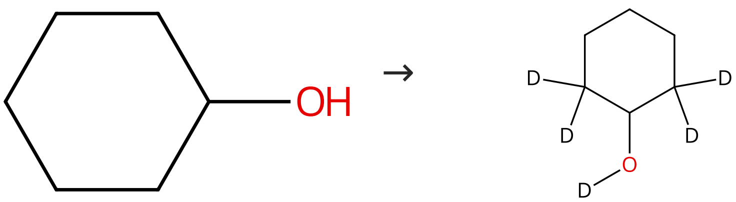
Ruthenium Catalyzed Selective α- and α, β-Deuteration of Alcohols Using D$_2$O

By: Chatterjee, Basujit; et al

Organic Letters (2015), 17(19), 4794-4797.

Scheme 115 (1 Reaction)

Steps: **1**



Suppliers (83)

31-116-CAS-15673919

Steps: **1**

1.1 **Reagents:** Sodium hydroxide, Water- *d*$_2$
Catalysts: (*OC*-6-52)-Carbonylchloro[2-(diphenylphosphino-κ*P*)-*N*-[2-(diphenylphosphino-κ*P*)ethyl]ethanamine-κ*N*]hydroruthenium; 0.5 h, 120 °C

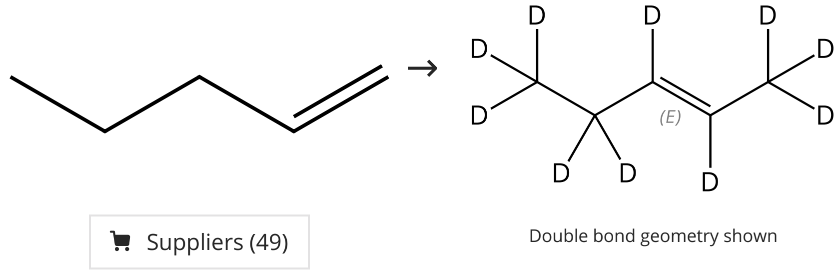
Experimental Protocols

Efficient deuterium labelling of alcohols in deuterated water catalyzed by ruthenium pincer complexes

By: Zhang, Lei; et al

Catalysis Communications (2016), 84, 67-70.

Scheme 116 (1 Reaction) Steps: **1**



31-116-CAS-11221319 Steps: **1**

1.1 **Reagents:** 1,1',1'',1'''-Methanetetrayltetrakis[1,1,1-trimethylsilane], Water-*d*$_2$
Catalysts: Ruthenium(1+), (acetonitrile)[2-[bis(1-methylethyl)phosphino-κ*P*]-4-(1,1-dimethylethyl)-1-methyl-1*H*-imidazole-κ*N*^{3}](η^5-2,4-cyclopentadien-1-yl)-, hexafluorophosphate(1-) (1:1)
Solvents: Acetone-d$_6$; 24 h, rt

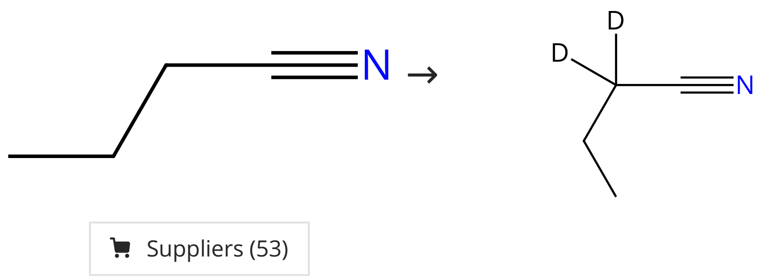
Experimental Protocols

Mild and Selective Deuteration and Isomerization of Alkenes by a Bifunctional Catalyst and Deuterium Oxide

By: Erdogan, Gulin; et al

Journal of the American Chemical Society (2009), 131(30), 10354-10355.

Scheme 117 (1 Reaction) Steps: **1**



31-116-CAS-19660648 Steps: **1**

1.1 **Reagents:** Potassium *tert*-butoxide, Water-*d*$_2$
Catalysts: (*OC*-6-52)-Carbonylchloro[2-(diphenylphosphino-κ*P*)-*N*-[2-(diphenylphosphino-κ*P*)ethyl]ethanamine-κ*N*]hydroruthenium; 24 h, 70 °C

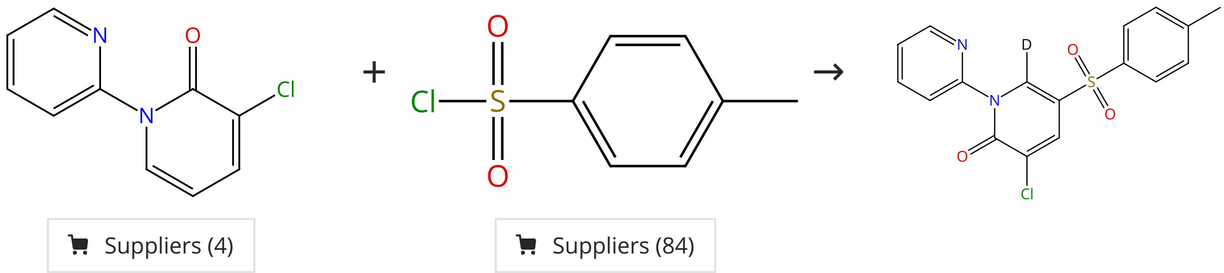
Experimental Protocols

Ruthenium-catalyzed selective α-deuteration of aliphatic nitriles using D_2O

By: Krishnakumar, Varadhan; et al

Chemical Communications (Cambridge, United Kingdom) (2018), 54(63), 8705-8708.

Scheme 118 (1 Reaction) Steps: **1**



31-614-CAS-37326381 Steps: **1**

1.1 **Reagents:** Potassium acetate, Water-*d*$_2$
Catalysts: Bis(dichloro(η^6-*p*-cymene)ruthenium)
Solvents: 1,4-Dioxane; 12 h, 120 °C

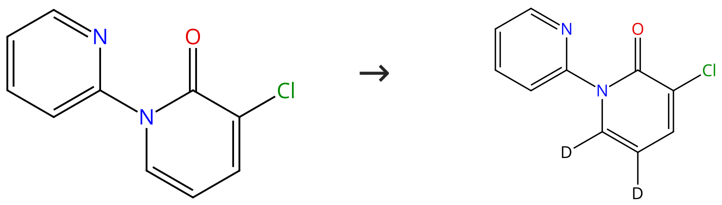
Experimental Protocols

Ruthenium(II)-Catalyzed Remote C-H Sulfonylation of 2-Pyridones

By: Yang, Fengqi; et al

Organic Letters (2023), 25(31), 5779-5783.

Scheme 119 (1 Reaction) Steps: **1**



Suppliers (4)

31-614-CAS-37326387 Steps: **1**

1.1 **Reagents:** Potassium acetate, Water-d_2
Catalysts: Bis(dichloro(η^6-*p*-cymene)ruthenium)
Solvents: 1,4-Dioxane; 12 h, 120 °C

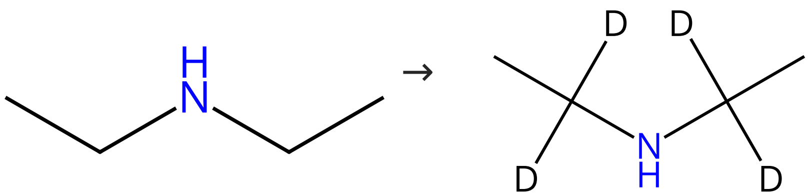
Experimental Protocols

Ruthenium(II)-Catalyzed Remote C-H Sulfonylation of 2-Pyridones

By: Yang, Fengqi; et al

Organic Letters (2023), 25(31), 5779-5783.

Scheme 120 (1 Reaction) Steps: **1**



Suppliers (74) Suppliers (15)

31-614-CAS-31824412 Steps: **1**

1.1 **Reagents:** Water-d_2
Catalysts: Dichlorotris(triphenylphosphine)ruthenium; 3 h, 8 bar, 150 °C

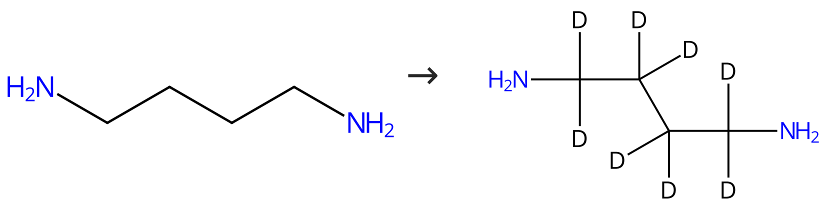
Experimental Protocols

Inclusion Complexes of Gold(I)-Dithiocarbamates with β-Cyclodextrin: A Journey from Drug Repurp osing towards Drug Discovery

By: Morgen, Michael; et al

Chemistry - A European Journal (2021), 27(47), 12156-12165.

Scheme 121 (1 Reaction) Steps: **1**



Suppliers (67) Suppliers (32)

31-614-CAS-38216494 Steps: **1**

1.1 **Reagents:** Hydrogen, Water-d_2
Catalysts: Ruthenium, *myo*-Inositol, 1,2,3,4,5,6-hexakis (dihydrogen phosphate), polymer with benzenamine; 10 h, 2 MPa, 100 °C

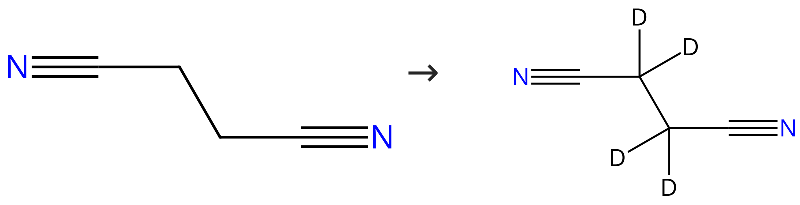
Experimental Protocols

Phytic Acid-Modulated Ru Catalyzes Regiose lective Deuter ation of 1,6-Hexamethylenediamine

By: Shao, Fangjun; et al

ACS Catalysis (2023), 13(24), 15746-15757.

Scheme 122 (1 Reaction)
Steps: 1



Suppliers (55)
Suppliers (6)

31-116-CAS-19660655
Steps: 1

1.1 **Reagents:** Potassium *tert*-butoxide, Water-d_2
Catalysts: (*OC*-6-52)-Carbonylchloro[2-(diphenylphosphino-κ*P*)-*N*-[2-(diphenylphosphino-κ*P*)ethyl]ethanamine-κ*N*]hydroruthenium; 24 h, 70 °C

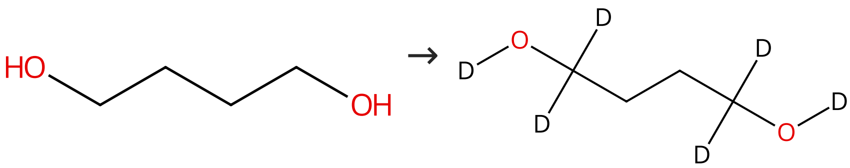
Experimental Protocols

Ruthenium-catalyzed selective α-deuteration of aliphatic nitriles using D_2O

By: Krishnakumar, Varadhan; et al

Chemical Communications (Cambridge, United Kingdom) (2018), 54(63), 8705-8708.

Scheme 123 (1 Reaction)
Steps: 1



Suppliers (51)

31-116-CAS-15208580
Steps: 1

1.1 **Reagents:** Potassium *tert*-butoxide
Catalysts: (*OC*-6-52)-Carbonylchloro[2-(diphenylphosphino-κ*P*)-*N*-[2-(diphenylphosphino-κ*P*)ethyl]ethanamine-κ*N*]hydroruthenium
Solvents: Water-d_2; 16 h, 80 °C

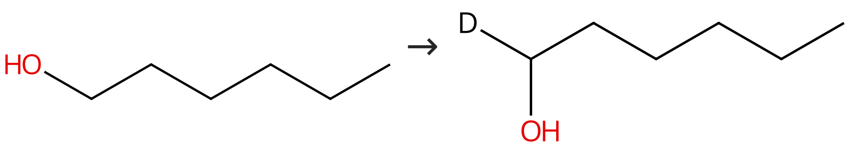
Experimental Protocols

Ruthenium Catalyzed Selective α- and α,β-Deuteration of Alcohols Using D_2O

By: Chatterjee, Basujit; et al

Organic Letters (2015), 17(19), 4794-4797.

Scheme 124 (1 Reaction)
Steps: 1



Suppliers (106)

31-116-CAS-14827926
Steps: 1

1.1 **Reagents:** Water-d_2
Catalysts: Dichlorotris(triphenylphosphine)ruthenium

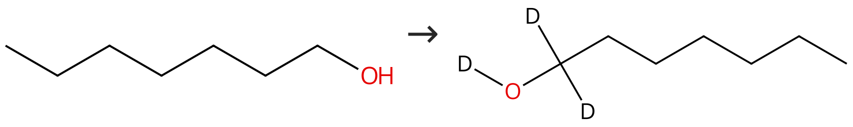
Selectively tritiated primary alcohols

By: Leseticky, L.; et al

Radioisotopy (1990), 31(4), 163-9.

Scheme 125 (2 Reactions)

Steps: **1**



Suppliers (94)

31-614-CAS-36147757

Steps: **1**

1.1 **Reagents:** Potassium hydroxide, Water-*d*2
Catalysts: (*OC*-6-52)-Carbonylchloro[2-(diphenylphosphino-κ*P*)-*N*-[2-(diphenylphosphino-κ*P*)ethyl]ethanamine-κ*N*]hydroruthenium; 18 h, 130 °C

Experimental Protocols

Expedient tandem dehydrogenative alkylation and cyclization reactions under Mn(I)-catalysis

By: Babu, Reshma; et al

Catalysis Science & Technology (2023), 13(9), 2763-2771.

31-116-CAS-4237875

Steps: **1**

1.1 **Reagents:** Potassium *tert*-butoxide
Catalysts: (*OC*-6-52)-Carbonylchloro[2-(diphenylphosphino-κ*P*)-*N*-[2-(diphenylphosphino-κ*P*)ethyl]ethanamine-κ*N*]hydroruthenium
Solvents: Water-*d*2; 16 h, 80 °C

Experimental Protocols

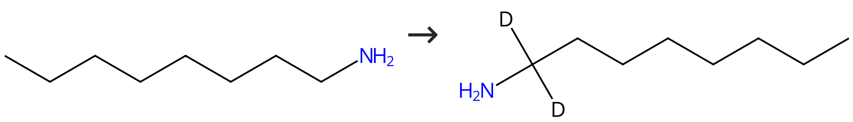
Ruthenium Catalyzed Selective α- and α,β-Deuteration of Alcohols Using D_2O

By: Chatterjee, Basujit; et al

Organic Letters (2015), 17(19), 4794-4797.

Scheme 126 (2 Reactions)

Steps: **1**



Suppliers (82)

31-614-CAS-38216499

Steps: **1**

1.1 **Reagents:** Hydrogen, Water-*d*2
Catalysts: Ruthenium, *myo*-Inositol, 1,2,3,4,5,6-hexakis(dihydrogen phosphate), polymer with benzenamine; 10 h, 2 MPa, 100 °C

Experimental Protocols

Phytic Acid-Modulated Ru Catalyzes Regioselective Deuteration of 1,6-Hexamethylenediamine

By: Shao, Fangjun; et al

ACS Catalysis (2023), 13(24), 15746-15757.

31-116-CAS-16271193

Steps: **1**

1.1 **Reagents:** Water-*d*2
Catalysts: (*OC*-6-12)-Hydro[[*N*,*N'*-(1*H*-isoindole-1,3(2*H*)-diyl-κ*N*)bis[6-methyl-2-pyridinaminato-κ*N*1]](1-)](triphenylphosphine)ruthenium
Solvents: Methylcyclohexane; 20 h, 110 °C

Experimental Protocols

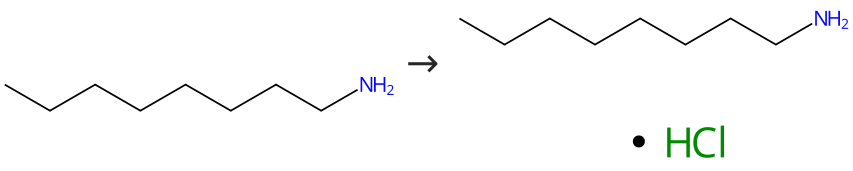
Stereoretentive Deuteration of α-Chiral Amines with D_2O

By: Hale, Lillian V. A.; et al

Journal of the American Chemical Society (2016), 138(41), 13489-13492.

Scheme 127 (1 Reaction)

Steps: **1**



Suppliers (82)

Suppliers (56)

31-575-CAS-16271195

Steps: **1**

1.1 **Reagents:** Water-*d*2
Catalysts: Ruthenium(1+), hydro[*N*-methyl-*N*-(6-methyl-2-pyridinyl-κ*N*)-1-[(6-methyl-2-pyridinyl-κ*N*)imino]-1*H*-isoindol-3-amine-κN^2](1,1,1-trifluoromethanesulfonato-κ*O*)(triphenyl phosphine)-, (*OC*-6-26)-, 1,1,1-trifluoromethanesulfonate (1:1)
Solvents: 2-Methyltetrahydrofuran; 20 h, 110 °C; 110 °C → rt

1.2 **Reagents:** Deuterium chloride
Solvents: Water-*d*2

Experimental Protocols

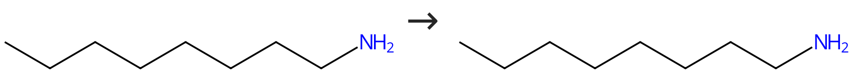
Stereoretentive Deuteration of α-Chiral Amines with D_2O

By: Hale, Lillian V. A.; et al

Journal of the American Chemical Society (2016), 138(41), 13489-13492.

Scheme 128 (1 Reaction)

Steps: **1**



Suppliers (82)

31-614-CAS-29032700

Steps: **1**

1.1 **Reagents:** Water-*d*2
Catalysts: Ruthenium(1+), hydro[*N*-methyl-*N*-(6-methyl-2-pyridinyl-κ*N*)-1-[(6-methyl-2-pyridinyl-κ*N*)imino]-1*H*-isoindol-3-amine-κN^2](1,1,1-trifluoromethanesulfonato-κ*O*)(triphenyl phosphine)-, (*OC*-6-26)-, 1,1,1-trifluoromethanesulfonate (1:1)
Solvents: 2-Methyltetrahydrofuran; 20 h, 110 °C

Experimental Protocols

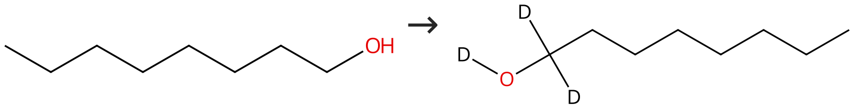
Stereoretentive Deuteration of α-Chiral Amines with D_2O

By: Hale, Lillian V. A.; et al

Journal of the American Chemical Society (2016), 138(41), 13489-13492.

Scheme 129 (1 Reaction)

Steps: **1**



Suppliers (140)

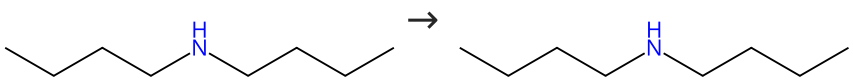
31-116-CAS-6421842	Steps: **1**
1.1	**Reagents:** Potassium *tert*-butoxide **Catalysts:** (*OC*-6-52)-Carbonylchloro[2-(diphenylphosphino-κ*P*)-*N*-[2-(diphenylphosphino-κ*P*)ethyl]ethanamine-κ*N*]hydroruthenium **Solvents:** Water-d_2; 16 h, 80 °C
Experimental Protocols	

Ruthenium Catalyzed Selective α- and α,β-Deuteration of Alcohols Using D_2O

By: Chatterjee, Basujit; et al

Organic Letters (2015), 17(19), 4794-4797.

Scheme 130 (3 Reactions) Steps: **1**



Suppliers (75)

31-614-CAS-30795482	Steps: **1**
1.1	**Reagents:** Water-d_2 **Catalysts:** Hexacarbonyldi-μ-chlorodichlorodiruthenium **Solvents:** Dimethyl sulfoxide; 3 h, 150 °C

One-step exchange-labeling of piperidines, piperazines and dialkylamines with deuterium oxide: catalysis by various ruthenium complexes

By: Alexakis, Efstathios; et al

Tetrahedron Letters (2005), 46(25), 4291-4293.

31-614-CAS-28392448	Steps: **1**
1.1	**Reagents:** Water-d_2 **Catalysts:** Dichlorotris(triphenylphosphine)ruthenium **Solvents:** Dimethyl sulfoxide; 3 h, 150 °C

One-step exchange-labeling of piperidines, piperazines and dialkylamines with deuterium oxide: catalysis by various ruthenium complexes

By: Alexakis, Efstathios; et al

Tetrahedron Letters (2005), 46(25), 4291-4293.

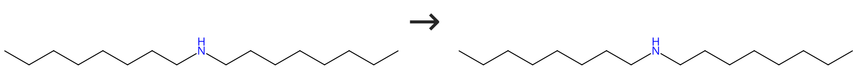
31-614-CAS-26668376	Steps: **1**
1.1	**Reagents:** Water-d_2 **Catalysts:** Bis(η^6-benzene)di-μ-chlorodichlorodiruthenium **Solvents:** Dimethyl sulfoxide; 3 h, 150 °C

One-step exchange-labeling of piperidines, piperazines and dialkylamines with deuterium oxide: catalysis by various ruthenium complexes

By: Alexakis, Efstathios; et al

Tetrahedron Letters (2005), 46(25), 4291-4293.

Scheme 131 (3 Reactions) Steps: **1**



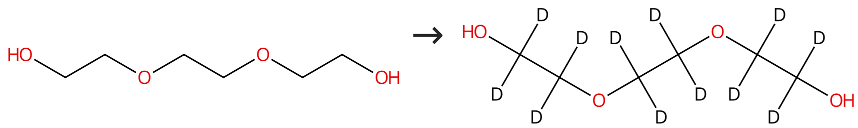
Suppliers (70)

31-614-CAS-27458814	Steps: **1**	**One-step exchange-labeling of piperidines, piperazines and dialkylamines with deuterium oxide: catalysis by various ruthenium complexes**
1.1	**Reagents:** Water-d_2 **Catalysts:** Bis(η^6-benzene)di-μ-chlorodichlorodiruthenium **Solvents:** Dimethyl sulfoxide; 3 h, 150 °C	By: Alexakis, Efstathios; et al Tetrahedron Letters (2005), 46(25), 4291-4293.

31-614-CAS-29194571	Steps: **1**	**One-step exchange-labeling of piperidines, piperazines and dialkylamines with deuterium oxide: catalysis by various ruthenium complexes**
1.1	**Reagents:** Water-d_2 **Catalysts:** Dichlorotris(triphenylphosphine)ruthenium **Solvents:** Dimethyl sulfoxide; 3 h, 150 °C	By: Alexakis, Efstathios; et al Tetrahedron Letters (2005), 46(25), 4291-4293.

31-614-CAS-25724011	Steps: **1**	**One-step exchange-labeling of piperidines, piperazines and dialkylamines with deuterium oxide: catalysis by various ruthenium complexes**
1.1	**Reagents:** Water-d_2 **Catalysts:** Hexacarbonyldi-μ-chlorodichlorodiruthenium **Solvents:** Dimethyl sulfoxide; 3 h, 150 °C	By: Alexakis, Efstathios; et al Tetrahedron Letters (2005), 46(25), 4291-4293.

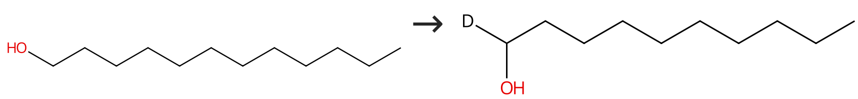
Scheme 132 (1 Reaction) Steps: **1**



Suppliers (104) Supplier (1)

31-614-CAS-38216505	Steps: **1**	**Phytic Acid-Modulated Ru Catalyzes Regioselective Deuteration of 1,6-Hexamethylenediamine**
1.1	**Reagents:** Hydrogen, Water-d_2 **Catalysts:** Ruthenium, *myo*-Inositol, 1,2,3,4,5,6-hexakis (dihydrogen phosphate), polymer with benzenamine; 5 h, 2 MPa, 100 °C	By: Shao, Fangjun; et al ACS Catalysis (2023), 13(24), 15746-15757.
Experimental Protocols		

Scheme 133 (1 Reaction) Steps: **1**

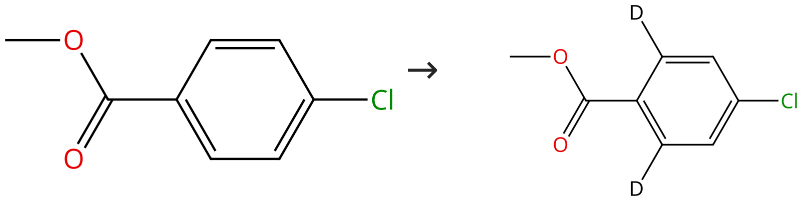


Suppliers (101)

31-116-CAS-1430848	Steps: **1**	**Selectively tritiated primary alcohols**
1.1	**Reagents:** Water-d_2 **Catalysts:** Dichlorotris(triphenylphosphine)ruthenium	By: Leseticky, L.; et al Radioisotopy (1990), 31(4), 163-9.

Scheme 134 (1 Reaction)

Steps: **1**



Suppliers (93)

31-116-CAS-12446382

Steps: **1**

1.1 **Reagents:** Water-*d*$_2$
Catalysts: Stereoisomer of dihydro[(1,2,3,3a,7a-η)-1-phenyl-1*H*-inden-1-yl](triethylsilyl)(triphenylphosphine)ruthenium
Solvents: Toluene; 16 h, 110 atm

Experimental Protocols

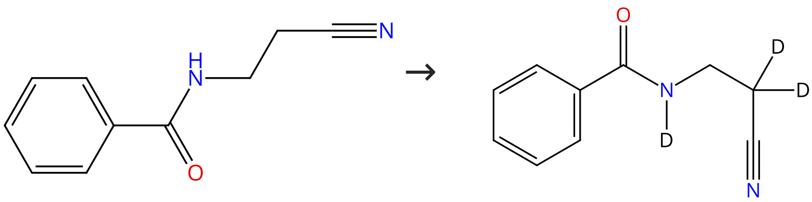
Regioselective ruthenium catalysed H-D exchange using D_2O as the deuterium source

By: Piola, Lorenzo; et al

Organic & Biomolecular Chemistry (2014), 12(43), 8683-8688.

Scheme 135 (1 Reaction)

Steps: **1**



Suppliers (9)

31-116-CAS-19660675

Steps: **1**

1.1 **Reagents:** Potassium *tert*-butoxide, Water-*d*$_2$
Catalysts: (*OC*-6-52)-Carbonylchloro[2-(diphenylphosphino-κ*P*)-*N*-[2-(diphenylphosphino-κ*P*)ethyl]ethanamine-κ*N*]hydroruthenium; 24 h, 70 °C

Experimental Protocols

Ruthenium-catalyzed selective α-deuteration of aliphatic nitriles using D_2O

By: Krishnakumar, Varadhan; et al

Chemical Communications (Cambridge, United Kingdom) (2018), 54(63), 8705-8708.

Scheme 136 (1 Reaction)

Steps: **1**

Suppliers (54)

31-116-CAS-8831463

Steps: **1**

1.1 **Reagents:** Potassium *tert*-butoxide, Water-*d*$_2$
Catalysts: (*OC*-6-52)-Carbonylchloro[2-(diphenylphosphino-κ*P*)-*N*-[2-(diphenylphosphino-κ*P*)ethyl]ethanamine-κ*N*]hydroruthenium
Solvents: 1,2-Dimethoxyethane; 24 h, 90 °C

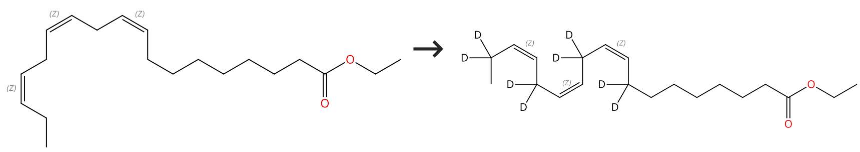
Experimental Protocols

The ruthenium-catalysed selective synthesis of mono-deuterated terminal alkynes

By: Chatterjee, Basujit; et al

Chemical Communications (Cambridge, United Kingdom) (2016), 52(24), 4509-4512.

Scheme 137 (1 Reaction) Steps: **1**



Double bond geometry shown

Suppliers (67)

Double bond geometry shown

31-116-CAS-17923445 Steps: **1**

1.1 **Reagents:** Water-*d*$_2$
Catalysts: Ruthenium(1+), tris(acetonitrile)(η^5-2,4-cyclopentadien-1-yl)-, hexafluorophosphate(1-) (1:1)
Solvents: Acetone-d$_6$; 1 h, rt

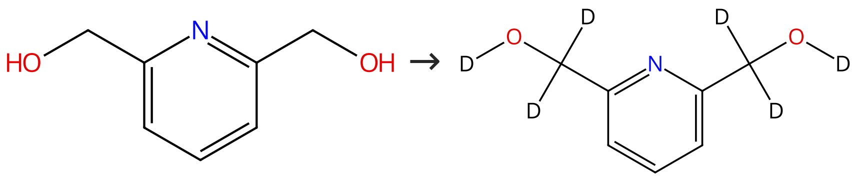
Experimental Protocols

Site-Specific Deuteration of Polyunsaturated Alkenes

By: Smarun, A. V.; et al

Journal of Organic Chemistry (2017), 82(24), 13115-13120.

Scheme 138 (1 Reaction) Steps: **1**



Suppliers (96)

31-116-CAS-13087138 Steps: **1**

1.1 **Reagents:** Potassium *tert*-butoxide
Catalysts: (*OC*-6-52)-Carbonylchloro[2-(diphenylphosphino-κ*P*)-*N*-[2-(diphenylphosphino-κ*P*)ethyl]ethanamine-κ*N*]hydroruthenium
Solvents: Water-*d*$_2$; 36 h, 100 °C

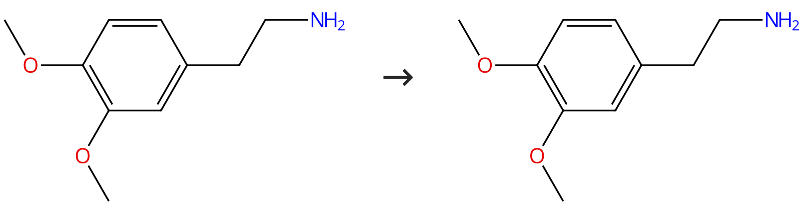
Experimental Protocols

Ruthenium Catalyzed Selective α- and α,β-Deuteration of Alcohols Using D_2O

By: Chatterjee, Basujit; et al

Organic Letters (2015), 17(19), 4794-4797.

Scheme 139 (1 Reaction) Steps: **1**



Suppliers (73)

31-614-CAS-24968713 Steps: **1**

1.1 **Reagents:** Water-*d*$_2$
Catalysts: Ruthenium(1+), hydro[*N*-methyl-*N*-(6-methyl-2-pyridinyl-κ*N*)-1-[(6-methyl-2-pyridinyl-κ*N*)imino]-1*H*-isoindol-3-amine-κ*N*^{2}](1,1,1-trifluoromethanesulfonato-κ*O*)(triphenylphosphine)-, (*OC*-6-26)-, 1,1,1-trifluoromethanesulfonate (1:1)
Solvents: 2-Methyltetrahydrofuran; 20 h, 110 °C

Experimental Protocols

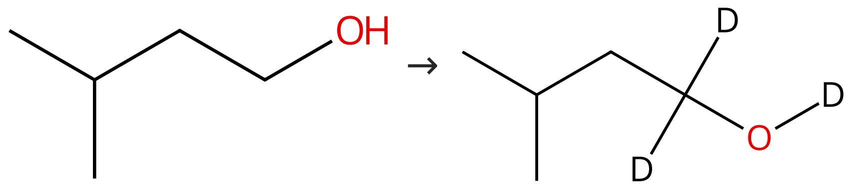
Stereoretentive Deuteration of α-Chiral Amines with D_2O

By: Hale, Lillian V. A.; et al

Journal of the American Chemical Society (2016), 138(41), 13489-13492.

Scheme 140 (1 Reaction)

Steps: 1



Suppliers (108)

31-116-CAS-6690502

Steps: 1

1.1 **Reagents:** Potassium *tert*-butoxide
Catalysts: (*OC*-6-52)-Carbonylchloro[2-(diphenylphosphino-κ*P*)-*N*-[2-(diphenylphosphino-κ*P*)ethyl]ethanamine-κ*N*]hydroruthenium
Solvents: Water-d_2; 12 h, 80 °C

Experimental Protocols

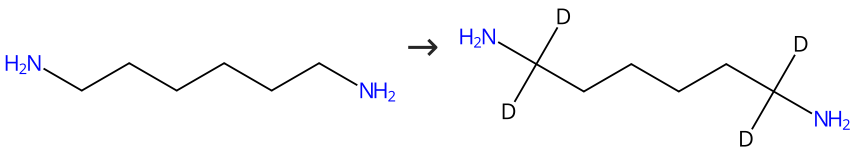
Ruthenium Catalyzed Selective α- and α,β-Deuteration of Alcohols Using D_2O

By: Chatterjee, Basujit; et al

Organic Letters (2015), 17(19), 4794-4797.

Scheme 141 (1 Reaction)

Steps: 1



Suppliers (89)

Suppliers (24)

31-116-CAS-2998131

Steps: 1

1.1 **Reagents:** Water-d_2
Catalysts: Dichlorobis(triphenylphosphine)ruthenium; 30 min, 10 atm, 150 °C

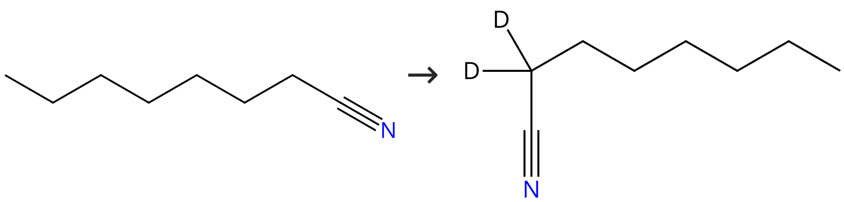
Ruthenium catalyzed deuterium labeling of α-carbon in primary alcohol and primary/secondary amine in D_2O

By: Takahashi, Masaaki; et al

Chemistry Letters (2005), 34(2), 192-193.

Scheme 142 (1 Reaction)

Steps: 1



Suppliers (37)

31-116-CAS-19660649

Steps: 1

1.1 **Reagents:** Potassium *tert*-butoxide, Water-d_2
Catalysts: (*OC*-6-52)-Carbonylchloro[2-(diphenylphosphino-κ*P*)-*N*-[2-(diphenylphosphino-κ*P*)ethyl]ethanamine-κ*N*]hydroruthenium; 24 h, 70 °C

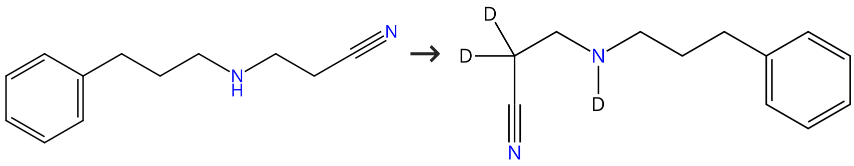
Experimental Protocols

Ruthenium-catalyzed selective α-deuteration of aliphatic nitriles using D_2O

By: Krishnakumar, Varadhan; et al

Chemical Communications (Cambridge, United Kingdom) (2018), 54(63), 8705-8708.

Scheme 143 (1 Reaction) Steps: **1**



Suppliers (5)

31-116-CAS-19660669 Steps: **1**

1.1 **Reagents:** Potassium *tert*-butoxide, Water-d_2
Catalysts: (*OC*-6-52)-Carbonylchloro[2-(diphenylphosphino-κ*P*)-*N*-[2-(diphenylphosphino-κ*P*)ethyl]ethanamine-κ*N*]hydroruthenium; 24 h, 70 °C

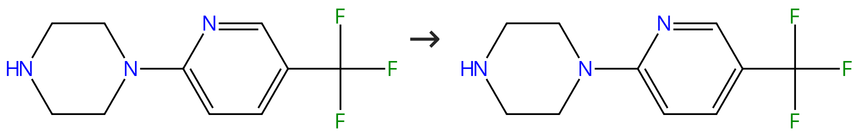
Experimental Protocols

Ruthenium-catalyzed selective α-deuteration of aliphatic nitriles using D_2O

By: Krishnakumar, Varadhan; et al

Chemical Communications (Cambridge, United Kingdom) (2018), 54(63), 8705-8708.

Scheme 144 (3 Reactions) Steps: **1**



Suppliers (80) Suppliers (3)

31-614-CAS-25976241 Steps: **1**

1.1 **Reagents:** Water-d_2
Catalysts: Hexacarbonyldi-μ-chlorodichlorodiruthenium
Solvents: Dimethyl sulfoxide; 3 h, 150 °C

One-step exchange-labeling of piperidines, piperazines and dialkylamines with deuterium oxide: catalysis by various ruthenium complexes

By: Alexakis, Efstathios; et al

Tetrahedron Letters (2005), 46(25), 4291-4293.

31-614-CAS-29419844 Steps: **1**

1.1 **Reagents:** Water-d_2
Catalysts: Dichlorotris(triphenylphosphine)ruthenium
Solvents: Dimethyl sulfoxide; 3 h, 150 °C

One-step exchange-labeling of piperidines, piperazines and dialkylamines with deuterium oxide: catalysis by various ruthenium complexes

By: Alexakis, Efstathios; et al

Tetrahedron Letters (2005), 46(25), 4291-4293.

31-614-CAS-27706009 Steps: **1**

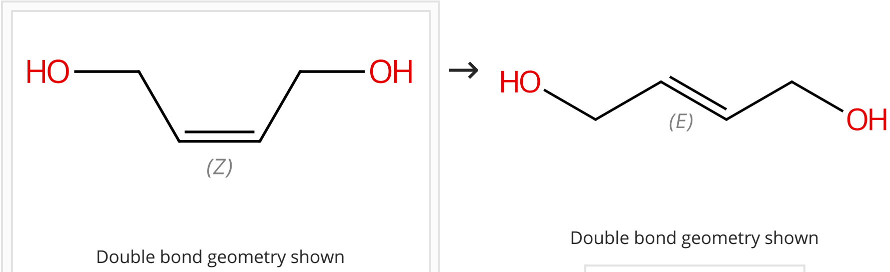
1.1 **Reagents:** Water-d_2
Catalysts: Bis(η^6-benzene)di-μ-chlorodichlorodiruthenium
Solvents: Dimethyl sulfoxide; 3 h, 150 °C

One-step exchange-labeling of piperidines, piperazines and dialkylamines with deuterium oxide: catalysis by various ruthenium complexes

By: Alexakis, Efstathios; et al

Tetrahedron Letters (2005), 46(25), 4291-4293.

Scheme 145 (1 Reaction) Steps: 1



Suppliers (78)

31-614-CAS-30919449 Steps: 1

1.1 **Catalysts:** Ruthenium(1+), (η^5-2,4-cyclopentadien-1-yl)(4-methoxy-2-quinolinecarboxylato-κN^1,κO^2)(η^3-2-propen-1-yl)-, hexafluorophosphate(1-) (1:1)
Solvents: Water-d_2; > 1 h, rt

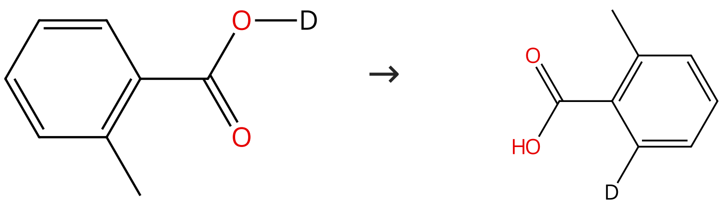
Experimental Protocols

Polycondensation of Butenediol: Synthesis of Telechelic 2-Butene-1,4-diol Oligomers

By: Kiesewetter, Matthew K.; et al

Journal of the American Chemical Society (2011), 133(41), 16390-16393.

Scheme 146 (1 Reaction) Steps: 1



Suppliers (3)

31-116-CAS-19010034 Steps: 1

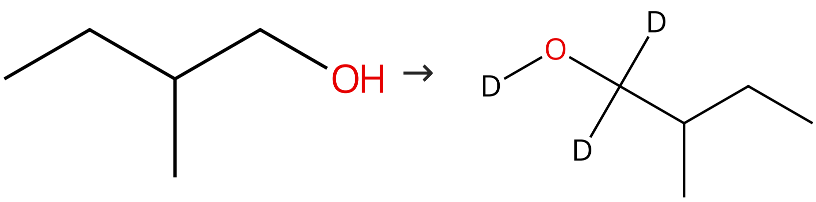
1.1 **Reagents:** Triethylamine, Water-d_2
Catalysts: Bis(dichloro(η^6-*p*-cymene)ruthenium)
Solvents: Ethanol-*d*, 2,2,2-trichloro-; 24 h, 60 °C

Catalytic C-N and C-H Bond Activation: ortho-Allylation of Benzoic Acids with Allyl Amines

By: Hu, Xiao-Qiang; et al

Organic Letters (2018), 20(14), 4337-4340.

Scheme 147 (1 Reaction) Steps: 1



Suppliers (68)

31-116-CAS-15553614 Steps: 1

1.1 **Reagents:** Sodium hydroxide, Water-d_2
Catalysts: (*OC*-6-52)-Carbonylchloro[2-(diphenylphosphino-κP)-*N*-[2-(diphenylphosphino-κP)ethyl]ethanamine-κN]hydroruthenium; 0.5 h, 120 °C

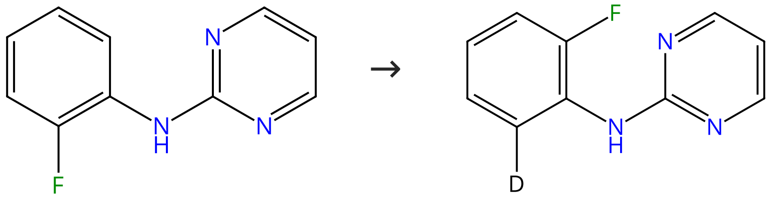
Experimental Protocols

Efficient deuterium labelling of alcohols in deuterated water catalyzed by ruthenium pincer complexes

By: Zhang, Lei; et al

Catalysis Communications (2016), 84, 67-70.

Scheme 148 (1 Reaction) Steps: **1**



Suppliers (4)

31-116-CAS-15806348	Steps: **1**
1.1	**Reagents:** Potassium acetate, Water-d_2 **Catalysts:** Dichloro[(1,2,3,4,5,6-η)-1-methyl-4-(1-methylethyl)benzene]ruthenium **Solvents:** Toluene; 24 h, 80 °C

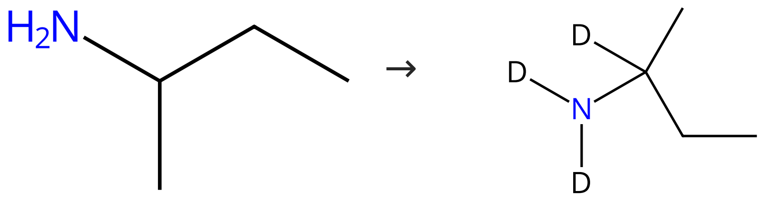
Experimental Protocols

Nickel-Catalyzed CH Chalcogenation of Anilines

By: Mueller, Thomas; et al

Chemistry - A European Journal (2016), 22(40), 14151-14154.

Scheme 149 (1 Reaction) Steps: **1**



Suppliers (74)

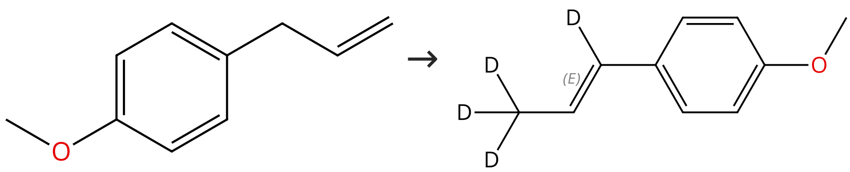
31-116-CAS-16029445	Steps: **1**
1.1	**Reagents:** Water-d_2 **Catalysts:** Ruthenium; 9 h, pH 7 - 12, 60 °C

Stereoretentive H/D Exchange via an Electroactivated Heterogeneous Catalyst at sp^3 C-H Sites Bearing Amines or Alcohols

By: Bhatia, Souful; et al

European Journal of Organic Chemistry (2016), 2016(24), 4230-4235.

Scheme 150 (1 Reaction) Steps: **1**



Suppliers (94)

Double bond geometry shown

31-116-CAS-4837950	Steps: **1**
1.1	**Reagents:** 1,1',1'',1'''-Methanetetrayltetrakis[1,1,1-trimethylsilane], Water-d_2 **Catalysts:** Ruthenium(1+), (acetonitrile)[2-[bis(1-methylethyl)phosphino-κ*P*]-4-(1,1-dimethylethyl)-1-methyl-1*H*-imidazole-κ*N*^{3}](η^5-2,4-cyclopentadien-1-yl)-, hexafluorophosphate(1-) (1:1) **Solvents:** Acetone-d_6; 72 h, rt

Experimental Protocols

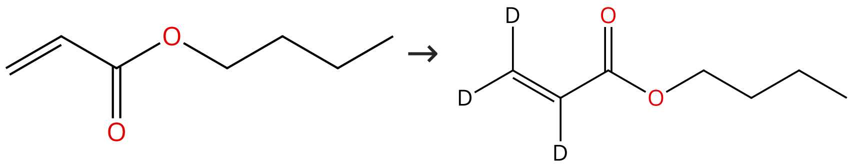
Mild and Selective Deuteration and Isomerization of Alkenes by a Bifunctional Catalyst and Deuterium Oxide

By: Erdogan, Gulin; et al

Journal of the American Chemical Society (2009), 131(30), 10354-10355.

Scheme 151 (2 Reactions)

Steps: **1**



Suppliers (65)

31-116-CAS-21268631	Steps: **1**
1.1	**Reagents:** Water-d_2 **Catalysts:** Carbonylchlorohydrotris(triphenylphosphine) ruthenium **Solvents:** Diglyme; 19 h, 100 °C
Experimental Protocols	

Ionic Pd/NHC Catalytic System Enables Recoverable Homogeneous Catalysis: Mechanistic Study and Application in the Mizoroki-Heck Reaction

By: Eremin, Dmitry B.; et al

Chemistry - A European Journal (2019), 25(72), 16564-16572.

31-116-CAS-16712184	Steps: **1**
1.1	**Reagents:** Water-d_2 **Catalysts:** Carbonylchlorohydrotris(triphenylphosphine) ruthenium **Solvents:** 1,4-Dioxane; 19 h, 100 °C; 100 °C → rt
Experimental Protocols	

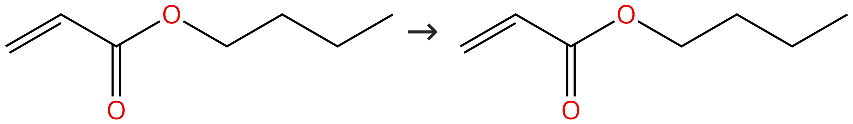
Palladium-Catalyzed Direct Intramolecular C-N Bond Formation: Access to Multisubstituted Dihydropyrroles

By: Jiang, Bing; et al

Organic Letters (2017), 19(4), 914-917.

Scheme 152 (1 Reaction)

Steps: **1**



Suppliers (65)

31-614-CAS-24853428	Steps: **1**
1.1	**Reagents:** Potassium acetate, Water-d_2 **Catalysts:** Bis(dichloro(η^6-*p*-cymene)ruthenium); 100 °C

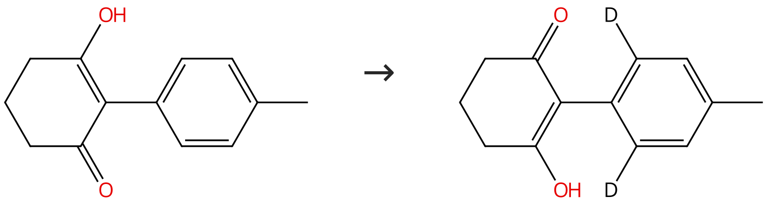
A Strategy for Site- and Chemoselective C-H Alkenylation through Osmaelectrooxidative Catalysis

By: Choi, Isaac; et al

Angewandte Chemie, International Edition (2021), 60(52), 27005-27012.

Scheme 153 (1 Reaction)

Steps: **1**



Supplier (1)

31-614-CAS-35261426 Steps: **1**

1.1 **Reagents:** Acetic acid, Potassium acetate, Water-d_2
Catalysts: Bis(dichloro(η^6-*p*-cymene)ruthenium)
Solvents: 1,2-Dichloroethane; 24 h, 100 °C

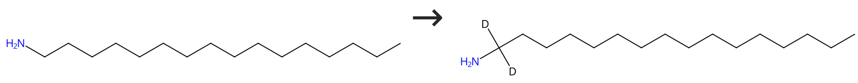
Experimental Protocols

Redox-Neutral Ruthenium(II)-Catalyzed Enol-Directed Arene C-H Alkylation with Maleimides

By: Mondal, Sudeshna; et al

Organic Letters (2023), 25(1), 70-75.

Scheme 154 (1 Reaction) Steps: **1**



Suppliers (72)

31-614-CAS-38216497 Steps: **1**

1.1 **Reagents:** Hydrogen, Water-d_2
Catalysts: Ruthenium, *myo*-Inositol, 1,2,3,4,5,6-hexakis (dihydrogen phosphate), polymer with benzenamine; 10 h, 2 MPa, 100 °C

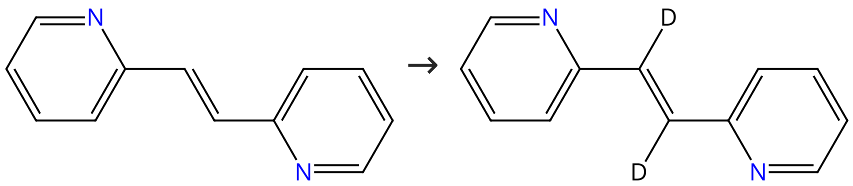
Experimental Protocols

Phytic Acid-Modulated Ru Catalyzes Regioselective Deuteration of 1,6-Hexamethylenediamine

By: Shao, Fangjun; et al

ACS Catalysis (2023), 13(24), 15746-15757.

Scheme 155 (1 Reaction) Steps: **1**



Suppliers (41)

31-116-CAS-15236387 Steps: **1**

1.1 **Reagents:** Water-d_2
Catalysts: Stereoisomer of dihydro[(1,2,3,3a,7a-η)-1-phenyl-1*H*-inden-1-yl](triethylsilyl)(triphenylphosphine)ruthenium
Solvents: Toluene; 16 h, 110 °C

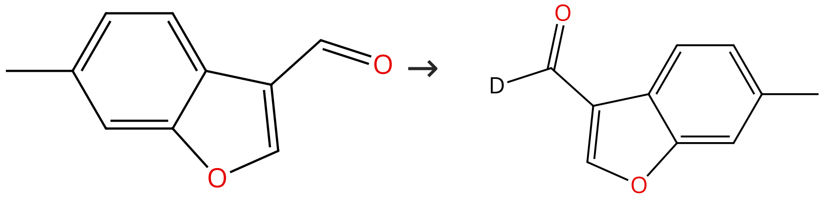
Experimental Protocols

Regioselective ruthenium catalysed H-D exchange using D_2O as the deuterium source

By: Piola, Lorenzo; et al

Organic & Biomolecular Chemistry (2014), 12(43), 8683-8688.

Scheme 156 (1 Reaction) Steps: **1**



Suppliers (13)

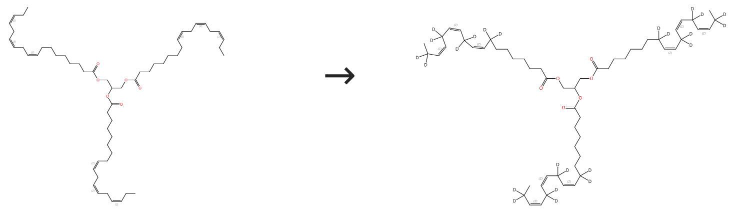
31-116-CAS-20983643	Steps: 1
1.1	**Reagents:** Potassium carbonate, Water-d_2 **Catalysts:** Silver acetate, Dichlorotris(triphenylphosphine) ruthenium **Solvents:** Toluene; 24 h, 140 °C
Experimental Protocols	

Ru(II)-Catalyzed C-H Activation/Alkylation of 3-Formylbenzofurans with Conjugated Olefins: Product Divergence

By: Srinivas, Kolluru; et al

Journal of Organic Chemistry (2019), 84(9), 5056-5066.

Scheme 157 (1 Reaction) Steps: **1**



Double bond geometry shown

Double bond geometry shown

Suppliers (39)

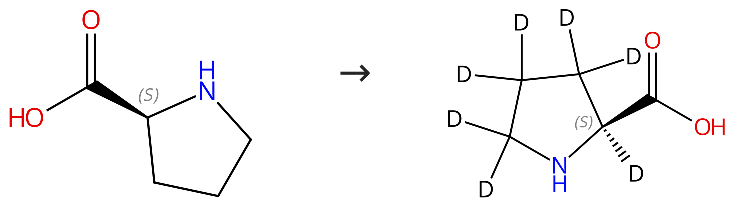
31-116-CAS-17923448	Steps: 1
1.1	**Reagents:** Water-d_2 **Catalysts:** Ruthenium(1+), tris(acetonitrile)(η^5-2,4-cyclopentadien-1-yl)-, hexafluorophosphate(1-) (1:1) **Solvents:** Acetone-d_6; 7 h, rt
Experimental Protocols	

Site-Specific Deuteration of Polyunsaturated Alkenes

By: Smarun, A. V.; et al

Journal of Organic Chemistry (2017), 82(24), 13115-13120.

Scheme 158 (1 Reaction) Steps: **1**



Absolute stereochemistry shown, Rotation (-)

Suppliers (170)

Absolute stereochemistry shown

Suppliers (28)

31-614-CAS-38216503	Steps: 1
1.1	**Reagents:** Hydrogen, Water-d_2 **Catalysts:** Ruthenium, *myo*-Inositol, 1,2,3,4,5,6-hexakis (dihydrogen phosphate), polymer with benzenamine; 10 h, 2 MPa, 100 °C
Experimental Protocols	

Phytic Acid-Modulated Ru Catalyzes Regioselective Deuteration of 1,6-Hexamethylenediamine

By: Shao, Fangjun; et al

ACS Catalysis (2023), 13(24), 15746-15757.

Scheme 159 (1 Reaction) Steps: **1**

Suppliers (45)

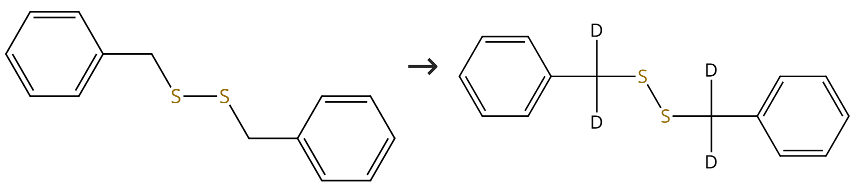
31-614-CAS-25500444	Steps: **1**
1.1	**Catalysts:** Dichlorotris(triphenylphosphine)ruthenium **Solvents:** Water-d_2; 15 min, 10 atm, 185 °C

Ruthenium-catalyzed isomerization of alkenol into alkanone in water under irradiation of microwaves

By: Ishibashi, Kenichi; et al

Chemistry Letters (2005), 34(5), 664-665.

Scheme 160 (1 Reaction) Steps: **1**



Suppliers (72) Supplier (1)

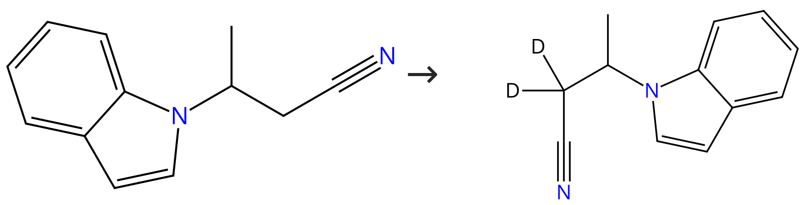
31-116-CAS-7479717	Steps: **1**
1.1	**Reagents:** Water-d_2 **Catalysts:** Stereoisomer of dihydro[(1,2,3,3a,7a-η)-1-phenyl-1*H*-inden-1-yl](triethylsilyl)(triphenylphosphine)ruthenium **Solvents:** Toluene; 16 h, 110 atm
Experimental Protocols	

Regioselective ruthenium catalysed H-D exchange using D_2O as the deuterium source

By: Piola, Lorenzo; et al

Organic & Biomolecular Chemistry (2014), 12(43), 8683-8688.

Scheme 161 (1 Reaction) Steps: **1**



Suppliers (3)

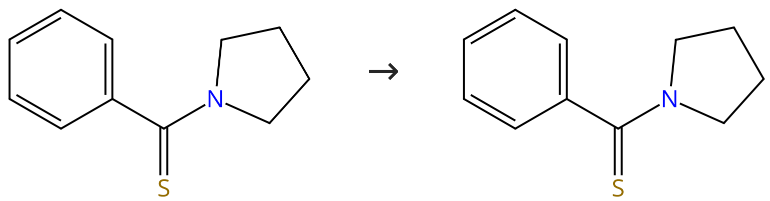
31-116-CAS-19660673	Steps: **1**
1.1	**Reagents:** Potassium *tert*-butoxide, Water-d_2 **Catalysts:** (*OC*-6-52)-Carbonylchloro[2-(diphenylphosphino-κ*P*)-*N*-[2-(diphenylphosphino-κ*P*)ethyl]ethanamine-κ*N*]hydroruthenium; 24 h, 70 °C
Experimental Protocols	

Ruthenium-catalyzed selective α-deuteration of aliphatic nitriles using D_2O

By: Krishnakumar, Varadhan; et al

Chemical Communications (Cambridge, United Kingdom) (2018), 54(63), 8705-8708.

Scheme 162 (1 Reaction) Steps: **1**



Suppliers (11)

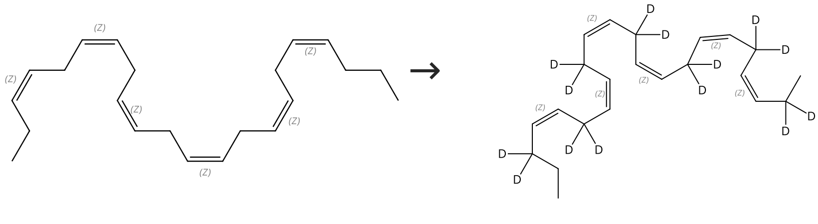
31-614-CAS-26144516	Steps: **1**
1.1	**Reagents:** Potassium carbonate, Water-d_2, Silver oxide (Ag_2O), Copper(II) triflate **Catalysts:** Bis(dichloro(η^6-*p*-cymene)ruthenium) **Solvents:** 2-Methyltetrahydrofuran; rt; 6 h, 120 °C

Ruthenium(II)-Catalyzed C-H Arylation of N,N-Dialkyl Thiobenzamides with Boronic Acids by Sulfur Coordination in 2-MeTHF

By: Zhang, Jin; et al

Organic Letters (2020), 22(17), 6884-6890.

Scheme 163 (1 Reaction) Steps: **1**



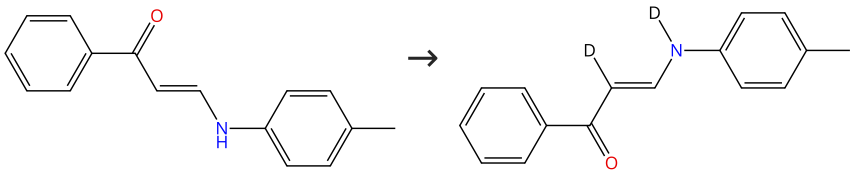
31-116-CAS-17923457	Steps: **1**
1.1	**Reagents:** Water-d_2 **Catalysts:** Ruthenium(1+), tris(acetonitrile)(η^5-2,4-cyclopentadien-1-yl)-, hexafluorophosphate(1-) (1:1) **Solvents:** Acetone-d_6; 18 h, rt
Experimental Protocols	

Site-Specific Deuteration of Polyunsaturated Alkenes

By: Smarun, A. V.; et al

Journal of Organic Chemistry (2017), 82(24), 13115-13120.

Scheme 164 (1 Reaction) Steps: **1**



Suppliers (3)

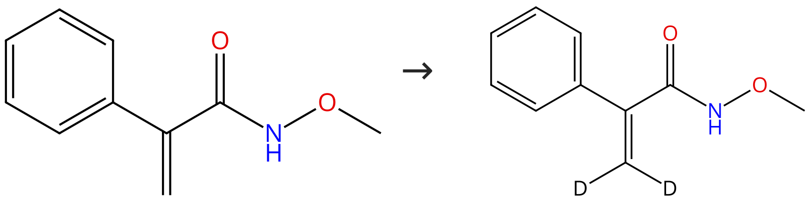
31-614-CAS-38031089	Steps: **1**
1.1	**Reagents:** Water-d_2, Silver oxide (Ag_2O) **Catalysts:** Di-μ-chlorodichlorobis[(1,2,3,4,5-η)-1,2,3,4,5-pentamethyl-2,4-cyclopentadien-1-yl]diruthenium **Solvents:** Nitromethane; 12 h, 40 °C
Experimental Protocols	

Unprecedented chemoselective Ru(III)-catalyzed [3 + 2] annulation of enaminones with iodonium ylides for the synthesis of functionalized 3a,7a-dihydroxy hexahydro-4H-indol-4-ones

By: Zhang, Mingshuai; et al

Organic Chemistry Frontiers (2023), 10(22), 5660-5666.

Scheme 165 (1 Reaction) Steps: **1**



Suppliers (2)

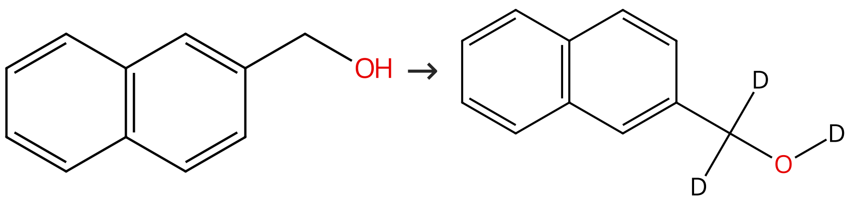
31-614-CAS-40572467	Steps: **1**
1.1	**Reagents:** Acetic acid **Catalysts:** Triruthenium dodecacarbonyl, Zinc triflate **Solvents:** Dichloromethane, Water-d_2; 12 h, 80 °C
Experimental Protocols	

Switchable Regioselective C-H Activation/Annulation of Acrylamides with Alkynes for the Synthesis of 2- Pyridones

By: Chen, Chao; et al

ChemSusChem (2024), 17(19), e202400066.

Scheme 166 (1 Reaction) Steps: **1**



Suppliers (98)

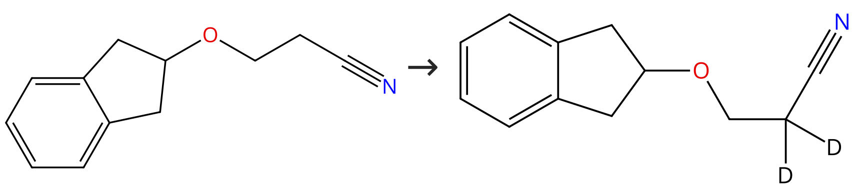
31-116-CAS-473170	Steps: **1**
1.1	**Reagents:** Potassium *tert*-butoxide **Catalysts:** (*OC*-6-52)-Carbonylchloro[2-(diphenylphosphino-κ*P*)-*N*-[2-(diphenylphosphino-κ*P*)ethyl]ethanamine-κ*N*]hydroruthenium **Solvents:** Water-d_2; 18 h, 80 °C
Experimental Protocols	

Ruthenium Catalyzed Selective α- and α,β-Deuteration of Alcohols Using D_2O

By: Chatterjee, Basujit; et al

Organic Letters (2015), 17(19), 4794-4797.

Scheme 167 (1 Reaction) Steps: **1**



Suppliers (2)

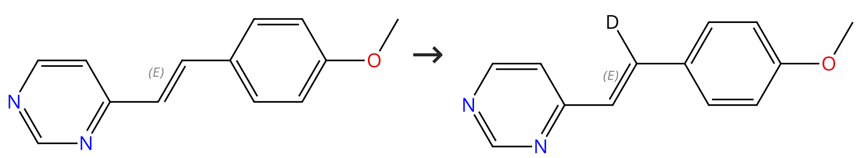
31-116-CAS-19660663	Steps: **1**
1.1	**Reagents:** Potassium *tert*-butoxide, Water-d_2 **Catalysts:** (*OC*-6-52)-Carbonylchloro[2-(diphenylphosphino-κ*P*)-*N*-[2-(diphenylphosphino-κ*P*)ethyl]ethanamine-κ*N*]hydroruthenium; 24 h, 70 °C
Experimental Protocols	

Ruthenium-catalyzed selective α-deuteration of aliphatic nitriles using D_2O

By: Krishnakumar, Varadhan; et al

Chemical Communications (Cambridge, United Kingdom) (2018), 54(63), 8705-8708.

Scheme 168 (1 Reaction) Steps: **1**



Double bond geometry shown

Double bond geometry shown

Suppliers (5)

31-116-CAS-18440856 Steps: **1**

1.1 **Reagents:** Potassium carbonate
Catalysts: Potassium acetate, Bis(dichloro(η^6-*p*-cymene) ruthenium)
Solvents: *N*-Methyl-2-pyrrolidone, Water-d_2; 3 h, 150 °C; 150 °C → rt

1.2 **Reagents:** Water; rt

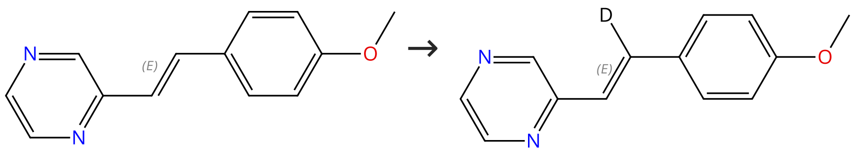
Experimental Protocols

Ruthenium(II)-Catalyzed C-H (Hetero)Arylation of Alkenylic 1, n-Diazines (n = 2, 3, and 4): Scope, Mechanism, and Application in Tandem Hydrogenations

By: Gramage-Doria, Rafael; et al

Journal of Organic Chemistry (2018), 83(3), 1462-1477.

Scheme 169 (1 Reaction) Steps: **1**



Double bond geometry shown

Double bond geometry shown

Suppliers (2)

31-116-CAS-18440857 Steps: **1**

1.1 **Reagents:** Potassium carbonate
Catalysts: Potassium acetate, Bis(dichloro(η^6-*p*-cymene) ruthenium)
Solvents: *N*-Methyl-2-pyrrolidone, Water-d_2; 3 h, 150 °C; 150 °C → rt

1.2 **Reagents:** Water; rt

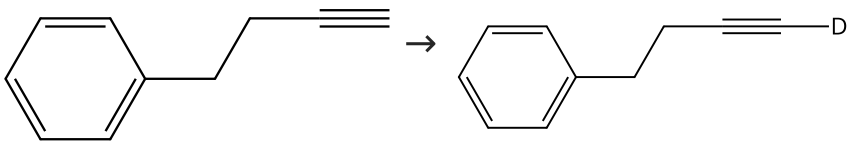
Experimental Protocols

Ruthenium(II)-Catalyzed C-H (Hetero)Arylation of Alkenylic 1, n-Diazines (n = 2, 3, and 4): Scope, Mechanism, and Application in Tandem Hydrogenations

By: Gramage-Doria, Rafael; et al

Journal of Organic Chemistry (2018), 83(3), 1462-1477.

Scheme 170 (1 Reaction) Steps: **1**



Suppliers (70)

31-116-CAS-3617079 Steps: **1**

1.1 **Reagents:** Potassium *tert*-butoxide, Water-d_2
Catalysts: (*OC*-6-52)-Carbonylchloro[2-(diphenylphosphino-κ*P*)-*N*-[2-(diphenylphosphino-κ*P*)ethyl]ethanamine-κ*N*]hydroruthenium
Solvents: 1,2-Dimethoxyethane; 24 h, 75 °C

Experimental Protocols

The ruthenium-catalysed selective synthesis of mono-deuterated terminal alkynes

By: Chatterjee, Basujit; et al

Chemical Communications (Cambridge, United Kingdom) (2016), 52(24), 4509-4512.

Scheme 171 (1 Reaction) Steps: **1**

Suppliers (49)

31-116-CAS-19660674 Steps: **1**

1.1 **Reagents:** Potassium *tert*-butoxide, Water-d_2
Catalysts: (*OC*-6-52)-Carbonylchloro[2-(diphenylphosphino-κ*P*)-*N*-[2-(diphenylphosphino-κ*P*)ethyl]ethanamine-κ*N*]hydroruthenium; 24 h, 70 °C

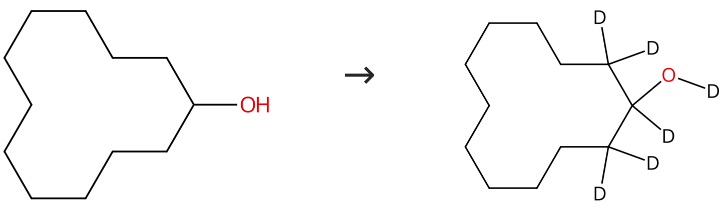
Experimental Protocols

Ruthenium-catalyzed selective α-deuteration of aliphatic nitriles using D_2O

By: Krishnakumar, Varadhan; et al

Chemical Communications (Cambridge, United Kingdom) (2018), 54(63), 8705-8708.

Scheme 172 (1 Reaction) Steps: **1**



Suppliers (67)

31-116-CAS-4705794 Steps: **1**

1.1 **Reagents:** Potassium *tert*-butoxide
Catalysts: (*OC*-6-52)-Carbonylchloro[2-(diphenylphosphino-κ*P*)-*N*-[2-(diphenylphosphino-κ*P*)ethyl]ethanamine-κ*N*]hydroruthenium
Solvents: Water-d_2; 16 h, 80 °C

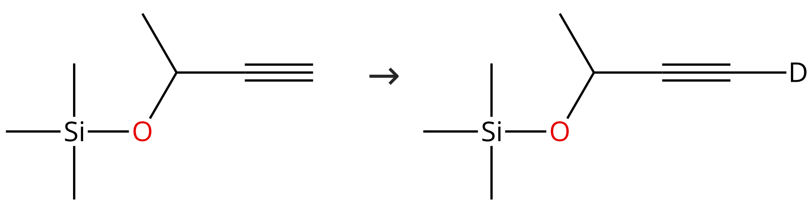
Experimental Protocols

Ruthenium Catalyzed Selective α- and α,β-Deuteration of Alcohols Using D_2O

By: Chatterjee, Basujit; et al

Organic Letters (2015), 17(19), 4794-4797.

Scheme 173 (1 Reaction) Steps: **1**



Suppliers (30)

31-116-CAS-11635511 Steps: **1**

1.1 **Reagents:** Potassium *tert*-butoxide, Water-d_2
Catalysts: (*OC*-6-52)-Carbonylchloro[2-(diphenylphosphino-κ*P*)-*N*-[2-(diphenylphosphino-κ*P*)ethyl]ethanamine-κ*N*]hydroruthenium
Solvents: 1,2-Dimethoxyethane; 24 h, 75 °C

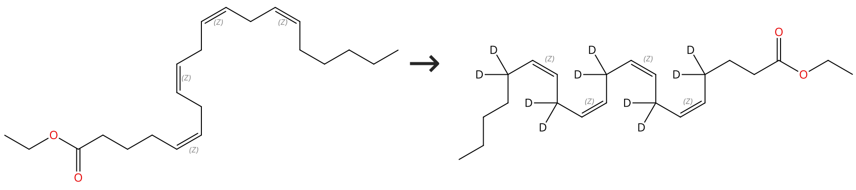
Experimental Protocols

The ruthenium-catalysed selective synthesis of mono-deuterated terminal alkynes

By: Chatterjee, Basujit; et al

Chemical Communications (Cambridge, United Kingdom) (2016), 52(24), 4509-4512.

Scheme 174 (1 Reaction) Steps: **1**



Double bond geometry shown

Double bond geometry shown

Suppliers (53)

31-116-CAS-17923446 Steps: **1**

1.1 **Reagents:** Water-d_2
Catalysts: Ruthenium(1+), tris(acetonitrile)(η^5-2,4-cyclopentadien-1-yl)-, hexafluorophosphate(1-) (1:1)
Solvents: Acetone-d_6; 24 h, rt

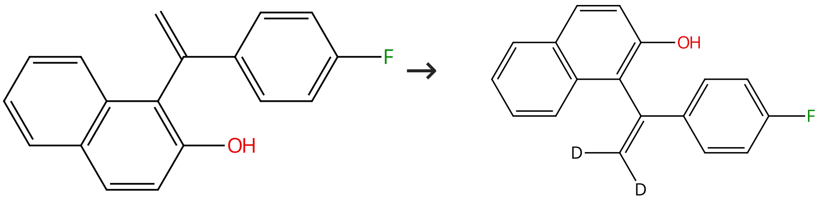
Experimental Protocols

Site-Specific Deuteration of Polyunsaturated Alkenes

By: Smarun, A. V.; et al

Journal of Organic Chemistry (2017), 82(24), 13115-13120.

Scheme 175 (1 Reaction) Steps: **1**



31-116-CAS-19042416 Steps: **1**

1.1 **Reagents:** Methanol-d_4, Cesium acetate, Water-d_2
Catalysts: Bis(dichloro(η^6-*p*-cymene)ruthenium); 24 h, 90 °C

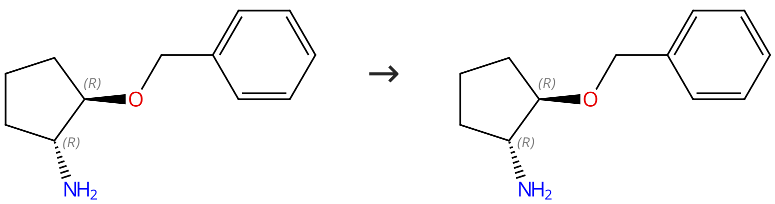
Experimental Protocols

Ruthenium(II)-Catalyzed Dearomatized C-H Activation and Annulation Reaction of Vinylnaphthols with Alkynes: Access to Spiro-Pentacyclic Naphthalenones

By: Duarah, Gauri; et al

Chemistry - A European Journal (2018), 24(40), 10196-10200.

Scheme 176 (1 Reaction) Steps: **1**



Absolute stereochemistry shown, Rotation (+)

Absolute stereochemistry shown

Suppliers (45)

31-614-CAS-29013839 Steps: **1**

1.1 **Reagents:** Water-d_2
Catalysts: Ruthenium(1+), hydro[*N*-methyl-*N*-(6-methyl-2-pyridinyl-κ*N*)-1-[(6-methyl-2-pyridinyl-κ*N*)imino]-1*H*-isoindol-3-amine-κN^2](1,1,1-trifluoromethanesulfonato-κ*O*)(triphenylphosphine)-, (*OC*-6-26)-, 1,1,1-trifluoromethanesulfonate (1:1)
Solvents: 2-Methyltetrahydrofuran; 20 h, 110 °C

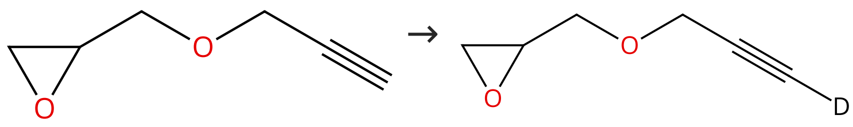
Experimental Protocols

Stereoretentive Deuteration of α-Chiral Amines with D_2O

By: Hale, Lillian V. A.; et al

Journal of the American Chemical Society (2016), 138(41), 13489-13492.

Scheme 177 (1 Reaction) Steps: **1**



Suppliers (61)

31-116-CAS-3500260 Steps: **1**

1.1 **Reagents:** Potassium *tert*-butoxide, Water-d_2
Catalysts: (*OC*-6-52)-Carbonylchloro[2-(diphenylphosphino-κ*P*)-*N*-[2-(diphenylphosphino-κ*P*)ethyl]ethanamine-κ*N*]hydroruthenium
Solvents: 1,2-Dimethoxyethane; 24 h, 75 °C

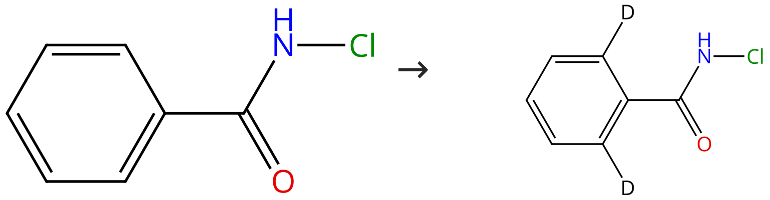
Experimental Protocols

The ruthenium-catalysed selective synthesis of mono-deuterated terminal alkynes

By: Chatterjee, Basujit; et al

Chemical Communications (Cambridge, United Kingdom) (2016), 52(24), 4509-4512.

Scheme 178 (1 Reaction) Steps: **1**



Suppliers (5)

31-614-CAS-42385087 Steps: **1**

1.1 **Reagents:** Potassium acetate, Water-d_2
Catalysts: Bis(dichloro(η^6-*p*-cymene)ruthenium)
Solvents: Water; 5 min, rt

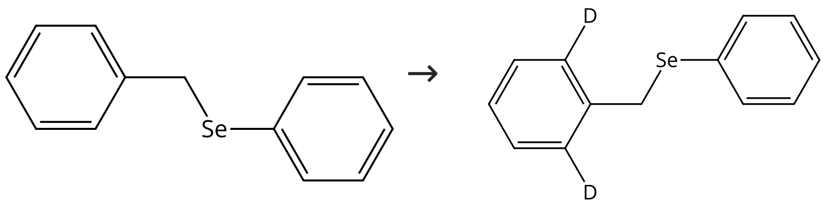
Experimental Protocols

Ru-Catalyzed Redox-Neutral Coupling of N-Chlorobenzamides with Unsymmetrical Alkynes in Water

By: Saha, Sharajit; et al

Journal of Organic Chemistry (2024), 89(22), 16850-16864.

Scheme 179 (2 Reactions) Steps: **1**



Suppliers (3)

31-614-CAS-39507717 Steps: **1**

1.1 **Reagents:** Water-d_2, Silver hexafluoroantimonate
Catalysts: Bis(dichloro(η^6-*p*-cymene)ruthenium)
Solvents: 1,2-Dichloroethane; 4 h, 100 °C; 4 h, 100 °C

Experimental Protocols

Ru-Catalyzed and Selenium-Directed Selective Formation of ortho- and Dialkenylated Selanes, Mixed Organoselenoethers, and Isoselenochromenes

By: Kumari, Sangeeta; et al

Organic Letters (2024), 26(9), 1758-1763.

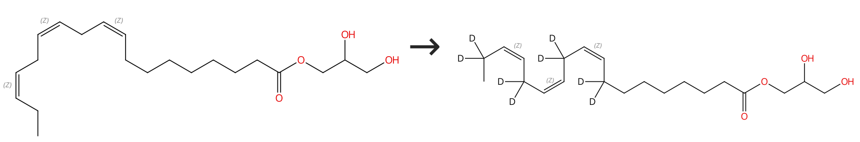
31-614-CAS-32581481	Steps: **1**
1.1	**Reagents:** Water-d_2 **Catalysts:** Silver hexafluoroantimonate, Bis(dichloro(η^6-*p*-cymene)ruthenium) **Solvents:** Dichloromethane; 4 h, 100 °C
Experimental Protocols	

Selenium-Directed Ortho C-H Activation of Benzyl Selenide by a Selenated NHC-Half-Pincer Ruthenium(II) Complex

By: Kumari, Sangeeta; et al

Organometallics (2022), 41(11), 1403-1411.

Scheme 180 (1 Reaction) Steps: **1**



Double bond geometry shown

Double bond geometry shown

Suppliers (21)

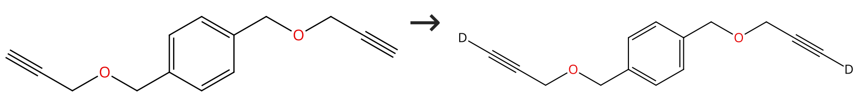
31-116-CAS-17923450	Steps: **1**
1.1	**Reagents:** Water-d_2 **Catalysts:** Ruthenium(1+), tris(acetonitrile)(η^5-2,4-cyclopentadien-1-yl)-, hexafluorophosphate(1-) (1:1) **Solvents:** Acetone-d_6; 1 h, rt
Experimental Protocols	

Site-Specific Deuteration of Polyunsaturated Alkenes

By: Smarun, A. V.; et al

Journal of Organic Chemistry (2017), 82(24), 13115-13120.

Scheme 181 (1 Reaction) Steps: **1**



Suppliers (30)

31-116-CAS-2448630	Steps: **1**
1.1	**Reagents:** Potassium *tert*-butoxide, Water-d_2 **Catalysts:** (*OC*-6-52)-Carbonylchloro[2-(diphenylphosphino-κ*P*)-*N*-[2-(diphenylphosphino-κ*P*)ethyl]ethanamine-κ*N*]hydroruthenium **Solvents:** 1,2-Dimethoxyethane; 24 h, 75 °C
Experimental Protocols	

The ruthenium-catalysed selective synthesis of mono-deuterated terminal alkynes

By: Chatterjee, Basujit; et al

Chemical Communications (Cambridge, United Kingdom) (2016), 52(24), 4509-4512.

Scheme 182 (1 Reaction) Steps: **1**

Multi-component structure image available in CAS SciFinder → Multi-component structure image available in CAS SciFinder

31-116-CAS-23622103 Steps: **1**

1.1 **Reagents:** Sodium acetate, Water-d_2
Catalysts: Bis(dichloro(η^6-*p*-cymene)ruthenium)
Solvents: Ethanol-d_6; 10 h, 120 °C

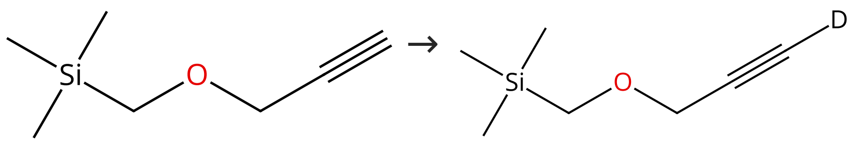
Experimental Protocols

Ruthenium-catalyzed coupling of α-carbonyl phosphoniums with sulfoxonium ylides via C-H activation/Wittig reaction sequences

By: Chen, Tian; et al

Chemical Communications (Cambridge, United Kingdom) (2021), 57(21), 2665-2668.

Scheme 183 (1 Reaction) Steps: **1**



31-116-CAS-378421 Steps: **1**

1.1 **Reagents:** Potassium *tert*-butoxide, Water-d_2
Catalysts: (*OC*-6-52)-Carbonylchloro[2-(diphenylphosphino-κ*P*)-*N*-[2-(diphenylphosphino-κ*P*)ethyl]ethanamine-κ*N*]hydroruthenium
Solvents: 1,2-Dimethoxyethane; 24 h, 75 °C

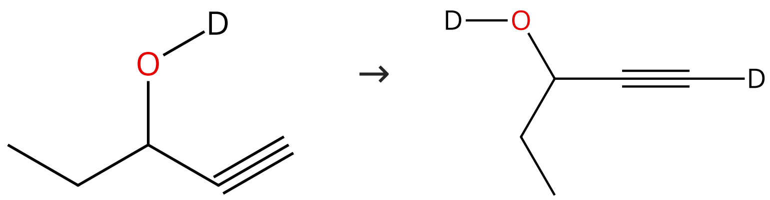
Experimental Protocols

The ruthenium-catalysed selective synthesis of mono-deuterated terminal alkynes

By: Chatterjee, Basujit; et al

Chemical Communications (Cambridge, United Kingdom) (2016), 52(24), 4509-4512.

Scheme 184 (1 Reaction) Steps: **1**



31-116-CAS-13758128 Steps: **1**

1.1 **Reagents:** Potassium *tert*-butoxide, Water-d_2
Catalysts: (*OC*-6-52)-Carbonylchloro[2-(diphenylphosphino-κ*P*)-*N*-[2-(diphenylphosphino-κ*P*)ethyl]ethanamine-κ*N*]hydroruthenium
Solvents: 1,2-Dimethoxyethane; 7 h, 60 °C

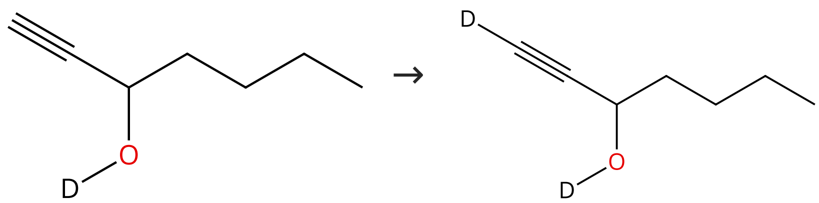
Experimental Protocols

The ruthenium-catalysed selective synthesis of mono-deuterated terminal alkynes

By: Chatterjee, Basujit; et al

Chemical Communications (Cambridge, United Kingdom) (2016), 52(24), 4509-4512.

Scheme 185 (1 Reaction) Steps: **1**



31-116-CAS-303389 Steps: **1**

1.1 **Reagents:** Potassium *tert*-butoxide, Water-d_2
Catalysts: (*OC*-6-52)-Carbonylchloro[2-(diphenylphosphino-κ*P*)-*N*-[2-(diphenylphosphino-κ*P*)ethyl]ethanamine-κ*N*]hydroruthenium
Solvents: 1,2-Dimethoxyethane; 7 h, 60 °C

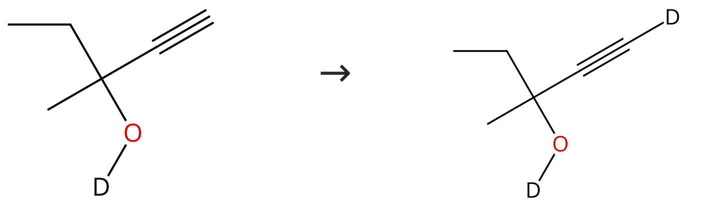
Experimental Protocols

The ruthenium-catalysed selective synthesis of mono-deuterated terminal alkynes

By: Chatterjee, Basujit; et al

Chemical Communications (Cambridge, United Kingdom) (2016), 52(24), 4509-4512.

Scheme 186 (1 Reaction) Steps: **1**



31-116-CAS-2496949 Steps: **1**

1.1 **Reagents:** Potassium *tert*-butoxide, Water-d_2
Catalysts: (*OC*-6-52)-Carbonylchloro[2-(diphenylphosphino-κ*P*)-*N*-[2-(diphenylphosphino-κ*P*)ethyl]ethanamine-κ*N*]hydroruthenium
Solvents: 1,2-Dimethoxyethane; 7 h, 60 °C

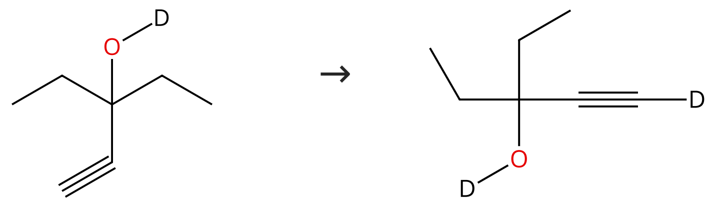
Experimental Protocols

The ruthenium-catalysed selective synthesis of mono-deuterated terminal alkynes

By: Chatterjee, Basujit; et al

Chemical Communications (Cambridge, United Kingdom) (2016), 52(24), 4509-4512.

Scheme 187 (1 Reaction) Steps: **1**



31-116-CAS-4619385 Steps: **1**

1.1 **Reagents:** Potassium *tert*-butoxide, Water-d_2
Catalysts: (*OC*-6-52)-Carbonylchloro[2-(diphenylphosphino-κ*P*)-*N*-[2-(diphenylphosphino-κ*P*)ethyl]ethanamine-κ*N*]hydroruthenium
Solvents: 1,2-Dimethoxyethane; 7 h, 60 °C

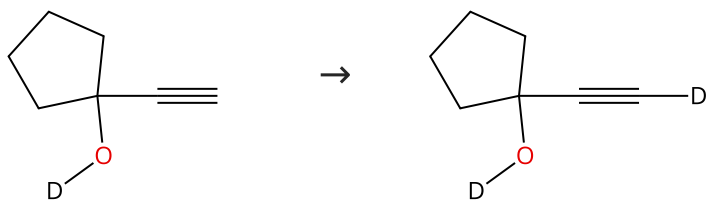
Experimental Protocols

The ruthenium-catalysed selective synthesis of mono-deuterated terminal alkynes

By: Chatterjee, Basujit; et al

Chemical Communications (Cambridge, United Kingdom) (2016), 52(24), 4509-4512.

Scheme 188 (1 Reaction) Steps: **1**



31-116-CAS-11010865 Steps: **1**

1.1 **Reagents:** Potassium *tert*-butoxide, Water-d_2
Catalysts: (*OC*-6-52)-Carbonylchloro[2-(diphenylphosphino-κ*P*)-*N*-[2-(diphenylphosphino-κ*P*)ethyl]ethanamine-κ*N*]hydroruthenium
Solvents: 1,2-Dimethoxyethane; 7 h, 60 °C

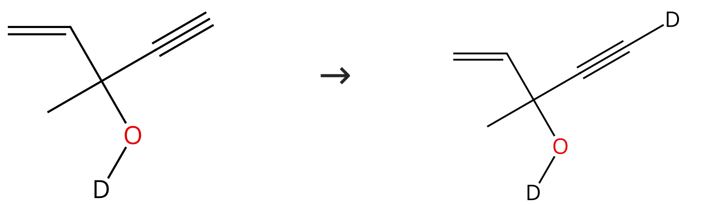
Experimental Protocols

The ruthenium-catalysed selective synthesis of mono-deuterated terminal alkynes

By: Chatterjee, Basujit; et al

Chemical Communications (Cambridge, United Kingdom) (2016), 52(24), 4509-4512.

Scheme 189 (1 Reaction) Steps: **1**



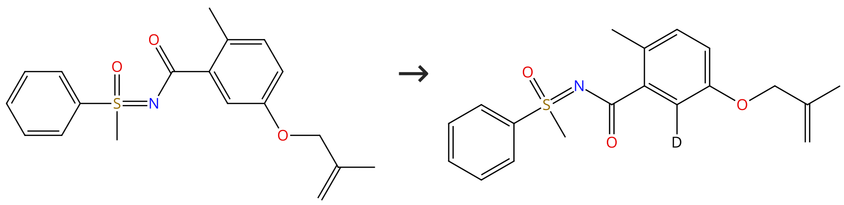
31-116-CAS-9160253	Steps: **1**
1.1	**Reagents:** Potassium *tert*-butoxide, Water-d_2 **Catalysts:** (*OC*-6-52)-Carbonylchloro[2-(diphenylphosphino-κ*P*)-*N*-[2-(diphenylphosphino-κ*P*)ethyl]ethanamine-κ*N*]hydroruthenium **Solvents:** 1,2-Dimethoxyethane; 7 h, 60 °C
Experimental Protocols	

The ruthenium-catalysed selective synthesis of mono-deuterated terminal alkynes

By: Chatterjee, Basujit; et al

Chemical Communications (Cambridge, United Kingdom) (2016), 52(24), 4509-4512.

Scheme 190 (1 Reaction) Steps: **1**



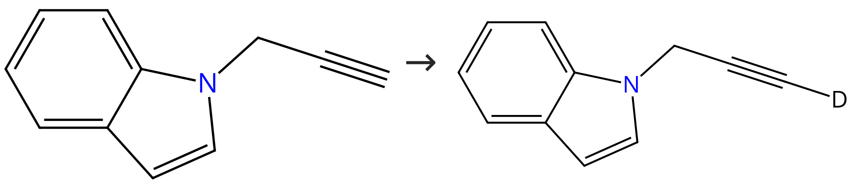
31-116-CAS-19437898	Steps: **1**
1.1	**Reagents:** Cupric acetate **Catalysts:** Potassium hexafluorophosphate, Bis(dichloro(η^6-*p*-cymene)ruthenium) **Solvents:** Water-d_2; 10 min, 50 °C

Ruthenium-Catalyzed Intramolecular Hydroarylation of Arenes with Olefins in Water

By: Mukherjee, Kallol; et al

Asian Journal of Organic Chemistry (2018), 7(7), 1380-1384.

Scheme 191 (1 Reaction) Steps: **1**



Suppliers (41)

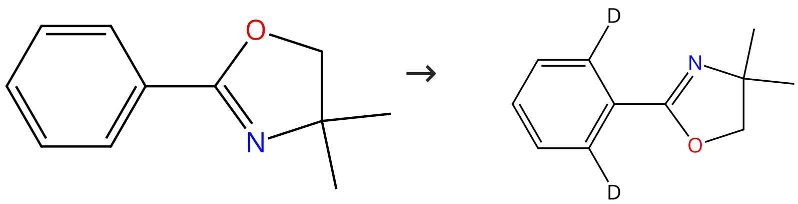
31-116-CAS-741576	Steps: **1**
1.1	**Reagents:** Potassium *tert*-butoxide, Water-d_2 **Catalysts:** (*OC*-6-52)-Carbonylchloro[2-(diphenylphosphino-κ*P*)-*N*-[2-(diphenylphosphino-κ*P*)ethyl]ethanamine-κ*N*]hydroruthenium **Solvents:** 1,2-Dimethoxyethane; 24 h, 90 °C
Experimental Protocols	

The ruthenium-catalysed selective synthesis of mono-deuterated terminal alkynes

By: Chatterjee, Basujit; et al

Chemical Communications (Cambridge, United Kingdom) (2016), 52(24), 4509-4512.

Scheme 192 (1 Reaction) Steps: **1**



Suppliers (49)

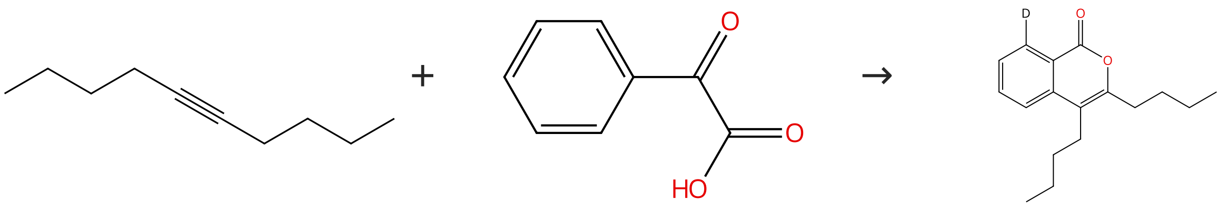
31-116-CAS-1794854	Steps: **1**
1.1	**Reagents:** Water-*d*$_2$ **Catalysts:** Stereoisomer of dihydro[(1,2,3,3a,7a-η)-1-phenyl-1*H*-inden-1-yl](triethylsilyl)(triphenylphosphine)ruthenium **Solvents:** Toluene; 16 h, 110 atm
Experimental Protocols	

Regioselective ruthenium catalysed H-D exchange using D_2O as the deuterium source

By: Piola, Lorenzo; et al

Organic & Biomolecular Chemistry (2014), 12(43), 8683-8688.

Scheme 193 (1 Reaction) Steps: **1**



Suppliers (65) Suppliers (111)

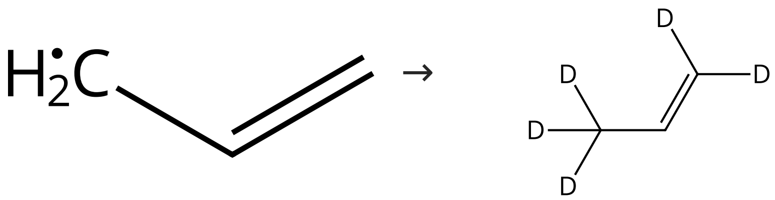
31-087-CAS-20311751	Steps: **1**
1.1	**Reagents:** Methanol-*d*$_4$, Propanoic acid, 2,2-dimethyl-, sodium salt (1:1), Water-*d*$_2$ **Catalysts:** Bis(dichloro(η^6-*p*-cymene)ruthenium); 24 h, 70 °C

Decarboxylative [4+2] annulation of arylglyoxylic acids with internal alkynes using the anodic ruthenium catalysis

By: Luo, Mu-Jia; et al

Chemical Communications (Cambridge, United Kingdom) (2019), 55(50), 7251-7254.

Scheme 194 (1 Reaction) Steps: **1**



Suppliers (4) Suppliers (4)

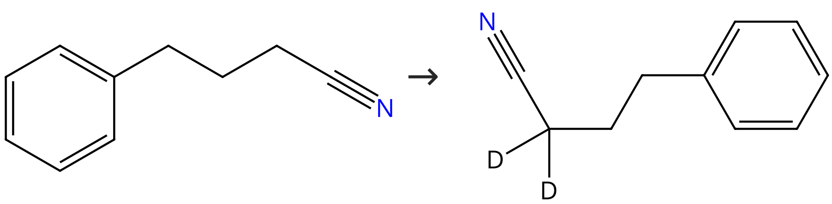
31-116-CAS-2701166	Steps: **1**
1.1	**Reagents:** Water-*d*$_2$ **Catalysts:** Ruthenium(1+), (acetonitrile)[2-[bis(1-methylethyl) phosphino-κ*P*]-4-(1,1-dimethylethyl)-1-methyl-1*H*-imidazole-κ*N*^{3}](η^5-2,4-cyclopentadien-1-yl)-, hexafluorophosphate(1-) (1:1) **Solvents:** 1,4-Dioxane, Acetone-d$_6$; 24 h, rt
Experimental Protocols	

Mild and Selective Deuteration and Isomerization of Alkenes by a Bifunctional Catalyst and Deuterium Oxide

By: Erdogan, Gulin; et al

Journal of the American Chemical Society (2009), 131(30), 10354-10355.

Scheme 195 (1 Reaction) Steps: **1**



Suppliers (52) Supplier (1)

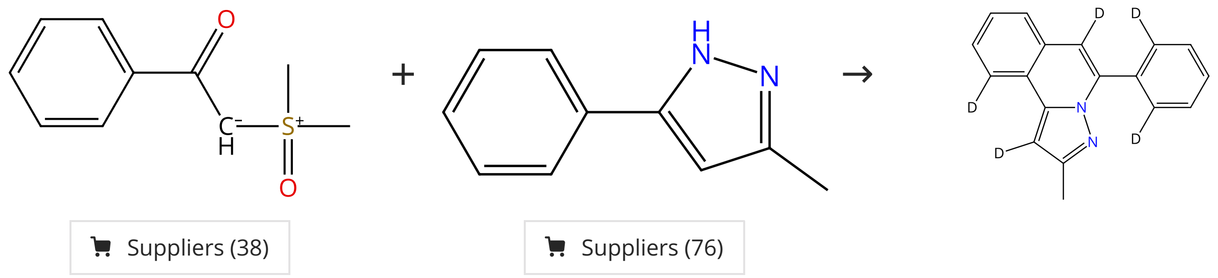
31-116-CAS-19660653	Steps: **1**
1.1	**Reagents:** Potassium *tert*-butoxide, Water-d_2 **Catalysts:** (*OC*-6-52)-Carbonylchloro[2-(diphenylphosphino-κ*P*)-*N*-[2-(diphenylphosphino-κ*P*)ethyl]ethanamine-κ*N*]hydroruthenium; 24 h, 70 °C
Experimental Protocols	

Ruthenium-catalyzed selective α-deuteration of aliphatic nitriles using D_2O

By: Krishnakumar, Varadhan; et al

Chemical Communications (Cambridge, United Kingdom) (2018), 54(63), 8705-8708.

Scheme 196 (1 Reaction) Steps: **1**



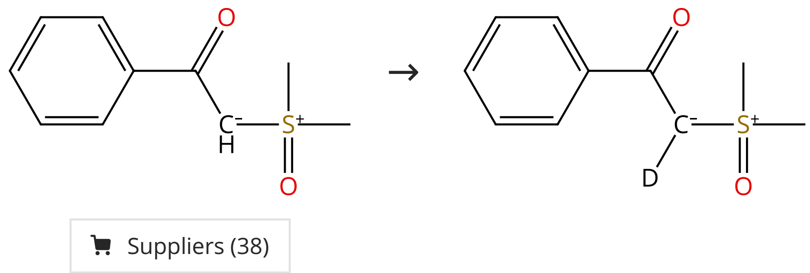
31-116-CAS-22742754	Steps: **1**
1.1	**Reagents:** Benzoic acid, Water-d_2 **Catalysts:** Silver hexafluoroantimonate, Bis(dichloro(η^6-*p*-cymene)ruthenium) **Solvents:** Ethanol-d_6; 20 h, 120 °C
Experimental Protocols	

Ruthenium-catalyzed α-carbonyl sulfoxonium ylide annulations with aryl substituted pyrazoles via C-H/N-H bond functionalizations

By: Chen, Zhangpei; et al

Organic & Biomolecular Chemistry (2020), 18(41), 8486-8490.

Scheme 197 (1 Reaction) Steps: **1**



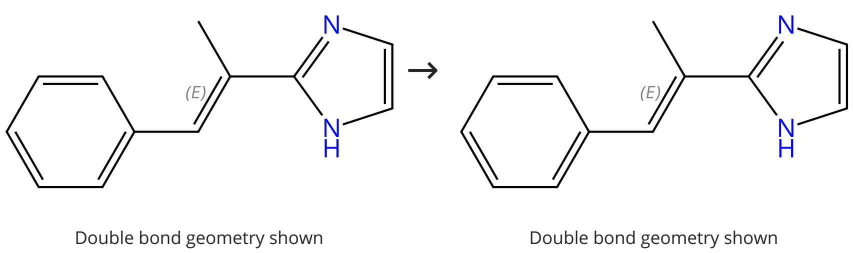
31-614-CAS-41425387	Steps: **1**
1.1	**Reagents:** Acetic acid **Catalysts:** Silver hexafluoroantimonate, Bis(dichloro(η^6-*p*-cymene)ruthenium) **Solvents:** 1,2-Dichloroethane; 5 min, rt
1.2	**Reagents:** Water-d_2; 10 min, rt → 50 °C
Experimental Protocols	

Ru(II)-Catalyzed C-H Activation/[4+2] Annulation of Sulfoxonium Ylide with Maleimide: Access to Fused Benzo[e]isoindole-1,3,5-trione

By: Dethe, Dattatraya H.; et al

Organic Letters (2024), 26(32), 6830-6834.

Scheme 198 (1 Reaction) Steps: **1**



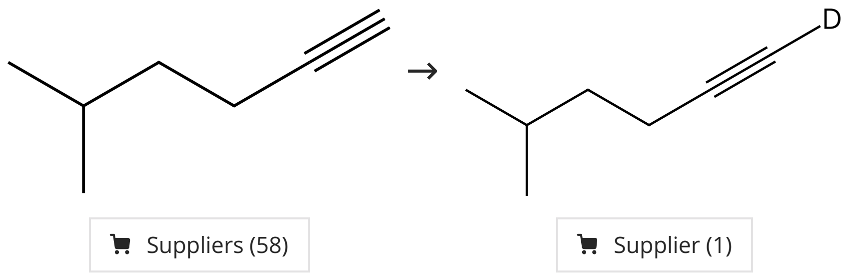
31-614-CAS-39311389	Steps: **1**
1.1	**Reagents:** Acetic acid, Cupric acetate, Water-d_2, Potassium hexafluorophosphate **Catalysts:** Bis(dichloro(η^6-*p*-cymene)ruthenium) **Solvents:** Methanol; 12 h, 70 °C
Experimental Protocols	

Ru(II)-Catalyzed [4 + 2]-Annulation of 2-Alkenyl/Arylimidazoles with N-Substituted Maleimides and 1,4-Naphthoquinones: Access to Imidazo-Fused Polyheterocycles

By: Meena, Neha; et al

Journal of Organic Chemistry (2024), 89(4), 2272-2282.

Scheme 199 (1 Reaction) Steps: **1**



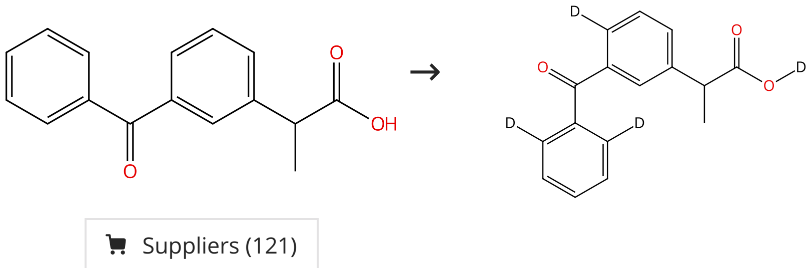
31-116-CAS-4621771	Steps: **1**
1.1	**Reagents:** Potassium *tert*-butoxide, Water-d_2 **Catalysts:** (*OC*-6-52)-Carbonylchloro[2-(diphenylphosphino-κ*P*)-*N*-[2-(diphenylphosphino-κ*P*)ethyl]ethanamine-κ*N*]hydroruthenium **Solvents:** 1,2-Dimethoxyethane; 24 h, 50 °C
Experimental Protocols	

The ruthenium-catalysed selective synthesis of mono-deuterated terminal alkynes

By: Chatterjee, Basujit; et al

Chemical Communications (Cambridge, United Kingdom) (2016), 52(24), 4509-4512.

Scheme 200 (1 Reaction) Steps: **1**



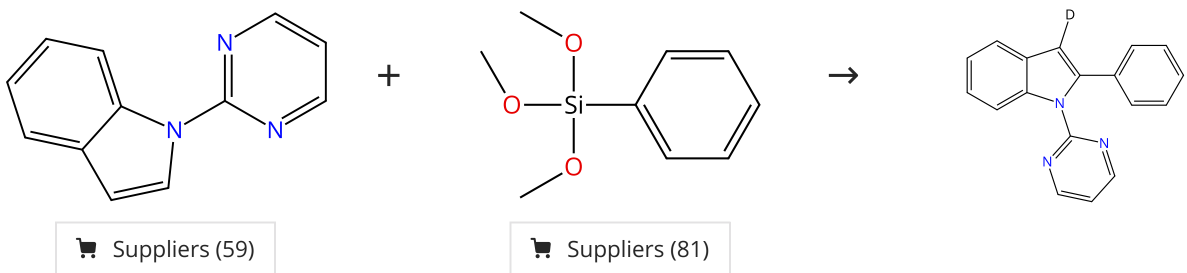
31-116-CAS-2616829	Steps: **1**
1.1	**Reagents:** Water-d_2 **Catalysts:** Stereoisomer of dihydro[(1,2,3,3a,7a-η)-1-phenyl-1*H*-inden-1-yl](triethylsilyl)(triphenylphosphine)ruthenium **Solvents:** Toluene; 16 h, 110 atm
Experimental Protocols	

Regioselective ruthenium catalysed H-D exchange using D_2O as the deuterium source

By: Piola, Lorenzo; et al

Organic & Biomolecular Chemistry (2014), 12(43), 8683-8688.

Scheme 201 (1 Reaction) Steps: **1**



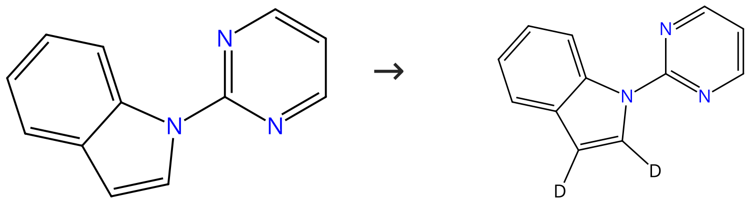
31-116-CAS-18334971	Steps: 1
1.1 **Reagents:** Copper fluoride (CuF_2) **Catalysts:** Silver hexafluoroantimonate, Bis(dichloro(η[6]-*p*-cymene)ruthenium) **Solvents:** Water-d_2; 20 h, 140 °C	
Experimental Protocols	

Ruthenium(II)-Catalyzed Direct C-H Arylation of Indoles with Arylsilanes in Water

By: Nareddy, Pradeep; et al

Organic Letters (2018), 20(2), 341-344.

Scheme 202 (3 Reactions) Steps: **1**



Suppliers (59)

31-116-CAS-22966182	Steps: 1
1.1 **Catalysts:** Diphenylphosphine oxide, Zinc chloride, Triruthenium dodecacarbonyl **Solvents:** Tetrahydrofuran, 1,4-Dioxane, Water-d_2; 10 min, rt; 5 h, 140 °C	
Experimental Protocols	

Divergent Coupling of Benzocyclobutenones with Indoles via C-H and C-C Activations

By: Lu, Hong; et al

Angewandte Chemie, International Edition (2020), 59(52), 23537-23543.

31-116-CAS-18334970	Steps: 1
1.1 **Reagents:** Copper fluoride (CuF_2) **Catalysts:** Silver hexafluoroantimonate, Bis(dichloro(η[6]-*p*-cymene)ruthenium) **Solvents:** Water-d_2; 20 h, 140 °C	
Experimental Protocols	

Ruthenium(II)-Catalyzed Direct C-H Arylation of Indoles with Arylsilanes in Water

By: Nareddy, Pradeep; et al

Organic Letters (2018), 20(2), 341-344.

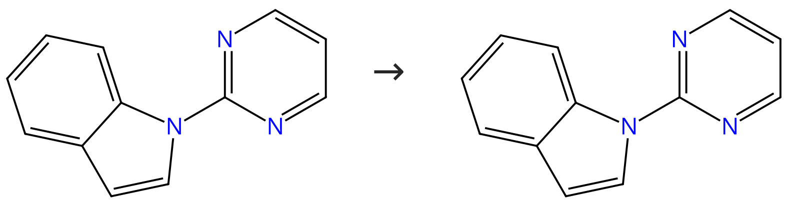
31-116-CAS-18334969	Steps: 1
1.1 **Catalysts:** Silver hexafluoroantimonate, Bis(dichloro(η[6]-*p*-cymene)ruthenium) **Solvents:** Water-d_2; 20 h, 140 °C	
Experimental Protocols	

Ruthenium(II)-Catalyzed Direct C-H Arylation of Indoles with Arylsilanes in Water

By: Nareddy, Pradeep; et al

Organic Letters (2018), 20(2), 341-344.

Scheme 203 (1 Reaction) Steps: **1**



Suppliers (59)

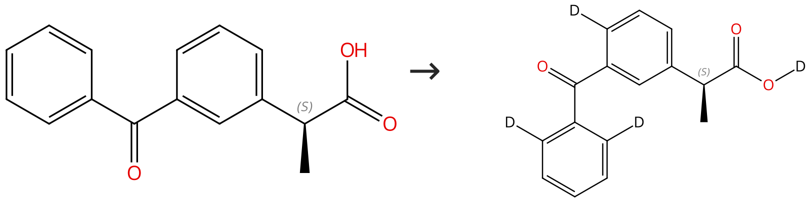
31-614-CAS-29212054	Steps: 1
1.1 **Reagents:** Water-d_2, Silver hexafluoroantimonate **Catalysts:** Bis(dichloro(η[6]-*p*-cymene)ruthenium) **Solvents:** THF-d_8; 18 h, rt	
Experimental Protocols	

Ru-Catalysed C-H Arylation of Indoles and Pyrroles with Boronic Acids: Scope and Mechanistic Studies

By: Sollert, Carina; et al

Chemistry - A European Journal (2015), 21(14), 5380-5386.

Scheme 204 (1 Reaction) Steps: **1**



Absolute stereochemistry shown, Rotation (+)

Absolute stereochemistry shown

Suppliers (78)

31-116-CAS-587123 Steps: **1**

1.1 **Reagents:** Water-d_2
Catalysts: Stereoisomer of dihydro[(1,2,3,3a,7a-η)-1-phenyl-1*H*-inden-1-yl](triethylsilyl)(triphenylphosphine)ruthenium
Solvents: Toluene; 16 h, 110 atm

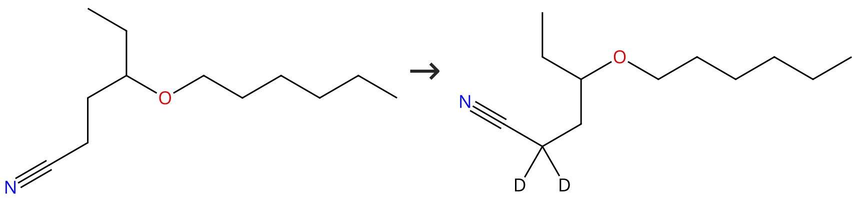
Experimental Protocols

Regioselective ruthenium catalysed H-D exchange using D_2O as the deuterium source

By: Piola, Lorenzo; et al

Organic & Biomolecular Chemistry (2014), 12(43), 8683-8688.

Scheme 205 (1 Reaction) Steps: **1**



31-116-CAS-19660662 Steps: **1**

1.1 **Reagents:** Potassium *tert*-butoxide, Water-d_2
Catalysts: (*OC*-6-52)-Carbonylchloro[2-(diphenylphosphino-κ*P*)-*N*-[2-(diphenylphosphino-κ*P*)ethyl]ethanamine-κ*N*]hydroruthenium; 24 h, 70 °C

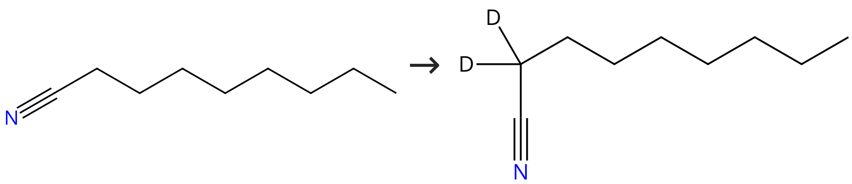
Experimental Protocols

Ruthenium-catalyzed selective α-deuteration of aliphatic nitriles using D_2O

By: Krishnakumar, Varadhan; et al

Chemical Communications (Cambridge, United Kingdom) (2018), 54(63), 8705-8708.

Scheme 206 (1 Reaction) Steps: **1**



Suppliers (47)

31-116-CAS-19660650 Steps: **1**

1.1 **Reagents:** Potassium *tert*-butoxide, Water-d_2
Catalysts: (*OC*-6-52)-Carbonylchloro[2-(diphenylphosphino-κ*P*)-*N*-[2-(diphenylphosphino-κ*P*)ethyl]ethanamine-κ*N*]hydroruthenium; 24 h, 70 °C

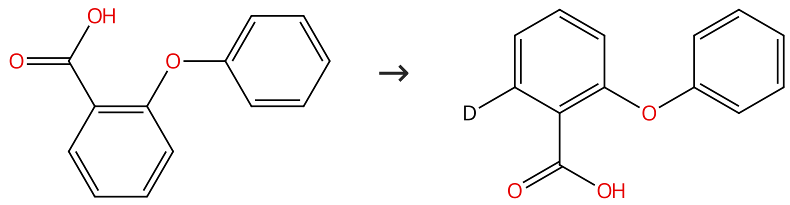
Experimental Protocols

Ruthenium-catalyzed selective α-deuteration of aliphatic nitriles using D_2O

By: Krishnakumar, Varadhan; et al

Chemical Communications (Cambridge, United Kingdom) (2018), 54(63), 8705-8708.

Scheme 207 (1 Reaction) Steps: **1**



Suppliers (81)

31-116-CAS-23162707 Steps: **1**

1.1 **Catalysts:** Bis(dichloro(η^6-*p*-cymene)ruthenium)
Solvents: Methanol-*d*$_4$, Water-*d*$_2$; 48 h, 50 °C

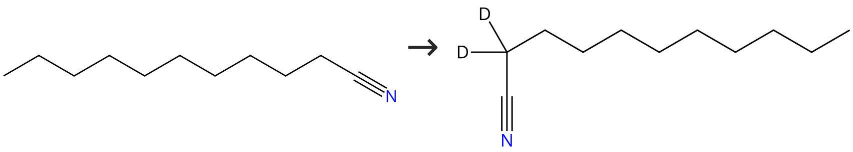
Experimental Protocols

Nickel-catalyzed C-O/N-H, C-S/N-H, and C-CN/N-H annulation of aromatic amides with alkynes: C-O, C-S, and C-CN activation

By: Iyori, Yasuaki; et al

Chemical Science (2021), 12(5), 1772-1777.

Scheme 208 (1 Reaction) Steps: **1**



Suppliers (44)

31-116-CAS-19660651 Steps: **1**

1.1 **Reagents:** Potassium *tert*-butoxide, Water-*d*$_2$
Catalysts: (*OC*-6-52)-Carbonylchloro[2-(diphenylphosphino-κ*P*)-*N*-[2-(diphenylphosphino-κ*P*)ethyl]ethanamine-κ*N*]hydroruthenium; 24 h, 70 °C

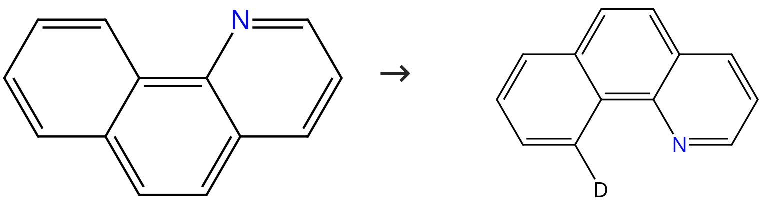
Experimental Protocols

Ruthenium-catalyzed selective α-deuteration of aliphatic nitriles using D_2O

By: Krishnakumar, Varadhan; et al

Chemical Communications (Cambridge, United Kingdom) (2018), 54(63), 8705-8708.

Scheme 209 (1 Reaction) Steps: **1**



Suppliers (81)

31-116-CAS-1524651 Steps: **1**

1.1 **Reagents:** Water-*d*$_2$
Catalysts: Stereoisomer of dihydro[(1,2,3,3a,7a-η)-1-phenyl-1*H*-inden-1-yl](triethylsilyl)(triphenylphosphine)ruthenium
Solvents: Toluene; 8 h, 110 °C

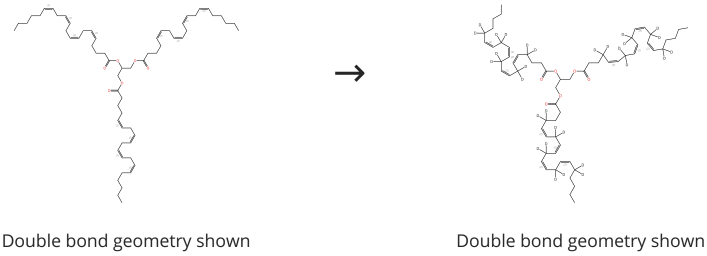
Experimental Protocols

Regioselective ruthenium catalysed H-D exchange using D_2O as the deuterium source

By: Piola, Lorenzo; et al

Organic & Biomolecular Chemistry (2014), 12(43), 8683-8688.

Scheme 210 (1 Reaction)
Steps: 1



31-116-CAS-17923449
Steps: 1

1.1 **Reagents:** Water-*d*$_2$
Catalysts: Ruthenium(1+), tris(acetonitrile)(η^5-2,4-cyclopentadien-1-yl)-, hexafluorophosphate(1-) (1:1)
Solvents: Acetone-d$_6$; 3 h, rt

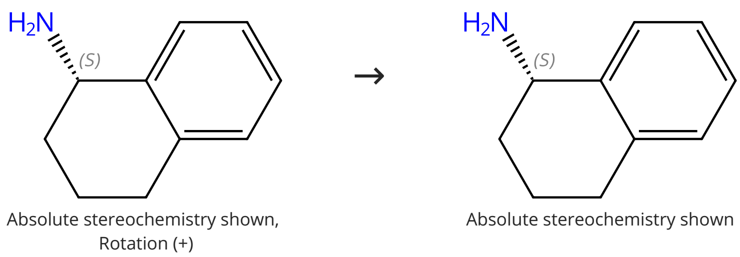
Experimental Protocols

Site-Specific Deuteration of Polyunsaturated Alkenes

By: Smarun, A. V.; et al

Journal of Organic Chemistry (2017), 82(24), 13115-13120.

Scheme 211 (1 Reaction)
Steps: 1



31-614-CAS-28209091
Steps: 1

1.1 **Reagents:** Water-*d*$_2$
Catalysts: Ruthenium(1+), hydro[*N*-methyl-*N*-(6-methyl-2-pyridinyl-κ*N*)-1-[(6-methyl-2-pyridinyl-κ*N*)imino]-1*H*-isoindol-3-amine-κ*N*^{2}](1,1,1-trifluoromethanesulfonato-κ*O*)(triphenylphosphine)-, (*OC*-6-26)-, 1,1,1-trifluoromethanesulfonate (1:1)
Solvents: 2-Methyltetrahydrofuran; 20 h, 110 °C

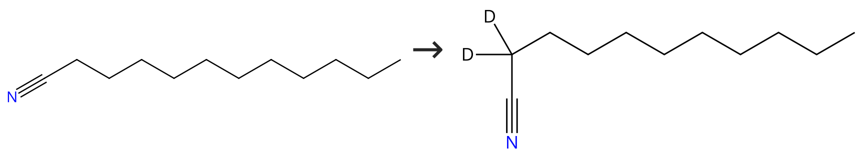
Experimental Protocols

Stereoretentive Deuteration of α-Chiral Amines with D_2O

By: Hale, Lillian V. A.; et al

Journal of the American Chemical Society (2016), 138(41), 13489-13492.

Scheme 212 (1 Reaction)
Steps: 1



31-116-CAS-19660652
Steps: 1

1.1 **Reagents:** Potassium *tert*-butoxide, Water-*d*$_2$
Catalysts: (*OC*-6-52)-Carbonylchloro[2-(diphenylphosphino-κ*P*)-*N*-[2-(diphenylphosphino-κ*P*)ethyl]ethanamine-κ*N*]hydroruthenium; 24 h, 70 °C

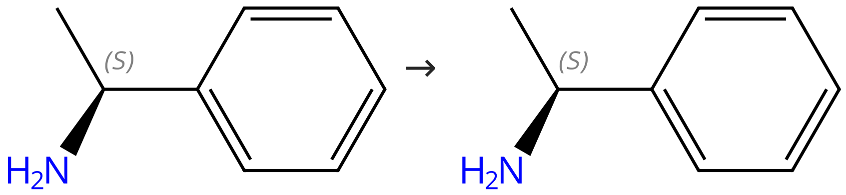
Experimental Protocols

Ruthenium-catalyzed selective α-deuteration of aliphatic nitriles using D_2O

By: Krishnakumar, Varadhan; et al

Chemical Communications (Cambridge, United Kingdom) (2018), 54(63), 8705-8708.

Scheme 213 (1 Reaction) Steps: **1**



Absolute stereochemistry shown, Rotation (-)

Absolute stereochemistry shown

Suppliers (96)

31-614-CAS-28334050 Steps: **1**

1.1 **Reagents:** Water-d_2
Catalysts: Ruthenium(1+), hydro[*N*-methyl-*N*-(6-methyl-2-pyridinyl-κ*N*)-1-[(6-methyl-2-pyridinyl-κ*N*)imino]-1*H*-isoindol-3-amine-κN^2](1,1,1-trifluoromethanesulfonato-κ*O*)(triphenyl phosphine)-, (*OC*-6-26)-, 1,1,1-trifluoromethanesulfonate (1:1)
Solvents: 2-Methyltetrahydrofuran; 20 h, 110 °C

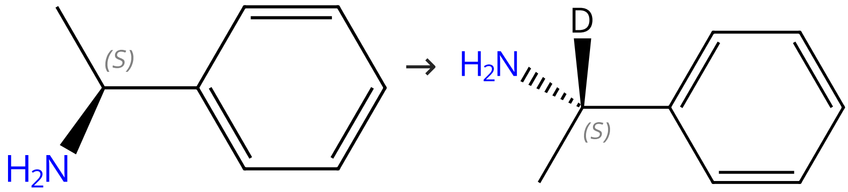
Experimental Protocols

Stereoretentive Deuteration of α-Chiral Amines with D_2O

By: Hale, Lillian V. A.; et al

Journal of the American Chemical Society (2016), 138(41), 13489-13492.

Scheme 214 (1 Reaction) Steps: **1**



Absolute stereochemistry shown, Rotation (-)

Absolute stereochemistry shown

Suppliers (96)

31-116-CAS-16271194 Steps: **1**

1.1 **Catalysts:** Ruthenium(1+), hydro[*N*-methyl-*N*-(6-methyl-2-pyridinyl-κ*N*)-1-[(6-methyl-2-pyridinyl-κ*N*)imino]-1*H*-isoindol-3-amine-κN^2](1,1,1-trifluoromethanesulfonato-κ*O*)(triphenyl phosphine)-, (*OC*-6-26)-, 1,1,1-trifluoromethanesulfonate (1:1)
Solvents: 2-Methyltetrahydrofuran, Water-d_2; 20 h, 110 °C

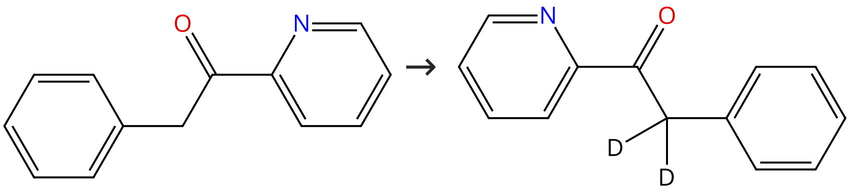
Experimental Protocols

Stereoretentive Deuteration of α-Chiral Amines with D_2O

By: Hale, Lillian V. A.; et al

Journal of the American Chemical Society (2016), 138(41), 13489-13492.

Scheme 215 (1 Reaction) Steps: **1**



Suppliers (60)

31-116-CAS-2307910 Steps: **1**

1.1 **Reagents:** Copper diacetate monohydrate, Water-d_2
Catalysts: Bis(dichloro(η^6-*p*-cymene)ruthenium)
Solvents: Toluene; 20 h, 150 °C

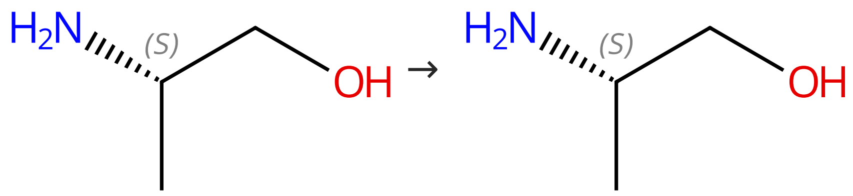
Experimental Protocols

sp^{3}C-H bond alkylation of ketones with alkenes via ruthenium (II) catalysed dehydrogenation of alcohols

By: Li, Bin; et al

Chemical Communications (Cambridge, United Kingdom) (2014), 50(45), 5970-5972.

Scheme 216 (1 Reaction) Steps: **1**



31-614-CAS-27478674 Steps: **1**

1.1 **Reagents:** Phosphoric acid, Deuterium
Catalysts: Ruthenium
Solvents: Water-d_2; 1 h, 1000 Pa, 150 °C

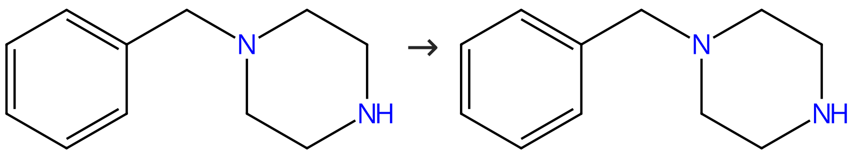
Experimental Protocols

Stereoretentive C-H Bond Activation in the Aqueous Phase Catalytic Hydrogenation of Amino Acids to Amino Alcohols

By: Jere, Frank T.; et al

Organic Letters (2003), 5(4), 527-530.

Scheme 217 (3 Reactions) Steps: **1**



31-614-CAS-28496154 Steps: **1**

1.1 **Reagents:** Water-d_2
Catalysts: Bis(η^6-benzene)di-μ-chlorodichlorodiruthenium
Solvents: Dimethyl sulfoxide; 3 h, 150 °C

One-step exchange-labeling of piperidines, piperazines and dialkylamines with deuterium oxide: catalysis by various ruthenium complexes

By: Alexakis, Efstathios; et al

Tetrahedron Letters (2005), 46(25), 4291-4293.

31-614-CAS-26773359 Steps: **1**

1.1 **Reagents:** Water-d_2
Catalysts: Hexacarbonyldi-μ-chlorodichlorodiruthenium
Solvents: Dimethyl sulfoxide; 3 h, 150 °C

One-step exchange-labeling of piperidines, piperazines and dialkylamines with deuterium oxide: catalysis by various ruthenium complexes

By: Alexakis, Efstathios; et al

Tetrahedron Letters (2005), 46(25), 4291-4293.

31-614-CAS-30231725 Steps: **1**

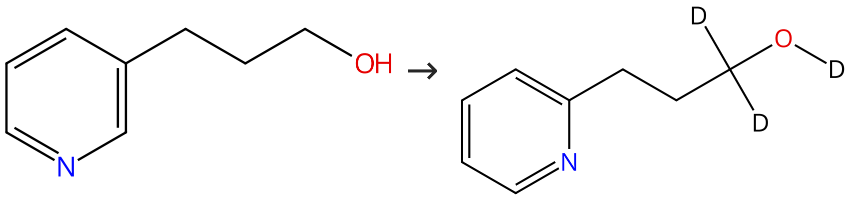
1.1 **Reagents:** Water-*d*$_2$
Catalysts: Dichlorotris(triphenylphosphine)ruthenium
Solvents: Dimethyl sulfoxide; 3 h, 150 °C

One-step exchange-labeling of piperidines, piperazines and dialkylamines with deuterium oxide: catalysis by various ruthenium complexes

By: Alexakis, Efstathios; et al

Tetrahedron Letters (2005), 46(25), 4291-4293.

Scheme 218 (1 Reaction) Steps: **1**



Suppliers (66)

31-116-CAS-10675365 Steps: **1**

1.1 **Reagents:** Potassium *tert*-butoxide
Catalysts: (*OC*-6-52)-Carbonylchloro[2-(diphenylphosphino-κ*P*)-*N*-[2-(diphenylphosphino-κ*P*)ethyl]ethanamine-κ*N*]hydroruthenium
Solvents: Water-*d*$_2$; 18 h, 80 °C

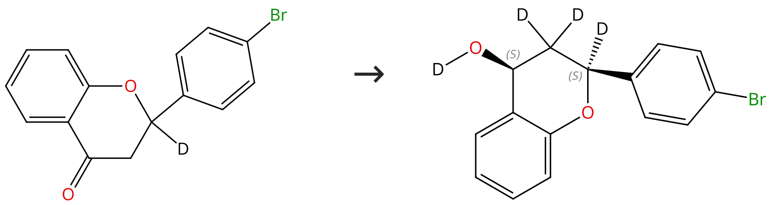
Experimental Protocols

Ruthenium Catalyzed Selective α- and α,β-Deuteration of Alcohols Using D_2O

By: Chatterjee, Basujit; et al

Organic Letters (2015), 17(19), 4794-4797.

Scheme 219 (1 Reaction) Steps: **1**



Absolute stereochemistry shown

31-614-CAS-37448821 Steps: **1**

1.1 **Reagents:** Sodium formate, Methanol-*d*$_4$
Catalysts: Ruthenium (complexes with trimethylbenzene, Cl and copolymer of EGDMA-NIPMAM-viny...), 2973383-97-8 (ruthenium complexes with trimethylbenzene and Cl)
Solvents: Water-*d*$_2$; 40 °C

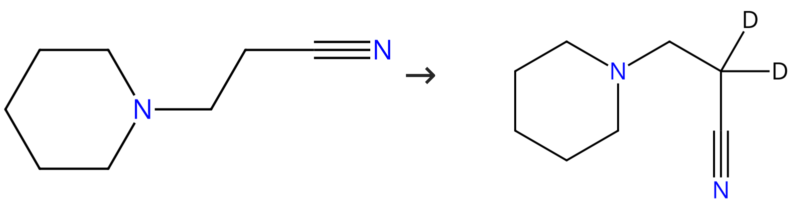
Experimental Protocols

Harmonization of an incompatible aqueous aldol condensation/oxa-Michael addition/reduction cascade process over a core-shell-structured thermoresponsive catalyst

By: Su, Yu; et al

Green Chemistry (2023), 25(17), 6859-6868.

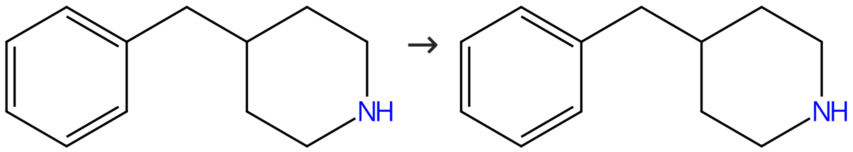
Scheme 220 (1 Reaction) Steps: **1**



Suppliers (74)

31-116-CAS-19660671	Steps: **1**	**Ruthenium-catalyzed selective α-deuteration of aliphatic nitriles using D_2O**
1.1	**Reagents:** Potassium *tert*-butoxide, Water-d_2 **Catalysts:** (*OC*-6-52)-Carbonylchloro[2-(diphenylphosphino-κ*P*)-*N*-[2-(diphenylphosphino-κ*P*)ethyl]ethanamine-κ*N*]hydroruthenium; 24 h, 70 °C	By: Krishnakumar, Varadhan; et al Chemical Communications (Cambridge, United Kingdom) (2018), 54(63), 8705-8708.
Experimental Protocols		

Scheme 221 (3 Reactions) Steps: **1**



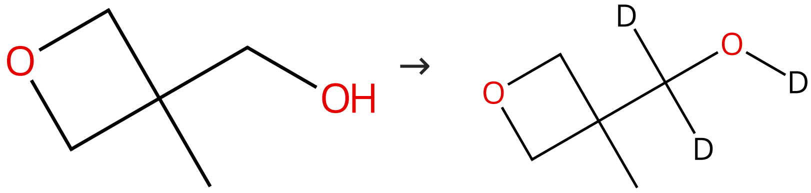
Suppliers (71)

31-614-CAS-30917379	Steps: **1**	**One-step exchange-labeling of piperidines, piperazines and dialkylamines with deuterium oxide: catalysis by various ruthenium complexes**
1.1	**Reagents:** Water-d_2 **Catalysts:** Bis(η^6-benzene)di-μ-chlorodichlorodiruthenium **Solvents:** Dimethyl sulfoxide; 3 h, 150 °C	By: Alexakis, Efstathios; et al Tetrahedron Letters (2005), 46(25), 4291-4293.

31-614-CAS-29175757	Steps: **1**	**One-step exchange-labeling of piperidines, piperazines and dialkylamines with deuterium oxide: catalysis by various ruthenium complexes**
1.1	**Reagents:** Water-d_2 **Catalysts:** Hexacarbonyldi-μ-chlorodichlorodiruthenium **Solvents:** Dimethyl sulfoxide; 3 h, 150 °C	By: Alexakis, Efstathios; et al Tetrahedron Letters (2005), 46(25), 4291-4293.

31-614-CAS-26791855	Steps: **1**	**One-step exchange-labeling of piperidines, piperazines and dialkylamines with deuterium oxide: catalysis by various ruthenium complexes**
1.1	**Reagents:** Water-d_2 **Catalysts:** Dichlorotris(triphenylphosphine)ruthenium **Solvents:** Dimethyl sulfoxide; 3 h, 150 °C	By: Alexakis, Efstathios; et al Tetrahedron Letters (2005), 46(25), 4291-4293.

Scheme 222 (1 Reaction) Steps: **1**



Suppliers (96)

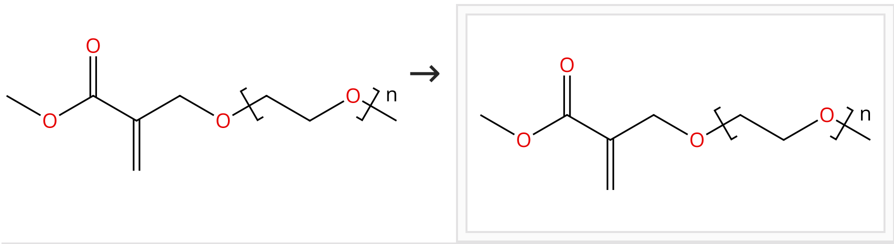
31-116-CAS-4559379	Steps: **1**
1.1	**Reagents:** Potassium *tert*-butoxide **Catalysts:** (*OC*-6-52)-Carbonylchloro[2-(diphenylphosphino-κ*P*)-*N*-[2-(diphenylphosphino-κ*P*)ethyl]ethanamine-κ*N*]hydroruthenium **Solvents:** Water-d_2; 20 h, 80 °C
Experimental Protocols	

Ruthenium Catalyzed Selective α- and α,β-Deuteration of Alcohols Using D_2O

By: Chatterjee, Basujit; et al

Organic Letters (2015), 17(19), 4794-4797.

Scheme 223 (1 Reaction) Steps: **1**



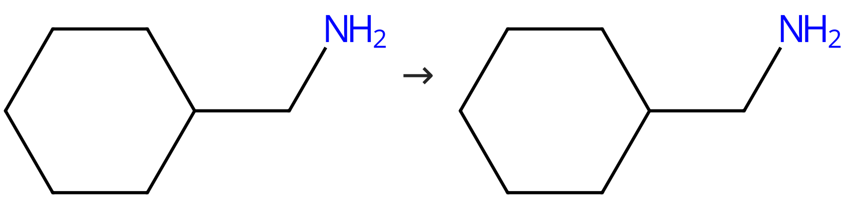
31-614-CAS-32405832	Steps: **1**
1.1	**Reagents:** 4-[[[(2-Carboxyethyl)thio]thioxomethyl]thio]-4-cyanopentanoic acid **Catalysts:** Tris(2,2'-bipyridyl)ruthenium(II) chloride **Solvents:** Dimethylformamide, Water-d_2; 20 h, 35 °C
Experimental Protocols	

Aqueous and kinetic comparison of polymerization of oligo(ethylene oxide) methyl ether methacrylate and methyl 2-(oligo(ethylene oxide) methyl ether)acrylate macromonomers

By: Martinez, Michael R.; et al

Journal of Polymer Science (Hoboken, NJ, United States) (2022), 60(12), 1887-1898.

Scheme 224 (1 Reaction) Steps: **1**



Suppliers (73)

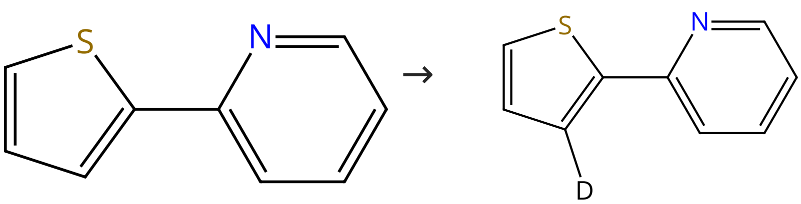
31-614-CAS-27419260	Steps: **1**
1.1	**Reagents:** Water-d_2 **Catalysts:** Ruthenium(1+), hydro[*N*-methyl-*N*-(6-methyl-2-pyridinyl-κ*N*)-1-[(6-methyl-2-pyridinyl-κ*N*)imino]-1*H*-isoindol-3-amine-κN^2](1,1,1-trifluoromethanesulfonato-κ*O*)(triphenylphosphine)-, (*OC*-6-26)-, 1,1,1-trifluoromethanesulfonate (1:1) **Solvents:** 2-Methyltetrahydrofuran; 20 h, 110 °C
Experimental Protocols	

Stereoretentive Deuteration of α-Chiral Amines with D_2O

By: Hale, Lillian V. A.; et al

Journal of the American Chemical Society (2016), 138(41), 13489-13492.

Scheme 225 (1 Reaction) Steps: **1**



Suppliers (71)

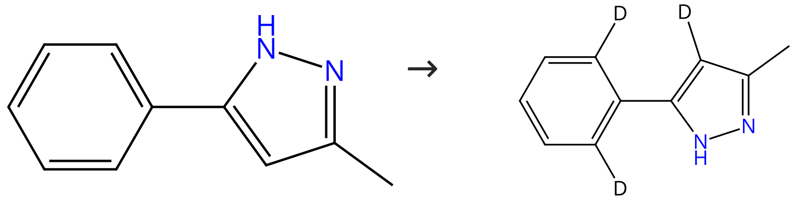
31-614-CAS-38711053	Steps: **1**
1.1	**Reagents:** Potassium carbonate, 1-Adamantanecarboxylic acid, Water-d_2 **Catalysts:** Bis(dichloro(η^6-*p*-cymene)ruthenium) **Solvents:** Toluene; 16 h, 120 °C
Experimental Protocols	

Catalyst-Controlled Divergent C3/C5 Site-Selective C-H Arylation of 2-Pyridylthiophenes

By: Huang, Xuecong; et al

Advanced Synthesis & Catalysis (2023), 365(21), 3674-3679.

Scheme 226 (1 Reaction) Steps: **1**



Suppliers (76)

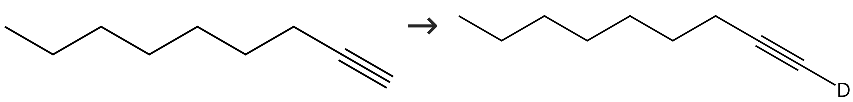
31-116-CAS-22738333	Steps: **1**
1.1	**Reagents:** Benzoic acid, Water-d_2 **Catalysts:** Silver hexafluoroantimonate, Bis(dichloro(η^6-*p*-cymene)ruthenium) **Solvents:** Ethanol-d_6; 20 h, 120 °C
Experimental Protocols	

Ruthenium-catalyzed α-carbonyl sulfoxonium ylide annula tions with aryl substituted pyrazoles via C-H/N-H bond functionalizations

By: Chen, Zhangpei; et al

Organic & Biomolecular Chemistry (2020), 18(41), 8486-8490.

Scheme 227 (1 Reaction) Steps: **1**



Suppliers (52)

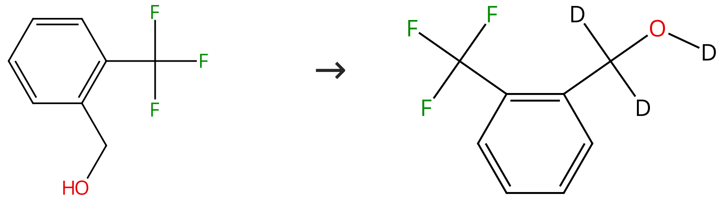
31-116-CAS-9923253	Steps: **1**
1.1	**Reagents:** Potassium *tert*-butoxide, Water-d_2 **Catalysts:** (*OC*-6-52)-Carbonylchloro[2-(diphenylphosphino-κ*P*)-*N*-[2-(diphenylphosphino-κ*P*)ethyl]ethanamine-κ*N*]hydroruthenium **Solvents:** 1,2-Dimethoxyethane; 24 h, 90 °C
Experimental Protocols	

The ruthenium-catalysed selective synthesis of mono-deuterated terminal alkynes

By: Chatterjee, Basujit; et al

Chemical Communications (Cambridge, United Kingdom) (2016), 52(24), 4509-4512.

Scheme 228 (1 Reaction) Steps: **1**



Suppliers (83)

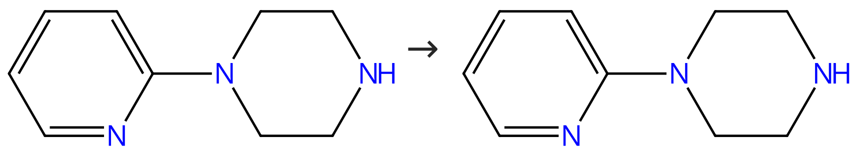
31-116-CAS-7176500	Steps: 1
1.1	**Reagents:** Potassium *tert*-butoxide **Catalysts:** (*OC*-6-52)-Carbonylchloro[2-(diphenylphosphino-κ*P*)-*N*-[2-(diphenylphosphino-κ*P*)ethyl]ethanamine-κ*N*]hydroruthenium **Solvents:** Water-d_2; 10 h, 80 °C
Experimental Protocols	

Ruthenium Catalyzed Selective α- and α,β-Deuteration of Alcohols Using D_2O

By: Chatterjee, Basujit; et al

Organic Letters (2015), 17(19), 4794-4797.

Scheme 229 (3 Reactions) Steps: **1**



Suppliers (108)

31-614-CAS-25995034	Steps: 1
1.1	**Reagents:** Water-d_2 **Catalysts:** Dichlorotris(triphenylphosphine)ruthenium **Solvents:** Dimethyl sulfoxide; 3 h, 150 °C

One-step exchange-labeling of piperidines, piperazines and dialkylamines with deuterium oxide: catalysis by various ruthenium complexes

By: Alexakis, Efstathios; et al

Tetrahedron Letters (2005), 46(25), 4291-4293.

31-614-CAS-30109909	Steps: 1
1.1	**Reagents:** Water-d_2 **Catalysts:** Bis(η^6-benzene)di-μ-chlorodichlorodiruthenium **Solvents:** Dimethyl sulfoxide; 3 h, 150 °C

One-step exchange-labeling of piperidines, piperazines and dialkylamines with deuterium oxide: catalysis by various ruthenium complexes

By: Alexakis, Efstathios; et al

Tetrahedron Letters (2005), 46(25), 4291-4293.

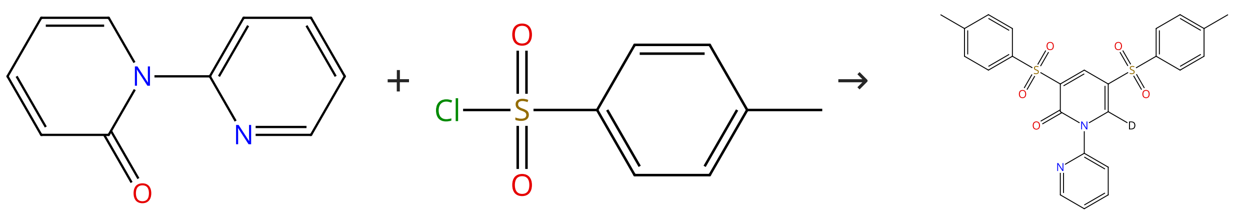
31-614-CAS-28373857	Steps: 1
1.1	**Reagents:** Water-d_2 **Catalysts:** Hexacarbonyldi-μ-chlorodichlorodiruthenium **Solvents:** Dimethyl sulfoxide; 3 h, 150 °C

One-step exchange-labeling of piperidines, piperazines and dialkylamines with deuterium oxide: catalysis by various ruthenium complexes

By: Alexakis, Efstathios; et al

Tetrahedron Letters (2005), 46(25), 4291-4293.

Scheme 230 (1 Reaction) Steps: **1**



Suppliers (8) Suppliers (84)

31-614-CAS-37326395	Steps: 1
1.1	**Reagents:** Potassium acetate, Water-d_2 **Catalysts:** Bis(dichloro(η^6-*p*-cymene)ruthenium) **Solvents:** 1,4-Dioxane; 12 h, 120 °C
Experimental Protocols	

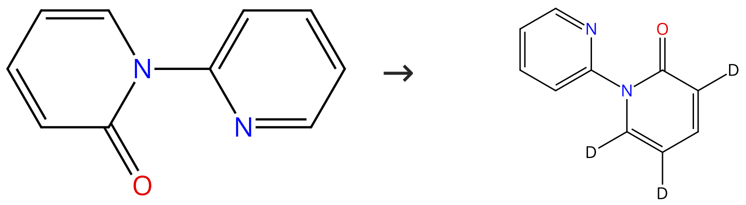
Ruthenium(II)-Catalyzed Remote C-H Sulfonylation of 2-Pyridones

By: Yang, Fengqi; et al

Organic Letters (2023), 25(31), 5779-5783.

Scheme 231 (1 Reaction)

Steps: **1**



Suppliers (8)

31-614-CAS-37326388

Steps: **1**

1.1 **Reagents:** Potassium acetate, Water-*d*$_2$
Catalysts: Bis(dichloro(η^6-*p*-cymene)ruthenium)
Solvents: 1,4-Dioxane; 12 h, 120 °C

Experimental Protocols

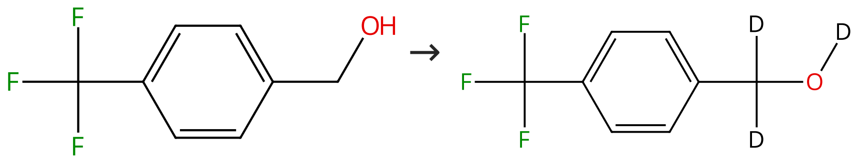
Ruthenium(II)-Catalyzed Remote C-H Sulfonylation of 2-Pyridones

By: Yang, Fengqi; et al

Organic Letters (2023), 25(31), 5779-5783.

Scheme 232 (1 Reaction)

Steps: **1**



Suppliers (85)

31-116-CAS-9311782

Steps: **1**

1.1 **Reagents:** Potassium *tert*-butoxide
Catalysts: (*OC*-6-52)-Carbonylchloro[2-(diphenylphosphino-κ*P*)-*N*-[2-(diphenylphosphino-κ*P*)ethyl]ethanamine-κ*N*]hydroruthenium
Solvents: Water-*d*$_2$; 10 h, 80 °C

Experimental Protocols

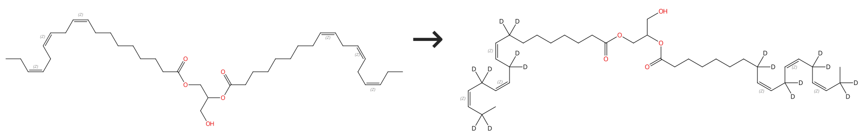
Ruthenium Catalyzed Selective α- and α, β-Deuteration of Alcohols Using D_2O

By: Chatterjee, Basujit; et al

Organic Letters (2015), 17(19), 4794-4797.

Scheme 233 (1 Reaction)

Steps: **1**



Double bond geometry shown

Double bond geometry shown

Suppliers (4)

31-116-CAS-17923451

Steps: **1**

1.1 **Reagents:** Water-*d*$_2$
Catalysts: Ruthenium(1+), tris(acetonitrile)(η^5-2,4-cyclopentadien-1-yl)-, hexafluorophosphate(1-) (1:1)
Solvents: Acetone-d$_6$; 4 h, rt

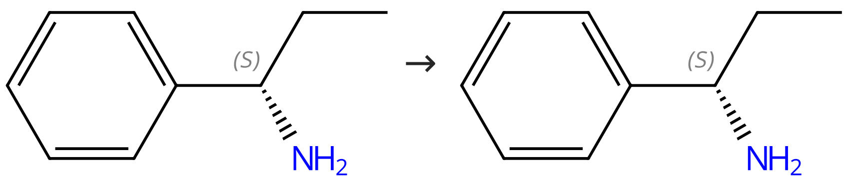
Experimental Protocols

Site-Specific Deuteration of Polyunsaturated Alkenes

By: Smarun, A. V.; et al

Journal of Organic Chemistry (2017), 82(24), 13115-13120.

Scheme 234 (1 Reaction) Steps: **1**



Absolute stereochemistry shown, Rotation (-)

Absolute stereochemistry shown

Suppliers (62)

31-614-CAS-30755460 Steps: **1**

1.1 **Reagents:** Water-*d*$_2$
Catalysts: Ruthenium(1+), hydro[*N*-methyl-*N*-(6-methyl-2-pyridinyl-κ*N*)-1-[(6-methyl-2-pyridinyl-κ*N*)imino]-1*H*-isoindol-3-amine-κ*N*^{2}](1,1,1-trifluoromethanesulfonato-κ*O*)(triphenyl phosphine)-, (*OC*-6-26)-, 1,1,1-trifluoromethanesulfonate (1:1)
Solvents: 2-Methyltetrahydrofuran; 20 h, 110 °C

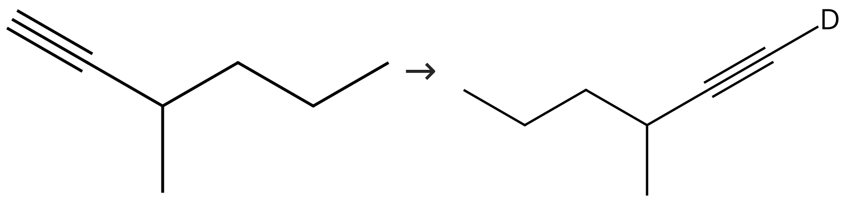
Experimental Protocols

Stereoretentive Deuteration of α-Chiral Amines with D_2O

By: Hale, Lillian V. A.; et al

Journal of the American Chemical Society (2016), 138(41), 13489-13492.

Scheme 235 (1 Reaction) Steps: **1**



Suppliers (19)

31-116-CAS-1837262 Steps: **1**

1.1 **Reagents:** Potassium *tert*-butoxide, Water-*d*$_2$
Catalysts: (*OC*-6-52)-Carbonylchloro[2-(diphenylphosphino-κ*P*)-*N*-[2-(diphenylphosphino-κ*P*)ethyl]ethanamine-κ*N*]hydroruthenium
Solvents: 1,2-Dimethoxyethane; 24 h, 90 °C

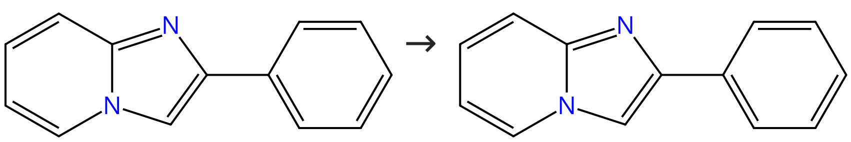
Experimental Protocols

The ruthenium-catalysed selective synthesis of mono-deuterated terminal alkynes

By: Chatterjee, Basujit; et al

Chemical Communications (Cambridge, United Kingdom) (2016), 52(24), 4509-4512.

Scheme 236 (1 Reaction) Steps: **1**



Suppliers (83)

31-614-CAS-31942937 Steps: **1**

1.1 **Reagents:** Water-*d*$_2$
Catalysts: Pivalic acid, Silver hexafluoroantimonate, Bis(dichloro(η^6-*p*-cymene)ruthenium); 4.5 h, rt

Experimental Protocols

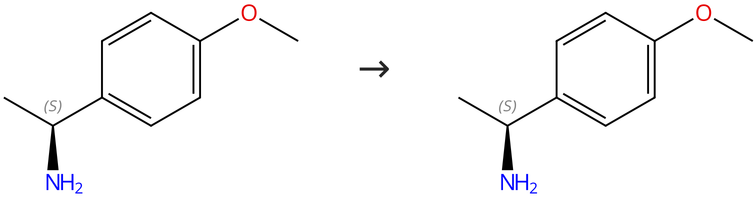
Mechanochemical Ruthenium-Catalyzed Ortho-Alkenylation of N-Heteroaryl Arenes with Alkynes under Ball-Milling Conditions

By: Bhawani; et al

Journal of Organic Chemistry (2022), 87(9), 5994-6005.

Scheme 237 (1 Reaction)

Steps: **1**



Absolute stereochemistry shown, Rotation (-)

Suppliers (84)

Absolute stereochemistry shown

31-614-CAS-29135878

Steps: **1**

1.1 **Reagents:** Water-d_2
Catalysts: Ruthenium(1+), hydro[*N*-methyl-*N*-(6-methyl-2-pyridinyl-κ*N*)-1-[(6-methyl-2-pyridinyl-κ*N*)imino]-1*H*-isoindol-3-amine-κN^2](1,1,1-trifluoromethanesulfonato-κ*O*)(triphenyl phosphine)-, (*OC*-6-26)-, 1,1,1-trifluoromethanesulfonate (1:1)
Solvents: 2-Methyltetrahydrofuran; 20 h, 110 °C

Experimental Protocols

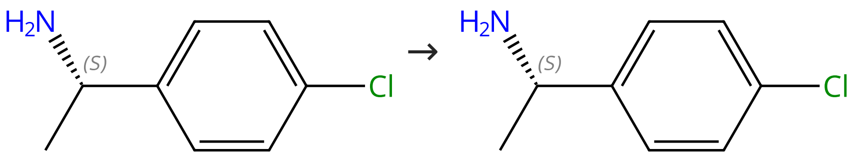
Stereoretentive Deuteration of α-Chiral Amines with D_2O

By: Hale, Lillian V. A.; et al

Journal of the American Chemical Society (2016), 138(41), 13489-13492.

Scheme 238 (1 Reaction)

Steps: **1**



Absolute stereochemistry shown, Rotation (-)

Suppliers (65)

Absolute stereochemistry shown

31-614-CAS-29935109

Steps: **1**

1.1 **Reagents:** Water-d_2
Catalysts: Ruthenium(1+), hydro[*N*-methyl-*N*-(6-methyl-2-pyridinyl-κ*N*)-1-[(6-methyl-2-pyridinyl-κ*N*)imino]-1*H*-isoindol-3-amine-κN^2](1,1,1-trifluoromethanesulfonato-κ*O*)(triphenyl phosphine)-, (*OC*-6-26)-, 1,1,1-trifluoromethanesulfonate (1:1)
Solvents: 2-Methyltetrahydrofuran; 20 h, 110 °C

Experimental Protocols

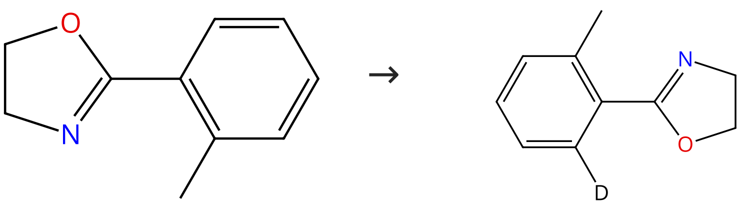
Stereoretentive Deuteration of α-Chiral Amines with D_2O

By: Hale, Lillian V. A.; et al

Journal of the American Chemical Society (2016), 138(41), 13489-13492.

Scheme 239 (1 Reaction)

Steps: **1**



Suppliers (9)

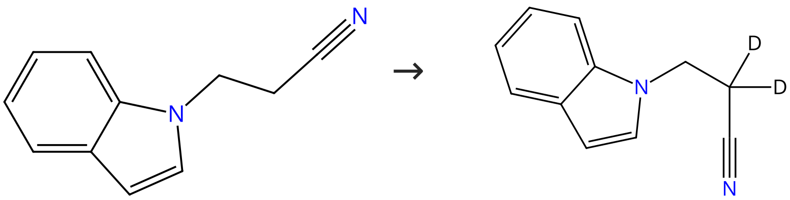
31-116-CAS-20662439	Steps: **1**
1.1	**Reagents:** Water-d_2 **Catalysts:** Cupric acetate, Silver hexafluoroantimonate, Bis(dichloro(η^6-*p*-cymene)ruthenium) **Solvents:** 2,2,2-Trifluoroethanol; 10 h, 60 °C

Oxazolinyl-Assisted Ru(II)-Catalyzed C-H Allylation with Allyl Alcohols and Synthesis of 4-Methyleneisochroman-1-ones

By: Singh, Diksha; et al

Journal of Organic Chemistry (2019), 84(20), 12881-12892.

Scheme 240 (1 Reaction) Steps: **1**



Suppliers (14)

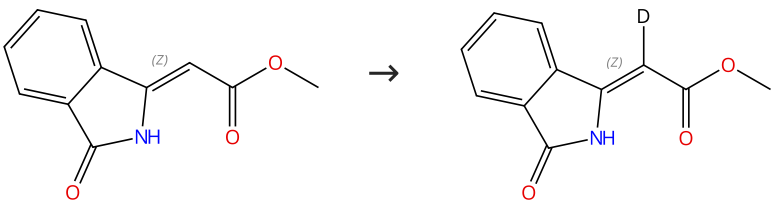
31-116-CAS-19660672	Steps: **1**
1.1	**Reagents:** Potassium *tert*-butoxide, Water-d_2 **Catalysts:** (*OC*-6-52)-Carbonylchloro[2-(diphenylphosphino-κ*P*)-*N*-[2-(diphenylphosphino-κ*P*)ethyl]ethanamine-κ*N*]hydroruthenium; 24 h, 70 °C
Experimental Protocols	

Ruthenium-catalyzed selective α-deuteration of aliphatic nitriles using D_2O

By: Krishnakumar, Varadhan; et al

Chemical Communications (Cambridge, United Kingdom) (2018), 54(63), 8705-8708.

Scheme 241 (1 Reaction) Steps: **1**



Double bond geometry shown

Double bond geometry shown

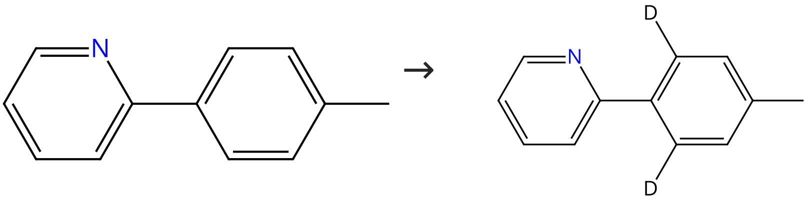
31-116-CAS-4964654	Steps: **1**
1.1	**Reagents:** Cupric acetate **Catalysts:** Potassium hexafluorophosphate, Bis(dichloro(η^6-*p*-cymene)ruthenium) **Solvents:** 1,2-Dichloroethane, Water-d_2; 12 h, 80 °C
Experimental Protocols	

Oxidative Alkenylation/Annulation of Benzimidates via Ruthenium(II)-Catalyzed C-H Activation to Generate 3-Methyleneisoindolin-1-ones

By: Li, Xing Guang; et al

Advanced Synthesis & Catalysis (2015), 357(2-3), 395-399.

Scheme 242 (1 Reaction) Steps: **1**



Suppliers (80)

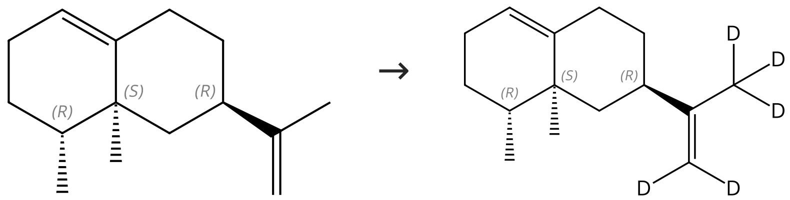
31-116-CAS-6715198	Steps: **1**
1.1	**Reagents:** Water-d_2 **Catalysts:** Stereoisomer of dihydro[(1,2,3,3a,7a-η)-1-phenyl-1*H*-inden-1-yl](triethylsilyl)(triphenylphosphine)ruthenium **Solvents:** Toluene; 16 h, 110 °C
Experimental Protocols	

Regioselective ruthenium catalysed H-D exchange using D_2O as the deuterium source

By: Piola, Lorenzo; et al

Organic & Biomolecular Chemistry (2014), 12(43), 8683-8688.

Scheme 243 (1 Reaction) Steps: **1**



Absolute stereochemistry shown, Rotation (+)

Suppliers (55)

Absolute stereochemistry shown

Supplier (1)

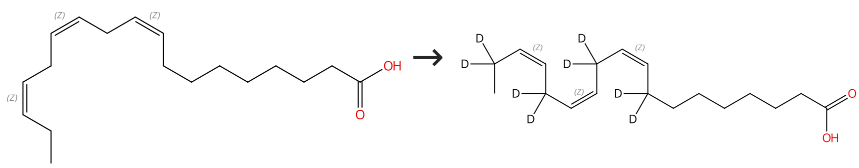
31-116-CAS-4507291	Steps: **1**
1.1	**Reagents:** 1,1',1'',1'''-Methanetetrayltetrakis[1,1,1-trimethylsilane], Water-d_2 **Catalysts:** Ruthenium(1+), (acetonitrile)[2-[bis(1-methylethyl)phosphino-κ*P*]-4-(1,1-dimethylethyl)-1-methyl-1*H*-imidazole-κN^3](η^5-2,4-cyclopentadien-1-yl)-, hexafluorophosphate(1-) (1:1) **Solvents:** Acetone-d_6; 144 h, 70 °C
Experimental Protocols	

Mild and Selective Deuteration and Isomerization of Alkenes by a Bifunctional Catalyst and Deuterium Oxide

By: Erdogan, Gulin; et al

Journal of the American Chemical Society (2009), 131(30), 10354-10355.

Scheme 244 (1 Reaction) Steps: **1**



Double bond geometry shown

Suppliers (124)

Double bond geometry shown

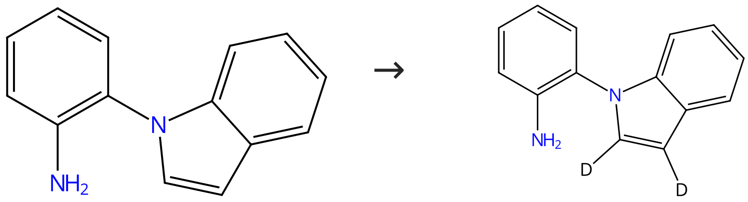
31-116-CAS-17923455	Steps: **1**
1.1	**Reagents:** Water-d_2 **Catalysts:** Ruthenium(1+), tris(acetonitrile)(η^5-2,4-cyclopentadien-1-yl)-, hexafluorophosphate(1-) (1:1) **Solvents:** Acetone-d_6; 24 h, rt
Experimental Protocols	

Site-Specific Deuteration of Polyunsaturated Alkenes

By: Smarun, A. V.; et al

Journal of Organic Chemistry (2017), 82(24), 13115-13120.

Scheme 245 (2 Reactions) Steps: **1**



Suppliers (29)

31-614-CAS-39895836 Steps: **1**

1.1 **Reagents:** Acetic acid, Water-d_2, Silver hexafluoroantimonate
Catalysts: Bis(dichloro(η^6-*p*-cymene)ruthenium)
Solvents: Tetrahydrofuran; 24 h, 60 °C

Experimental Protocols

Free Amine-Directed Redox Neutral Ruthenium(II) Catalysis toward Regioselective Synthesis of Heterobiaryls

By: Ghosh, Suman; et al

Organic Letters (2024), 26(15), 2987-2992.

31-614-CAS-33530638 Steps: **1**

1.1 **Reagents:** Acetic acid, Water-d_2, Silver hexafluoroantimonate
Catalysts: Bis(dichloro(η^6-*p*-cymene)ruthenium)
Solvents: Ethyl acetate; 12 h, 80 °C

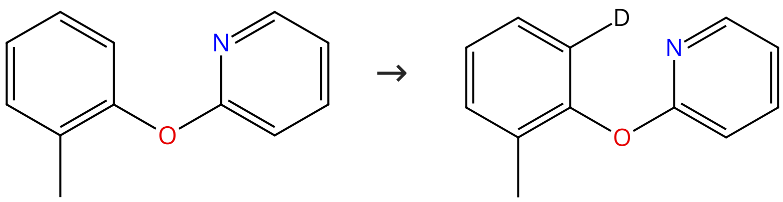
Experimental Protocols

Divergent construction of 3-(indol-2-yl)succinimide/maleimide and fused benzodiazepine skeletons from 2-(1H-indol-1-yl) anilines and maleimides

By: Ma, Chunhua; et al

Organic Chemistry Frontiers (2022), 9(17), 4663-4669.

Scheme 246 (1 Reaction) Steps: **1**



Suppliers (8)

31-116-CAS-19519593 Steps: **1**

1.1 **Reagents:** Cupric acetate, Oxygen, Water-d_2
Catalysts: Acetic acid, Zinc triflate, Ruthenium(2+), tris(acetonitrile)[(1,2,3,4,5,6-η)-1-methyl-4-(1-methylethyl)benzene]-, (*OC*-6-11)-hexafluoroantimonate(1-) (1:2)
Solvents: Toluene; 1 h, 130 °C

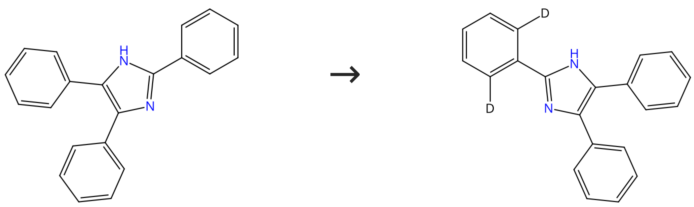
Experimental Protocols

Experimental and Theoretical Studies on Ru(II)-Catalyzed Oxidative C-H/C-H Coupling of Phenols with Aromatic Amides Using Air as Oxidant: Scope, Synthetic Applications, and Mechanistic Insights

By: Zhang, Luoqiang; et al

ACS Catalysis (2018), 8(9), 8324-8335.

Scheme 247 (1 Reaction) Steps: **1**



Suppliers (83)

31-614-CAS-35444450 Steps: **1**

1.1 **Reagents:** Cupric acetate, Water-d_2
Catalysts: Silver hexafluoroantimonate, Bis(dichloro(η^6-*p*-cymene)ruthenium)
Solvents: 1,2-Dichloroethane; 12 h, 100 °C

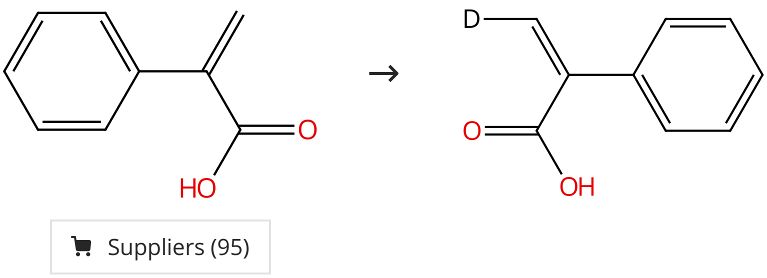
Experimental Protocols

Ruthenium(II)-Catalyzed Annulation of 2-Arylimidazoles with Arylglyoxals: Synthesis of 5-Hydroxyimidazo[2,1-a]isoquinolin-6(5H)-ones and Their Photophysical Studies

By: Sonam; et al

European Journal of Organic Chemistry (2023), 26(1), e202201065.

Scheme 248 (2 Reactions) Steps: **1**



31-614-CAS-43130338 Steps: **1**

1.1 **Reagents:** Cesium acetate, Water-d_2
Catalysts: Bis(dichloro(η^6-*p*-cymene)ruthenium)
Solvents: 1,1,1,3,3,3-Hexafluoro-2-propanol; 1 h, 60 °C

Experimental Protocols

Ru-Catalyzed Switchable Reactions of Acrylic Acids with Glyoxylate: Access to Functionalized γ-Butenolides

By: Zhang, Xin; et al

Organic Letters (2024), 26(50), 10658-10664.

31-614-CAS-32985192 Steps: **1**

1.1 **Reagents:** Sodium acetate, Water-d_2
Catalysts: Bis(dichloro(η^6-*p*-cymene)ruthenium)
Solvents: 1,1,1,3,3,3-Hexafluoro-2-propanol; 1 h, 100 °C

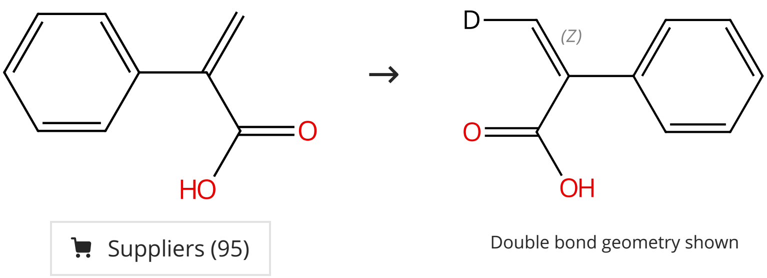
Experimental Protocols

Synthesis of Pyranones: Ru-Catalyzed Cascade Reaction via Vinylic C-H Addition to Glyoxylate

By: Yu, Shuling; et al

Organic Letters (2022), 24(27), 4871-4875.

Scheme 249 (1 Reaction) Steps: **1**



Double bond geometry shown

31-614-CAS-32058891 Steps: **1**

1.1 **Reagents:** Lithium carbonate (Li_2CO_3), Water-d_2
Catalysts: Bis(dichloro(η^6-*p*-cymene)ruthenium), Phosphine, triethyl-, tetrafluoroborate(1-) (1:1)
Solvents: *N*-Methyl-2-pyrrolidone; 10 min, 100 °C; 100 °C → rt

1.2 **Reagents:** Hydrochloric acid
Solvents: Water; rt

Experimental Protocols

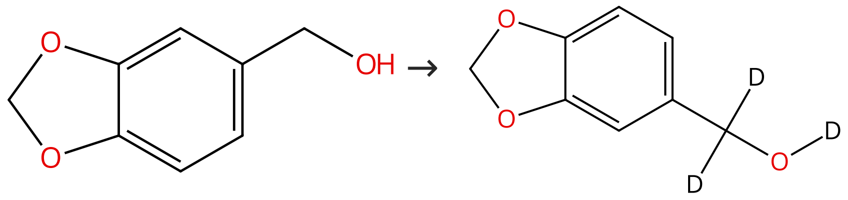
Ru-Catalyzed C-H Arylation of Acrylic Acids with Aryl Bromides

By: Belitz, Florian; et al

Organic Letters (2022), 24(19), 3466-3470.

Scheme 250 (1 Reaction)

Steps: **1**



Suppliers (84)

31-116-CAS-5029902

Steps: **1**

1.1 **Reagents:** Potassium *tert*-butoxide
Catalysts: (*OC*-6-52)-Carbonylchloro[2-(diphenylphosphino-κ*P*)-*N*-[2-(diphenylphosphino-κ*P*)ethyl]ethanamine-κ*N*]hydroruthenium
Solvents: Water-d_2; 10 h, 60 °C

Experimental Protocols

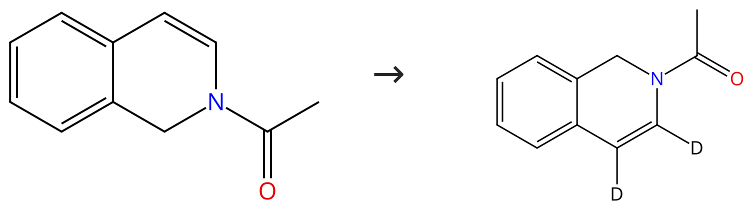
Ruthenium Catalyzed Selective α- and α, β-Deuteration of Alcohols Using D_2O

By: Chatterjee, Basujit; et al

Organic Letters (2015), 17(19), 4794-4797.

Scheme 251 (1 Reaction)

Steps: **1**



Suppliers (4)

31-116-CAS-20032880

Steps: **1**

1.1 **Reagents:** Cupric acetate, Water-d_2
Catalysts: Silver hexafluoroantimonate, Bis(dichloro(η^6-*p*-cymene)ruthenium)
Solvents: 2-Methyl-2-butanol; rt → 100 °C; 12 h, 100 °C

Experimental Protocols

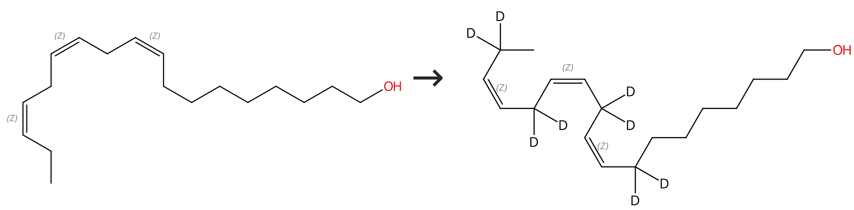
Ruthenium-Catalyzed Directed C(3)-H Olefination of N-Acetyl-1,2-dihydroisoquinolines: A Method to Achieve C3-Olefinated Isoquinolines

By: Das, Riki; et al

Synthesis (2019), 51(12), 2515-2522.

Scheme 252 (1 Reaction)

Steps: **1**



Double bond geometry shown

Double bond geometry shown

Suppliers (35)

31-116-CAS-17923453

Steps: **1**

1.1 **Reagents:** Water-d_2
Catalysts: Ruthenium(1+), tris(acetonitrile)(η^5-2,4-cyclopentadien-1-yl)-, hexafluorophosphate(1-) (1:1)
Solvents: Acetone-d_6; 18 h, rt

Experimental Protocols

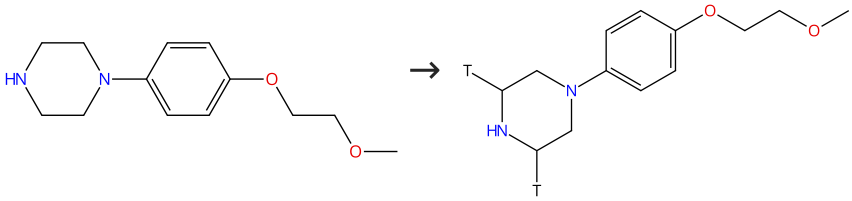
Site-Specific Deuteration of Polyunsaturated Alkenes

By: Smarun, A. V.; et al

Journal of Organic Chemistry (2017), 82(24), 13115-13120.

Scheme 253 (1 Reaction)

Steps: 1



Suppliers (60)

31-614-CAS-26804250

Steps: 1

1.1 **Reagents:** Water-*d*$_2$
Catalysts: Dichlorotris(triphenylphosphine)ruthenium
Solvents: 1,4-Dioxane; 3 h, 120 °C

Experimental Protocols

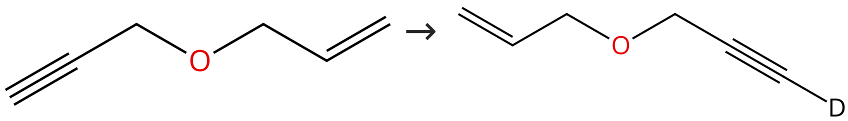
Synthesis of ^{3}H, ^{2}H$_4$, and ^{14}C-MK 3814 (preladenant)

By: Hesk, D.; et al

Journal of Labelled Compounds and Radiopharmaceuticals (2017), 60(4), 194-199.

Scheme 254 (1 Reaction)

Steps: 1



Suppliers (15)

31-116-CAS-6275817

Steps: 1

1.1 **Reagents:** Potassium *tert*-butoxide, Water-*d*$_2$
Catalysts: (*OC*-6-52)-Carbonylchloro[2-(diphenylphosphino-κ*P*)-*N*-[2-(diphenylphosphino-κ*P*)ethyl]ethanamine-κ*N*]hydroruthenium
Solvents: 1,2-Dimethoxyethane; 24 h, 75 °C

Experimental Protocols

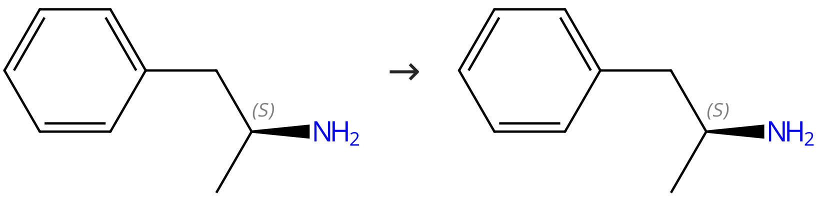
The ruthenium-catalysed selective synthesis of mono-deuterated terminal alkynes

By: Chatterjee, Basujit; et al

Chemical Communications (Cambridge, United Kingdom) (2016), 52(24), 4509-4512.

Scheme 255 (1 Reaction)

Steps: 1



Absolute stereochemistry shown, Rotation (+)

Absolute stereochemistry shown

Suppliers (13)

31-614-CAS-26609827

Steps: 1

1.1 **Reagents:** Water-*d*$_2$
Catalysts: Ruthenium(1+), hydro[*N*-methyl-*N*-(6-methyl-2-pyridinyl-κ*N*)-1-[(6-methyl-2-pyridinyl-κ*N*)imino]-1*H*-isoindol-3-amine-κ*N*^{2}](1,1,1-trifluoromethanesulfonato-κ*O*)(triphenylphosphine)-, (*OC*-6-26)-, 1,1,1-trifluoromethanesulfonate (1:1)
Solvents: 2-Methyltetrahydrofuran; 20 h, 110 °C

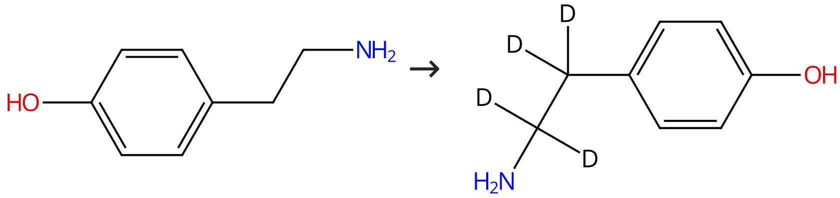
Experimental Protocols

Stereoretentive Deuteration of α-Chiral Amines with D_2O

By: Hale, Lillian V. A.; et al

Journal of the American Chemical Society (2016), 138(41), 13489-13492.

Scheme 256 (1 Reaction) Steps: **1**



Suppliers (101) Supplier (1)

31-614-CAS-38216495 Steps: **1**

1.1 **Reagents:** Hydrogen, Water-*d*2
Catalysts: Ruthenium, *myo*-Inositol, 1,2,3,4,5,6-hexakis (dihydrogen phosphate), polymer with benzenamine; 10 h, 2 MPa, 100 °C

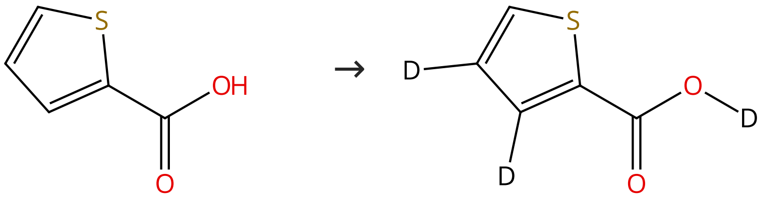
Experimental Protocols

Phytic Acid-Modulated Ru Catalyzes Regioselective Deuteration of 1,6-Hexamethylenediamine

By: Shao, Fangjun; et al

ACS Catalysis (2023), 13(24), 15746-15757.

Scheme 257 (1 Reaction) Steps: **1**



Suppliers (101)

31-116-CAS-1146114 Steps: **1**

1.1 **Reagents:** Water-*d*2
Catalysts: Stereoisomer of dihydro[(1,2,3,3a,7a-η)-1-phenyl-1*H*-inden-1-yl](triethylsilyl)(triphenylphosphine)ruthenium
Solvents: Toluene; 16 h, 110 atm

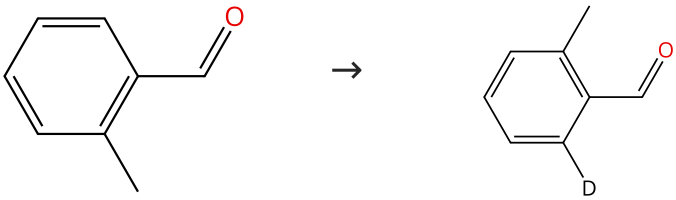
Experimental Protocols

Regioselective ruthenium catalysed H-D exchange using D_2O as the deuterium source

By: Piola, Lorenzo; et al

Organic & Biomolecular Chemistry (2014), 12(43), 8683-8688.

Scheme 258 (1 Reaction) Steps: **1**



Suppliers (94)

31-614-CAS-31372748 Steps: **1**

1.1 **Reagents:** Sodium acetate, Water-*d*2
Catalysts: Benzylamine, Di-μ-chlorodichlorobis[(1,2,3,4,5-η)-1,2,3,4,5-pentamethyl-2,4-cyclopentadien-1-yl]diruthenium; 15 min, rt; 24 h, 110 °C

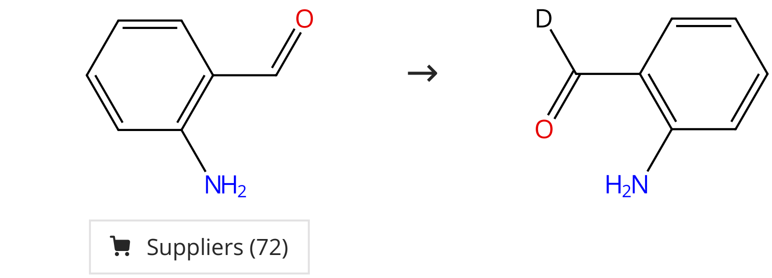
Experimental Protocols

Ir-Catalyzed Remote Functionalization by the Combination of Deconjugative Chain-Walking and C-H Activation Using a Transient Directing Group

By: Tang, King Hung Nigel; et al

Organic Letters (2022), 24(6), 1313-1317.

Scheme 259 (1 Reaction) Steps: **1**



31-614-CAS-33446193 Steps: **1**

1.1 **Reagents:** Lithium acetate, Water-*d*$_2$
Catalysts: Bis(dichloro(η^6-*p*-cymene)ruthenium)
Solvents: 1,1,1,3,3,3-Hexafluoro-2-propanol; 1 h, 80 °C

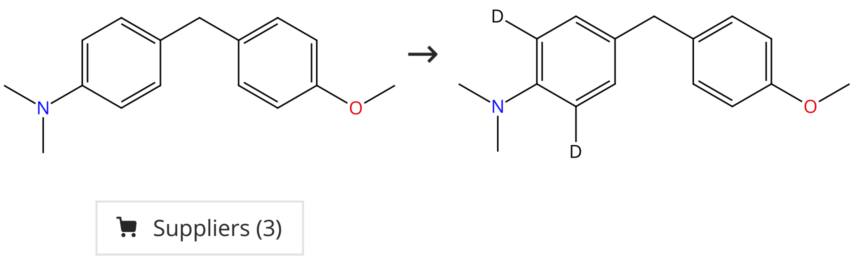
Experimental Protocols

Ru(II)-Catalyzed Decarbonylative Alkylation and Annulations of Benzaldehydes with Iodonium Ylides under Chelation Assistance

By: Li, Xiang; et al

Organic Letters (2022), 24(29), 5281-5286.

Scheme 260 (1 Reaction) Steps: **1**



31-116-CAS-14330248 Steps: **1**

1.1 **Reagents:** Water-*d*$_2$
Catalysts: Triruthenium dodecacarbonyl
Solvents: Toluene; 12 h, 120 °C

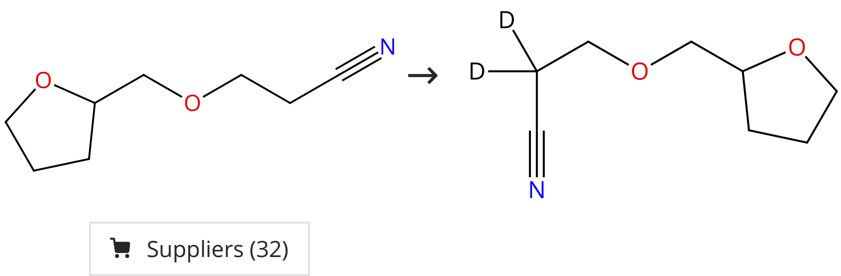
Experimental Protocols

A convenient method for the Ru(0)-catalyzed regioselective deuteration of N-alkyl-substituted anilines

By: Zhan, Miao; et al

Tetrahedron Letters (2014), 55(36), 5070-5073.

Scheme 261 (1 Reaction) Steps: **1**



31-116-CAS-19660676 Steps: **1**

1.1 **Reagents:** Potassium *tert*-butoxide, Water-*d*$_2$
Catalysts: (*OC*-6-52)-Carbonylchloro[2-(diphenylphosphino-κ*P*)-*N*-[2-(diphenylphosphino-κ*P*)ethyl]ethanamine-κ*N*]hydroruthenium; 24 h, 70 °C

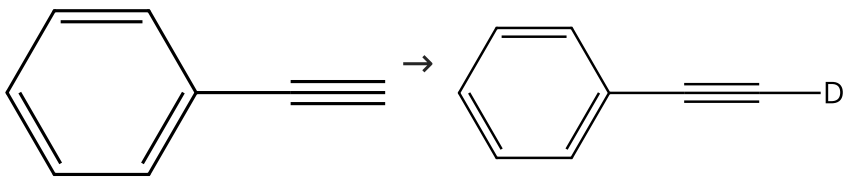
Experimental Protocols

Ruthenium-catalyzed selective α-deuteration of aliphatic nitriles using D_2O

By: Krishnakumar, Varadhan; et al

Chemical Communications (Cambridge, United Kingdom) (2018), 54(63), 8705-8708.

Scheme 262 (1 Reaction) Steps: **1**



Suppliers (72) Suppliers (11)

31-116-CAS-6679475 Steps: **1**

1.1 **Reagents:** Potassium *tert*-butoxide, Water-d_2
Catalysts: (*OC*-6-52)-Carbonylchloro[2-(diphenylphosphino-κ*P*)-*N*-[2-(diphenylphosphino-κ*P*)ethyl]ethanamine-κ*N*]hydroruthenium
Solvents: 1,2-Dimethoxyethane; 16 h, 50 °C

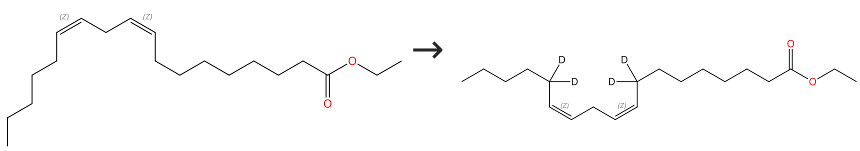
Experimental Protocols

The ruthenium-catalysed selective synthesis of mono-deuterated terminal alkynes

By: Chatterjee, Basujit; et al

Chemical Communications (Cambridge, United Kingdom) (2016), 52(24), 4509-4512.

Scheme 263 (1 Reaction) Steps: **1**



Double bond geometry shown Double bond geometry shown

Suppliers (85)

31-116-CAS-17923431 Steps: **1**

1.1 **Reagents:** Water-d_2
Catalysts: Ruthenium(1+), tris(acetonitrile)($η^5$-2,4-cyclopentadien-1-yl)-, hexafluorophosphate(1-) (1:1)
Solvents: Acetone; 3 h, rt

1.2 **Reagents:** Hydrochloric acid
Solvents: Water; 15 min, rt

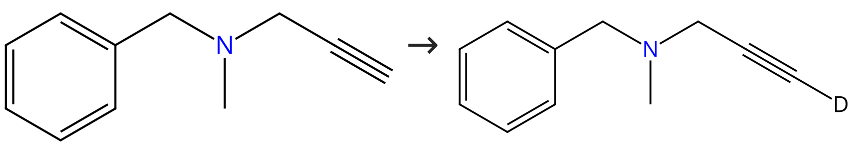
Experimental Protocols

Site-Specific Deuteration of Polyunsaturated Alkenes

By: Smarun, A. V.; et al

Journal of Organic Chemistry (2017), 82(24), 13115-13120.

Scheme 264 (1 Reaction) Steps: **1**



Suppliers (63)

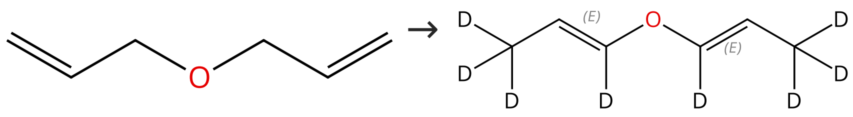
31-116-CAS-15228322	Steps: 1
1.1	**Reagents:** Potassium *tert*-butoxide, Water-d_2 **Catalysts:** (*OC*-6-52)-Carbonylchloro[2-(diphenylphosphino-κ*P*)-*N*-[2-(diphenylphosphino-κ*P*)ethyl]ethanamine-κ*N*]hydroruthenium **Solvents:** 1,2-Dimethoxyethane; 24 h, 90 °C
Experimental Protocols	

The ruthenium-catalysed selective synthesis of mono-deuterated terminal alkynes

By: Chatterjee, Basujit; et al

Chemical Communications (Cambridge, United Kingdom) (2016), 52(24), 4509-4512.

Scheme 265 (1 Reaction) Steps: **1**



Suppliers (32)

Double bond geometry shown

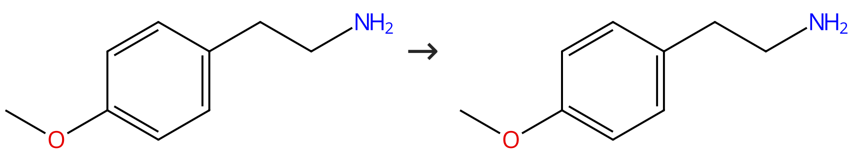
31-116-CAS-6969649	Steps: 1
1.1	**Reagents:** 2,6-Lutidine, 1,1',1'',1'''-Methanetetrayltetrakis[1,1,1-trimethylsilane], Water-d_2 **Catalysts:** Ruthenium(1+), (acetonitrile)[2-[bis(1-methylethyl)phosphino-κ*P*]-4-(1,1-dimethylethyl)-1-methyl-1*H*-imidazole-κN^3](η^5-2,4-cyclopentadien-1-yl)-, hexafluorophosphate(1-) (1:1) **Solvents:** Acetone-d_6; 72 h, rt
Experimental Protocols	

Mild and Selective Deuteration and Isomerization of Alkenes by a Bifunctional Catalyst and Deuterium Oxide

By: Erdogan, Gulin; et al

Journal of the American Chemical Society (2009), 131(30), 10354-10355.

Scheme 266 (1 Reaction) Steps: **1**



Suppliers (64)

31-614-CAS-27523619	Steps: 1
1.1	**Reagents:** Water-d_2 **Catalysts:** Ruthenium(1+), hydro[*N*-methyl-*N*-(6-methyl-2-pyridinyl-κ*N*)-1-[(6-methyl-2-pyridinyl-κ*N*)imino]-1*H*-isoindol-3-amine-κN^2](1,1,1-trifluoromethanesulfonato-κ*O*)(triphenylphosphine)-, (*OC*-6-26)-, 1,1,1-trifluoromethanesulfonate (1:1) **Solvents:** 2-Methyltetrahydrofuran; 20 h, 110 °C
Experimental Protocols	

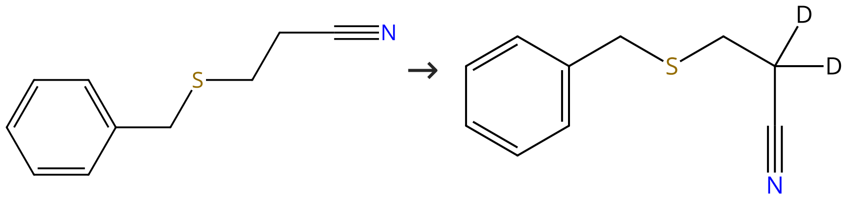
Stereoretentive Deuteration of α-Chiral Amines with D_2O

By: Hale, Lillian V. A.; et al

Journal of the American Chemical Society (2016), 138(41), 13489-13492.

Scheme 267 (1 Reaction)

Steps: **1**



Suppliers (13)

31-116-CAS-19660665

Steps: **1**

1.1 **Reagents:** Potassium *tert*-butoxide, Water-d_2
Catalysts: (*OC*-6-52)-Carbonylchloro[2-(diphenylphosphino-κ*P*)-*N*-[2-(diphenylphosphino-κ*P*)ethyl]ethanamine-κ*N*]hydroruthenium; 24 h, 70 °C

Experimental Protocols

Ruthenium-catalyzed selective α-deuteration of aliphatic nitriles using D_2O

By: Krishnakumar, Varadhan; et al

Chemical Communications (Cambridge, United Kingdom) (2018), 54(63), 8705-8708.

Scheme 268 (1 Reaction)

Steps: **1**

Absolute stereochemistry shown, Rotation (+)

Suppliers (195)

Absolute stereochemistry shown

Suppliers (51)

31-614-CAS-38216496

Steps: **1**

1.1 **Reagents:** Hydrogen, Water-d_2
Catalysts: Ruthenium, *myo*-Inositol, 1,2,3,4,5,6-hexakis (dihydrogen phosphate), polymer with benzenamine; 10 h, 2 MPa, 100 °C

Experimental Protocols

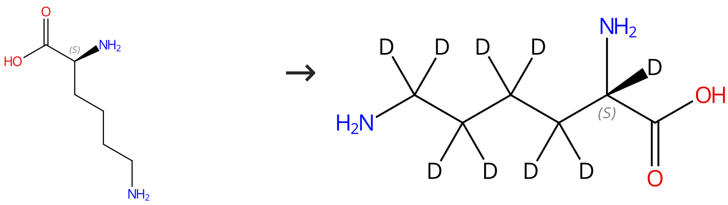
Phytic Acid-Modulated Ru Catalyzes Regioselective Deuteration of 1,6-Hexamethylenediamine

By: Shao, Fangjun; et al

ACS Catalysis (2023), 13(24), 15746-15757.

Scheme 269 (1 Reaction)

Steps: **1**



Absolute stereochemistry shown

Suppliers (122)

Absolute stereochemistry shown

31-614-CAS-38216500

Steps: **1**

1.1 **Reagents:** Hydrogen, Water-d_2
Catalysts: Ruthenium, *myo*-Inositol, 1,2,3,4,5,6-hexakis (dihydrogen phosphate), polymer with benzenamine; 10 h, 2 MPa, 100 °C

Experimental Protocols

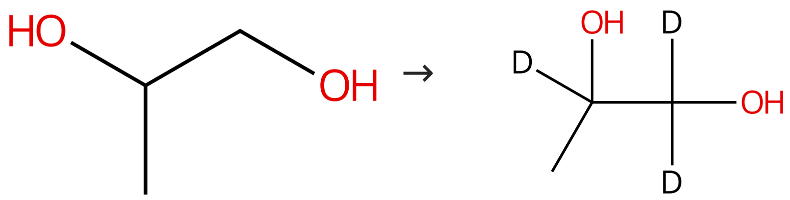
Phytic Acid-Modulated Ru Catalyzes Regioselective Deuteration of 1,6-Hexamethylenediamine

By: Shao, Fangjun; et al

ACS Catalysis (2023), 13(24), 15746-15757.

Scheme 270 (1 Reaction)

Steps: **1**



Suppliers (162) Suppliers (14)

31-614-CAS-38216507 Steps: **1**

1.1 **Reagents:** Hydrogen, Water-*d*2
Catalysts: Ruthenium, *myo*-Inositol, 1,2,3,4,5,6-hexakis (dihydrogen phosphate), polymer with benzenamine; 5 h, 2 M Pa, 100 °C

Experimental Protocols

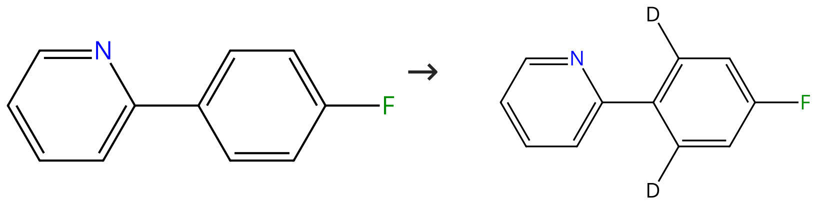
Phytic Acid-Modulated Ru Catalyzes Regioselective Deuteration of 1,6-Hexamethylenediamine

By: Shao, Fangjun; et al

ACS Catalysis (2023), 13(24), 15746-15757.

Scheme 271 (1 Reaction)

Steps: **1**



Suppliers (73)

31-116-CAS-8572209 Steps: **1**

1.1 **Reagents:** Water-*d*2
Catalysts: Stereoisomer of dihydro[(1,2,3,3a,7a-η)-1-phenyl-1*H*-inden-1-yl](triethylsilyl)(triphenylphosphine)ruthenium
Solvents: Toluene; 8 h, 110 °C

Experimental Protocols

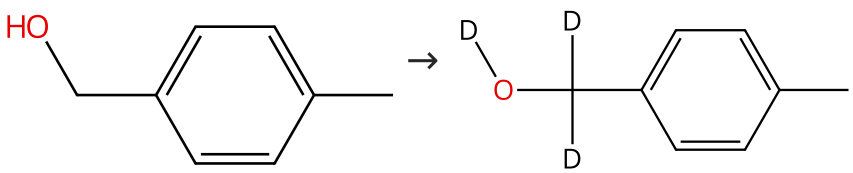
Regioselective ruthenium catalysed H-D exchange using D_2O as the deuterium source

By: Piola, Lorenzo; et al

Organic & Biomolecular Chemistry (2014), 12(43), 8683-8688.

Scheme 272 (1 Reaction)

Steps: **1**



Suppliers (90)

31-116-CAS-2911190 Steps: **1**

1.1 **Reagents:** Potassium *tert*-butoxide
Catalysts: (*OC*-6-52)-Carbonylchloro[2-(diphenylphosphino-κ*P*)-*N*-[2-(diphenylphosphino-κ*P*)ethyl]ethanamine-κ*N*]hydroruthenium
Solvents: Water-*d*2; 3 h, 60 °C

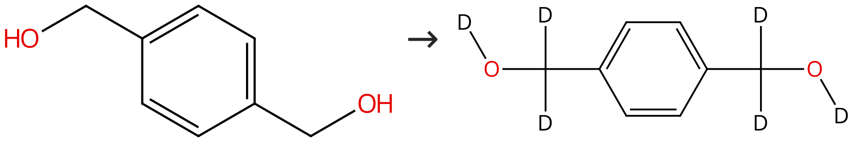
Experimental Protocols

Ruthenium Catalyzed Selective α- and α,β-Deuteration of Alcohols Using D_2O

By: Chatterjee, Basujit; et al

Organic Letters (2015), 17(19), 4794-4797.

Scheme 273 (1 Reaction) Steps: **1**



Suppliers (96)

31-116-CAS-10956838 Steps: **1**

1.1 **Reagents:** Potassium *tert*-butoxide
Catalysts: (*OC*-6-52)-Carbonylchloro[2-(diphenylphosphino-κ*P*)-*N*-[2-(diphenylphosphino-κ*P*)ethyl]ethanamine-κ*N*]hydroruthenium
Solvents: Water-d_2; 10 h, 80 °C

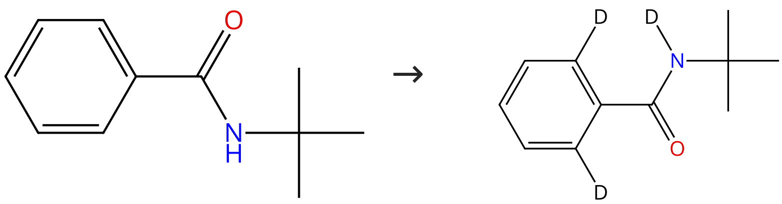
Experimental Protocols

Ruthenium Catalyzed Selective α- and α,β-Deuteration of Alcohols Using D_2O

By: Chatterjee, Basujit; et al

Organic Letters (2015), 17(19), 4794-4797.

Scheme 274 (1 Reaction) Steps: **1**



Suppliers (55)

31-116-CAS-19519594 Steps: **1**

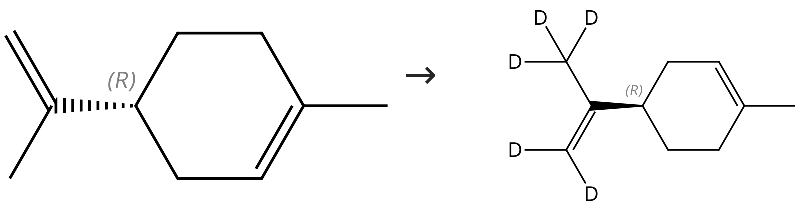
1.1 **Reagents:** Cupric acetate, Oxygen, Water-d_2, 2-(2,6-Dimethylphenoxy)pyridine
Catalysts: Acetic acid, Zinc triflate, Ruthenium(2+), tris(acetonitrile)[(1,2,3,4,5,6-η)-1-methyl-4-(1-methylethyl)benzene]-, (*OC*-6-11)-hexafluoroantimonate(1-) (1:2)
Solvents: Toluene; 1 h, 130 °C

Experimental and Theoretical Studies on Ru(II)-Catalyzed Oxidative C-H/C-H Coupling of Phenols with Aromatic Amides Using Air as Oxidant: Scope, Synthetic Applications, and Mechanistic Insights

By: Zhang, Luoqiang; et al

ACS Catalysis (2018), 8(9), 8324-8335.

Scheme 275 (1 Reaction) Steps: **1**



Absolute stereochemistry shown, Rotation (+)

Absolute stereochemistry shown

Suppliers (112)

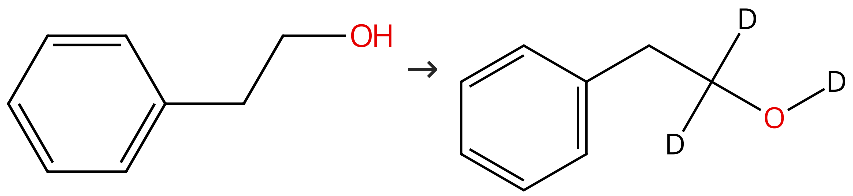
31-116-CAS-231824	Steps: 1
1.1	**Reagents:** 1,1',1'',1'''-Methanetetrayltetrakis[1,1,1-trimethylsilane], Water-d_2 **Catalysts:** Ruthenium(1+), (acetonitrile)[2-[bis(1-methylethyl)phosphino-κ*P*]-4-(1,1-dimethylethyl)-1-methyl-1*H*-imidazole-κN^3](η^5-2,4-cyclopentadien-1-yl)-, hexafluorophosphate(1-) (1:1) **Solvents:** Acetone-d_6; 120 h, 70 °C
Experimental Protocols	

Mild and Selective Deuteration and Isomerization of Alkenes by a Bifunctional Catalyst and Deuterium Oxide

By: Erdogan, Gulin; et al

Journal of the American Chemical Society (2009), 131(30), 10354-10355.

Scheme 276 (1 Reaction) Steps: **1**



Suppliers (119)

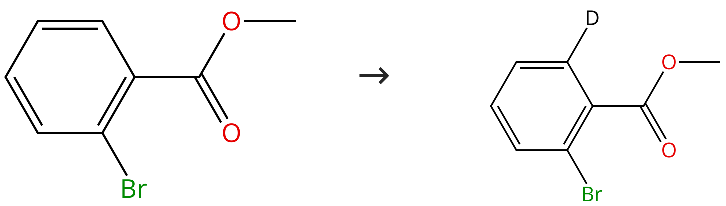
31-116-CAS-8545652	Steps: 1
1.1	**Reagents:** Potassium *tert*-butoxide **Catalysts:** (*OC*-6-52)-Carbonylchloro[2-(diphenylphosphino-κ*P*)-*N*-[2-(diphenylphosphino-κ*P*)ethyl]ethanamine-κ*N*]hydroruthenium **Solvents:** Water-d_2; 5 h, 80 °C
Experimental Protocols	

Ruthenium Catalyzed Selective α- and α,β-Deuteration of Alcohols Using D_2O

By: Chatterjee, Basujit; et al

Organic Letters (2015), 17(19), 4794-4797.

Scheme 277 (1 Reaction) Steps: **1**



Suppliers (92)

Supplier (1)

31-116-CAS-2946268	Steps: 1
1.1	**Reagents:** Water-d_2 **Catalysts:** Stereoisomer of dihydro[(1,2,3,3a,7a-η)-1-phenyl-1*H*-inden-1-yl](triethylsilyl)(triphenylphosphine)ruthenium **Solvents:** Toluene; 16 h, 110 atm
Experimental Protocols	

Regioselective ruthenium catalysed H-D exchange using D_2O as the deuterium source

By: Piola, Lorenzo; et al

Organic & Biomolecular Chemistry (2014), 12(43), 8683-8688.

Scheme 278 (1 Reaction) Steps: **1**

Suppliers (68)

Supplier (1)

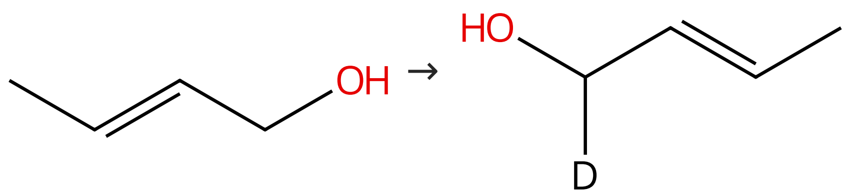
31-116-CAS-7529257	Steps: **1**
1.1	**Reagents:** Water-d_2 **Catalysts:** Stereoisomer of dihydro[(1,2,3,3a,7a-η)-1-phenyl-1*H*-inden-1-yl](triethylsilyl)(triphenylphosphine)ruthenium **Solvents:** Toluene; 16 h, 110 atm
Experimental Protocols	

Regioselective ruthenium catalysed H-D exchange using D_2O as the deuterium source

By: Piola, Lorenzo; et al

Organic & Biomolecular Chemistry (2014), 12(43), 8683-8688.

Scheme 279 (1 Reaction) Steps: **1**



Suppliers (44)

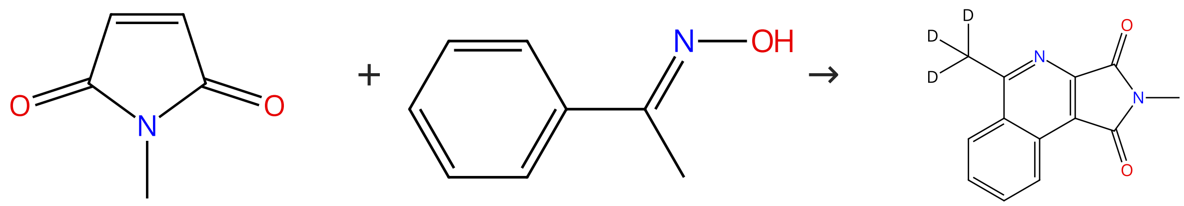
31-116-CAS-1949115	Steps: **1**
1.1	**Reagents:** Water-d_2 **Catalysts:** Dichlorotris(triphenylphosphine)ruthenium

Oxidation of [1-^{2}H]-alcohols, using ceric trihydroxy hydroperoxide [$Ce(OH)_3O_2H$] - a pronounced deuterium isotope effect

By: Saljoughian, M.; et al

Synthetic Communications (1985), 15(9), 765-8.

Scheme 280 (1 Reaction) Steps: **1**



Suppliers (82) Suppliers (59)

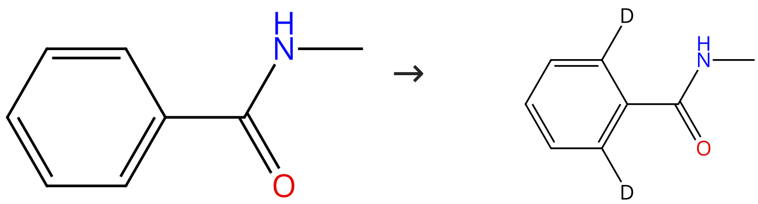
31-614-CAS-41473099	Steps: **1**
1.1	**Reagents:** Oxygen, Water-d_2 **Catalysts:** Bis(dichloro(η^6-*p*-cymene)ruthenium) **Solvents:** Methanol; 10 h, 110 °C
Experimental Protocols	

Ruthenium(II)-Catalyzed Annulation of Oximes with Maleimides: Synthesis of Pyrrolo[3,4-c]isoquinoline-1,3-diones

By: Kianmehr, Ebrahim; et al

Organic Letters (2024), 26(33), 6977-6982.

Scheme 281 (1 Reaction) Steps: **1**



Suppliers (72)

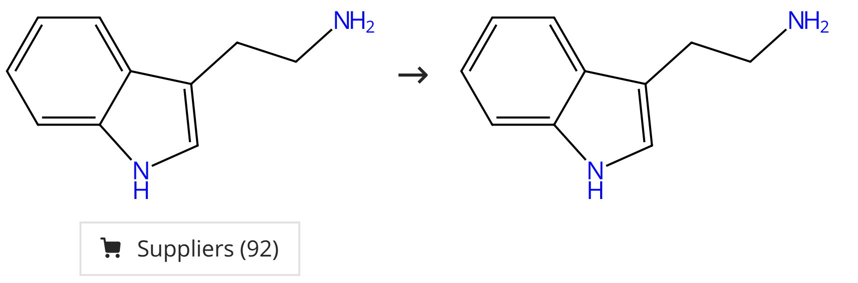
31-116-CAS-18603604	Steps: **1**
1.1	**Reagents:** Cupric acetate, Water-d_2 **Catalysts:** Potassium hexafluorophosphate, Bis(dichloro(η^6-*p*-cymene)ruthenium); 24 h, 100 °C
Experimental Protocols	

Cobalt(III)-Catalyzed C-H Activation and Secondary Amide-Directed Decarboxylative Functionalization of Alkynyl Carboxylic Acids Wherein Amide NH-group Remains Unreactive

By: Muniraj, Nachimuthu; et al

Advanced Synthesis & Catalysis (2018), 360(7), 1370-1375.

Scheme 282 (1 Reaction) Steps: **1**



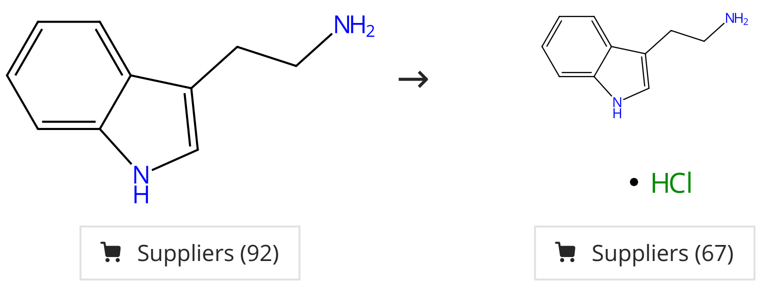
31-614-CAS-28910994	Steps: **1**
1.1	**Reagents:** Water-d_2 **Catalysts:** Ruthenium(1+), hydro[*N*-methyl-*N*-(6-methyl-2-pyridinyl-κ*N*)-1-[(6-methyl-2-pyridinyl-κ*N*)imino]-1*H*-isoindol-3-amine-κ*N*^{2}](1,1,1-trifluoromethanesulfonato-κ*O*)(triphenyl phosphine)-, (*OC*-6-26)-, 1,1,1-trifluoromethanesulfonate (1:1) **Solvents:** 2-Methyltetrahydrofuran; 20 h, 110 °C
Experimental Protocols	

Stereoretentive Deuteration of α-Chiral Amines with D_2O

By: Hale, Lillian V. A.; et al

Journal of the American Chemical Society (2016), 138(41), 13489-13492.

Scheme 283 (1 Reaction) Steps: **1**



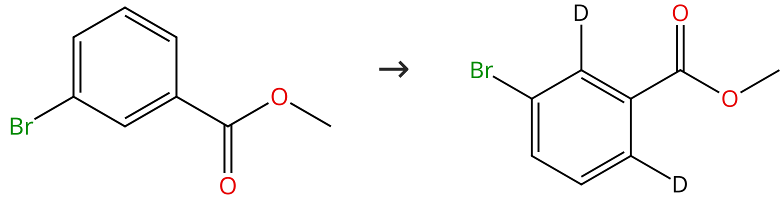
31-575-CAS-16271197	Steps: **1**
1.1	**Reagents:** Water-d_2 **Catalysts:** Ruthenium(1+), hydro[*N*-methyl-*N*-(6-methyl-2-pyridinyl-κ*N*)-1-[(6-methyl-2-pyridinyl-κ*N*)imino]-1*H*-isoindol-3-amine-κ*N*^{2}](1,1,1-trifluoromethanesulfonato-κ*O*)(triphenyl phosphine)-, (*OC*-6-26)-, 1,1,1-trifluoromethanesulfonate (1:1) **Solvents:** 2-Methyltetrahydrofuran; 20 h, 110 °C
1.2	**Reagents:** Deuterium chloride **Solvents:** Water-d_2
Experimental Protocols	

Stereoretentive Deuteration of α-Chiral Amines with D_2O

By: Hale, Lillian V. A.; et al

Journal of the American Chemical Society (2016), 138(41), 13489-13492.

Scheme 284 (1 Reaction) Steps: **1**



Suppliers (95)

31-116-CAS-12065802 Steps: **1**

1.1 **Reagents:** Water-d_2
Catalysts: Stereoisomer of dihydro[(1,2,3,3a,7a-η)-1-phenyl-1*H*-inden-1-yl](triethylsilyl)(triphenylphosphine)ruthenium
Solvents: Toluene; 16 h, 110 atm

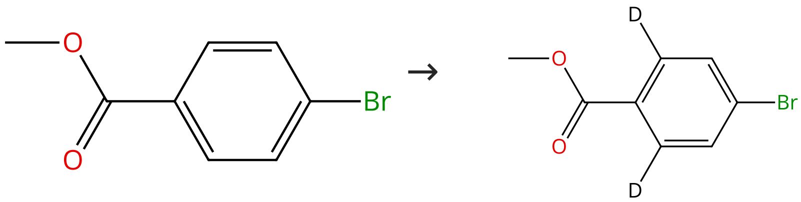
Experimental Protocols

Regioselective ruthenium catalysed H-D exchange using D_2O as the deuterium source

By: Piola, Lorenzo; et al

Organic & Biomolecular Chemistry (2014), 12(43), 8683-8688.

Scheme 285 (1 Reaction) Steps: **1**



Suppliers (105)

31-116-CAS-5693344 Steps: **1**

1.1 **Reagents:** Water-d_2
Catalysts: Stereoisomer of dihydro[(1,2,3,3a,7a-η)-1-phenyl-1*H*-inden-1-yl](triethylsilyl)(triphenylphosphine)ruthenium
Solvents: Toluene; 16 h, 110 atm

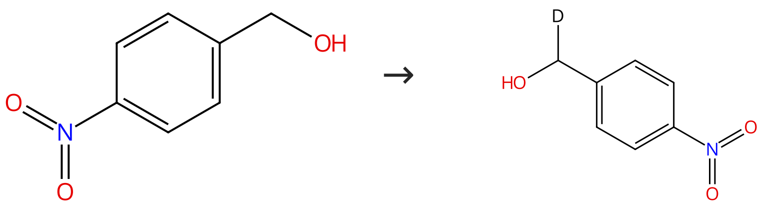
Experimental Protocols

Regioselective ruthenium catalysed H-D exchange using D_2O as the deuterium source

By: Piola, Lorenzo; et al

Organic & Biomolecular Chemistry (2014), 12(43), 8683-8688.

Scheme 286 (1 Reaction) Steps: **1**



Suppliers (105) Supplier (1)

31-116-CAS-13200328 Steps: **1**

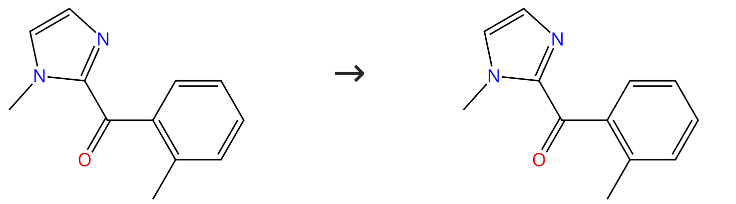
1.1 **Reagents:** Water-d_2
Catalysts: Dichlorotris(triphenylphosphine)ruthenium

Oxidation of [1-^{2}H]-alcohols, using ceric trihydroxy hydroperoxide [$Ce(OH)_3O_2H$] - a pronounced deuterium isotope effect

By: Saljoughian, M.; et al

Synthetic Communications (1985), 15(9), 765-8.

Scheme 287 (1 Reaction) Steps: **1**



Suppliers (6)

31-614-CAS-27079582 Steps: **1**

1.1 **Reagents:** Potassium carbonate, Water-*d*$_2$
Catalysts: 2,6-Dimethylbenzoic acid, Bis(dichloro(η^6-*p*-cymene)ruthenium)
Solvents: Toluene; 18 h, 150 °C

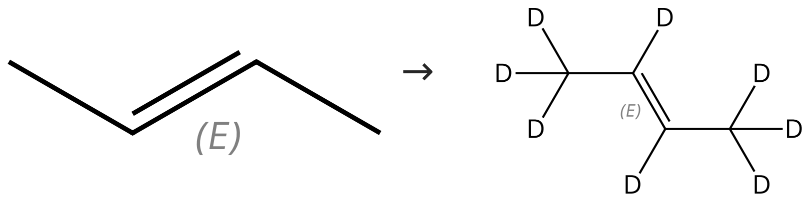
Experimental Protocols

Ruthenium(II)-catalyzed Arylation of ortho-C-H Bonds in 2-Aroyl-imidazoles with Aryl Halides

By: Wang, Chen-an; et al

Chemistry Letters (2021), 50(4), 589-592.

Scheme 288 (1 Reaction) Steps: **1**



Double bond geometry shown

Suppliers (15)

Double bond geometry shown

Suppliers (4)

31-116-CAS-9096453 Steps: **1**

1.1 **Reagents:** Water-*d*$_2$
Catalysts: Ruthenium(1+), (acetonitrile)[2-[bis(1-methylethyl)phosphino-κ*P*]-4-(1,1-dimethylethyl)-1-methyl-1*H*-imidazole-κ*N*^{3}](η^5-2,4-cyclopentadien-1-yl)-, hexafluorophosphate(1-) (1:1)
Solvents: 1,4-Dioxane, Acetone-d$_6$; 24 h, rt

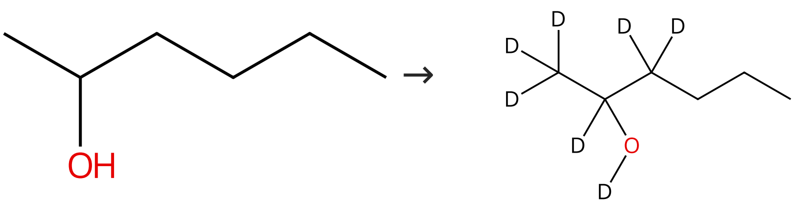
Experimental Protocols

Mild and Selective Deuteration and Isomerization of Alkenes by a Bifunctional Catalyst and Deuterium Oxide

By: Erdogan, Gulin; et al

Journal of the American Chemical Society (2009), 131(30), 10354-10355.

Scheme 289 (1 Reaction) Steps: **1**



Suppliers (56)

31-116-CAS-11711615 Steps: **1**

1.1 **Reagents:** Potassium *tert*-butoxide
Catalysts: (*OC*-6-52)-Carbonylchloro[2-(diphenylphosphino-κ*P*)-*N*-[2-(diphenylphosphino-κ*P*)ethyl]ethanamine-κ*N*]hydroruthenium
Solvents: Water-*d*$_2$; 10 h, 80 °C

Experimental Protocols

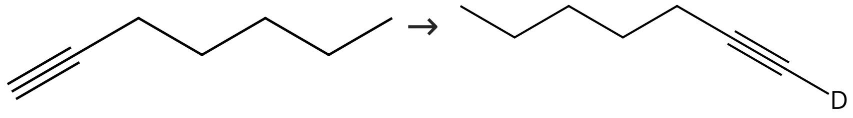
Ruthenium Catalyzed Selective α- and α,β-Deuteration of Alcohols Using D_2O

By: Chatterjee, Basujit; et al

Organic Letters (2015), 17(19), 4794-4797.

Scheme 290 (1 Reaction)

Steps: **1**



Suppliers (52)

31-116-CAS-11028816

Steps: **1**

1.1 **Reagents:** Potassium *tert*-butoxide, Water-*d*$_2$
Catalysts: (*OC*-6-52)-Carbonylchloro[2-(diphenylphosphino-κ*P*)-*N*-[2-(diphenylphosphino-κ*P*)ethyl]ethanamine-κ*N*]hydroruthenium
Solvents: 1,2-Dimethoxyethane; 24 h, 75 °C

Experimental Protocols

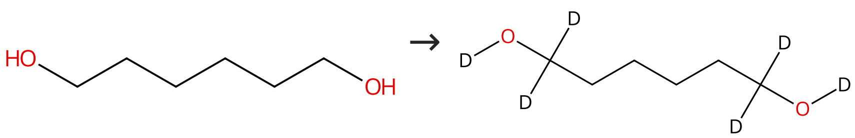
The ruthenium-catalysed selective synthesis of mono-deuterated terminal alkynes

By: Chatterjee, Basujit; et al

Chemical Communications (Cambridge, United Kingdom) (2016), 52(24), 4509-4512.

Scheme 291 (1 Reaction)

Steps: **1**



Suppliers (95)

31-116-CAS-1822149

Steps: **1**

1.1 **Reagents:** Potassium *tert*-butoxide
Catalysts: (*OC*-6-52)-Carbonylchloro[2-(diphenylphosphino-κ*P*)-*N*-[2-(diphenylphosphino-κ*P*)ethyl]ethanamine-κ*N*]hydroruthenium
Solvents: Water-*d*$_2$; 16 h, 80 °C

Experimental Protocols

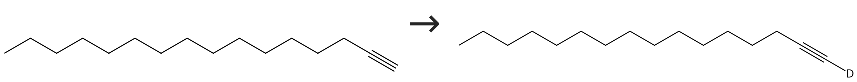
Ruthenium Catalyzed Selective α- and α,β-Deuteration of Alcohols Using D_2O

By: Chatterjee, Basujit; et al

Organic Letters (2015), 17(19), 4794-4797.

Scheme 292 (1 Reaction)

Steps: **1**



Suppliers (56)

31-116-CAS-13481521

Steps: **1**

1.1 **Reagents:** Potassium *tert*-butoxide, Water-*d*$_2$
Catalysts: (*OC*-6-52)-Carbonylchloro[2-(diphenylphosphino-κ*P*)-*N*-[2-(diphenylphosphino-κ*P*)ethyl]ethanamine-κ*N*]hydroruthenium
Solvents: 1,2-Dimethoxyethane; 24 h, 90 °C

Experimental Protocols

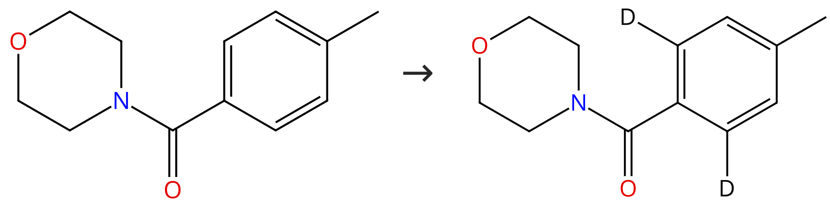
The ruthenium-catalysed selective synthesis of mono-deuterated terminal alkynes

By: Chatterjee, Basujit; et al

Chemical Communications (Cambridge, United Kingdom) (2016), 52(24), 4509-4512.

Scheme 293 (1 Reaction)

Steps: **1**



Suppliers (32)

31-116-CAS-22781702

Steps: **1**

1.1 **Reagents:** Water-*d*$_2$
Catalysts: Silver hexafluoroantimonate, Bis(dichloro(η^6-*p*-cymene)ruthenium)
Solvents: Dichloromethane; 72 h, 160 °C

Experimental Protocols

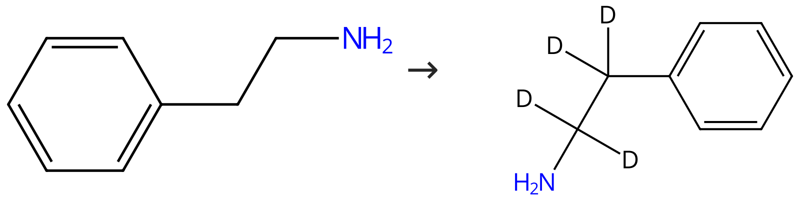
Synthesis of 3-unsubstituted phthalides from aryl amides and paraformaldehyde via Ruthenium(II)-catalyzed C-H activation

By: Zhou, Chao; et al

European Journal of Organic Chemistry (2020), 2020(41), 6485-6488.

Scheme 294 (1 Reaction)

Steps: **1**



Suppliers (62)

Suppliers (33)

31-614-CAS-38216498

Steps: **1**

1.1 **Reagents:** Hydrogen, Water-*d*$_2$
Catalysts: Ruthenium, *myo*-Inositol, 1,2,3,4,5,6-hexakis (dihydrogen phosphate), polymer with benzenamine; 10 h, 2 MPa, 100 °C

Experimental Protocols

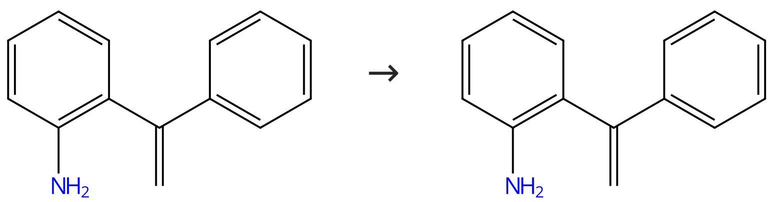
Phytic Acid-Modulated Ru Catalyzes Regioselective Deuteration of 1,6-Hexamethylenediamine

By: Shao, Fangjun; et al

ACS Catalysis (2023), 13(24), 15746-15757.

Scheme 295 (1 Reaction)

Steps: **1**



Suppliers (18)

31-614-CAS-28968662

Steps: **1**

1.1 **Reagents:** Potassium carbonate, Oxygen
Catalysts: Bis(dichloro(η^6-*p*-cymene)ruthenium)
Solvents: Tetrahydrofuran, Water-*d*$_2$; 12 h, 120 °C; 120 °C → rt

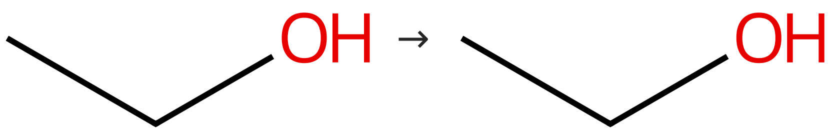
Ru^{II}-Catalyzed/NH$_2$-Assisted Selective Alkenyl C-H [5 + 1] Annulation of Alkenylanilines with Sulfoxonium Ylides to Quinolines

By: Chen, Pu; et al

Organic Letters (2019), 21(12), 4812-4815.

Scheme 296 (1 Reaction)

Steps: 1



Suppliers (582)

31-614-CAS-30233365

Steps: 1

1.1 **Reagents:** Potassium *tert*-butoxide
Catalysts: (*OC*-6-52)-Carbonylchloro[2-(diphenylphosphino-κ*P*)-*N*-[2-(diphenylphosphino-κ*P*)ethyl]ethanamine-κ*N*]hydroruthenium
Solvents: Water-d_2; 24 h, 100 °C

Experimental Protocols

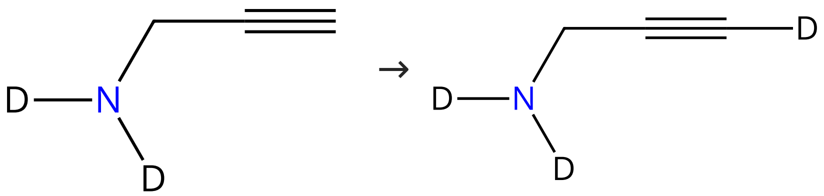
Ruthenium Catalyzed Selective α- and α,β-Deuteration of Alcohols Using D_2O

By: Chatterjee, Basujit; et al

Organic Letters (2015), 17(19), 4794-4797.

Scheme 297 (1 Reaction)

Steps: 1



31-116-CAS-43977

Steps: 1

1.1 **Reagents:** Potassium *tert*-butoxide, Water-d_2
Catalysts: (*OC*-6-52)-Carbonylchloro[2-(diphenylphosphino-κ*P*)-*N*-[2-(diphenylphosphino-κ*P*)ethyl]ethanamine-κ*N*]hydroruthenium
Solvents: 1,2-Dimethoxyethane; 7 h, 75 °C

Experimental Protocols

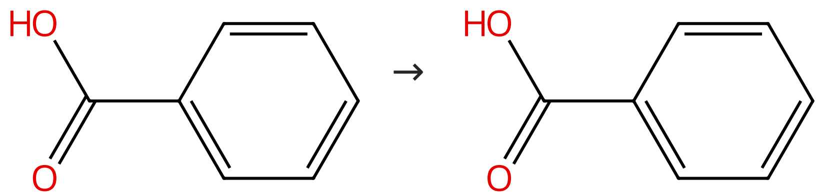
The ruthenium-catalysed selective synthesis of mono-deuterated terminal alkynes

By: Chatterjee, Basujit; et al

Chemical Communications (Cambridge, United Kingdom) (2016), 52(24), 4509-4512.

Scheme 298 (2 Reactions)

Steps: 1



Suppliers (192)

31-614-CAS-39508855

Steps: 1

1.1 **Reagents:** Tripotassium phosphate, Water-d_2
Catalysts: 1-Adamantanecarboxylic acid, Tricyclohexylphosphine, Bis(dichloro(η^6-*p*-cymene)ruthenium)
Solvents: *N*-Methyl-2-pyrrolidone; 2 h, 100 °C

Experimental Protocols

Ruthenium-Catalyzed C-H Arylation of Aromatic Acids with ortho-Haloaniline To Access Phenanthridinones

By: Luo, Xianglin; et al

Organic Letters (2024), 26(14), 2883-2887.

31-614-CAS-37662075 Steps: **1**

1.1 **Reagents:** Potassium carbonate, Water-*d*$_2$
Catalysts: 3,4,7,8-Tetramethyl-1,10-phenanthroline, stereo isomer of Di-μ-iododiiodobis[(1,2,3,4,5,6-η)-1-methyl-4-(1-methylethyl)benzene]diruthenium
Solvents: *N*-Methyl-2-pyrrolidone; 2 h, 120 °C

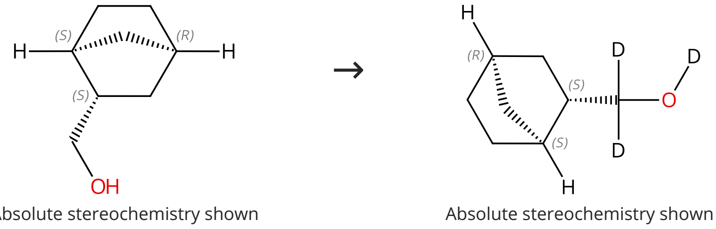
Experimental Protocols

Ligand-Enabled ortho-Arylation of (hetero)Aromatic Acids with 2,6-Disubstituted Aryl Halides

By: Luo, Xianglin; et al

ACS Catalysis (2023), 13(18), 12104-12113.

Scheme 299 (1 Reaction) Steps: **1**



Suppliers (3)

31-116-CAS-8827014 Steps: **1**

1.1 **Reagents:** Potassium *tert*-butoxide
Catalysts: (*OC*-6-52)-Carbonylchloro[2-(diphenylphosphino-κ*P*)-*N*-[2-(diphenylphosphino-κ*P*)ethyl]ethanamine-κ*N*]hydroruthenium
Solvents: Water-*d*$_2$; 10 h, 80 °C

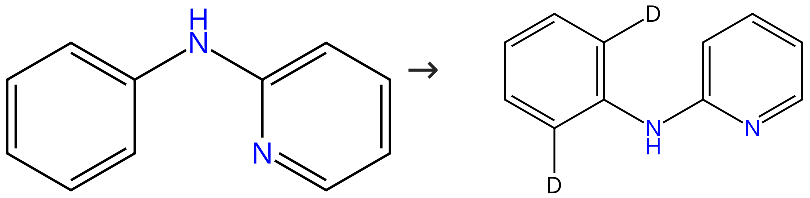
Experimental Protocols

Ruthenium Catalyzed Selective α- and α, β-Deuteration of Alcohols Using D_2O

By: Chatterjee, Basujit; et al

Organic Letters (2015), 17(19), 4794-4797.

Scheme 300 (1 Reaction) Steps: **1**



Suppliers (73)

31-614-CAS-33852121 Steps: **1**

1.1 **Reagents:** Silver acetate, Water-*d*$_2$
Catalysts: Bis(dichloro(η^6-*p*-cymene)ruthenium)
Solvents: Dichloromethane; 12 h, 80 °C

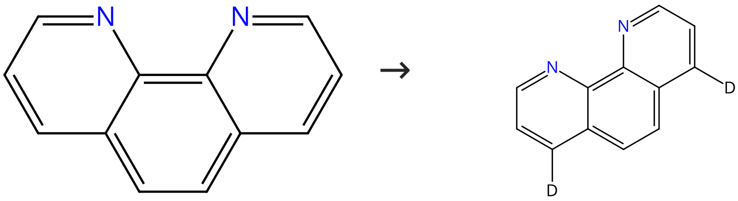
Experimental Protocols

C-H acylation of aniline derivatives with α-oxocarboxylic acids using ruthenium catalyst

By: Liu, Qiong; et al

Organic & Biomolecular Chemistry (2022), 20(34), 6890-6896.

Scheme 301 (1 Reaction) Steps: **1**



Suppliers (111)

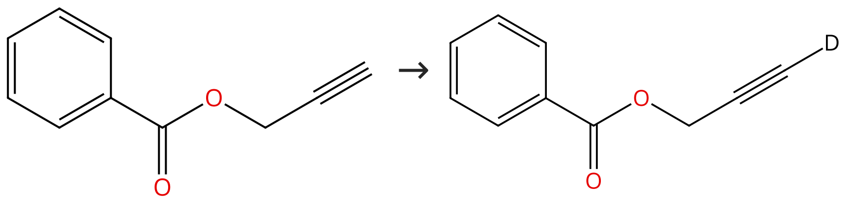
31-116-CAS-22370918	Steps: **1**
1.1	**Reagents:** Trifluoroacetic acid, Water-*d*$_2$ **Catalysts:** Rhodium(1+), [4,4'-bis(1,1-dimethylethyl)-2,2'-bipyridine-κ*N*^{1},κ*N*$^{1'}$]chloro[(1,2,3,4,5-η)-1,2,3,4,5-pentamethyl-2,4-cyclopentadien-1-yl]-, chloride (1:1), Ruthenium(3+), bis[4,4'-bis(1,1-dimethylethyl)-2,2'-bipyridine-κ*N*^{1},κ*N*$^{1'}$][chloro[(1,2,3,4,5-η)-1,2,3,4,5-pentamethyl-2,4-cyclopentadien-1-yl]rhodium][μ-(dipyrido[3,2-5,6:3',2'-5,6]quinoxalino[2,3-*f*][1,10]phenanthroline-κ*N*^{4},κ*N*^{5}:κ*N*^{13},κ*N*^{14})]-, chloride hexafluorophosphate(1-) (1:1:2) **Solvents:** Acetonitrile-*d*$_3$; 45 min; 60 min, 50 °C

The Metallic Traveler: Formate- and Photoinduced Regioselective Phenanthroline Deuterations via Reductively Activated RhCp* Centers

By: Mengele, Alexander K.; et al

Organometallics (2020), 39(14), 2739-2748.

Scheme 302 (1 Reaction) Steps: **1**



Suppliers (54)

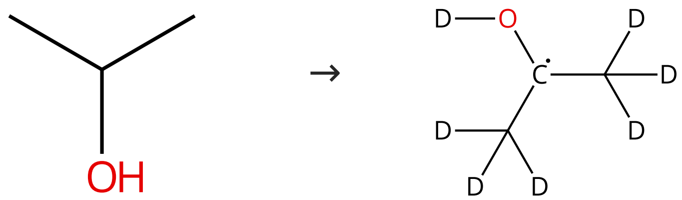
31-116-CAS-8073342	Steps: **1**
1.1	**Reagents:** Potassium *tert*-butoxide, Water-*d*$_2$ **Catalysts:** (*OC*-6-52)-Carbonylchloro[2-(diphenylphosphino-κ*P*)-*N*-[2-(diphenylphosphino-κ*P*)ethyl]ethanamine-κ*N*]hydroruthenium **Solvents:** 1,2-Dimethoxyethane; 24 h, 90 °C
Experimental Protocols	

The ruthenium-catalysed selective synthesis of mono-deuterated terminal alkynes

By: Chatterjee, Basujit; et al

Chemical Communications (Cambridge, United Kingdom) (2016), 52(24), 4509-4512.

Scheme 303 (1 Reaction) Steps: **1**



Suppliers (386)

31-116-CAS-15609034	Steps: **1**
1.1	**Reagents:** Sodium hydroxide, Water-*d*$_2$ **Catalysts:** (*OC*-6-52)-Carbonylchloro[2-(diphenylphosphino-κ*P*)-*N*-[2-(diphenylphosphino-κ*P*)ethyl]ethanamine-κ*N*]hydroruthenium; 2 h, 120 °C
Experimental Protocols	

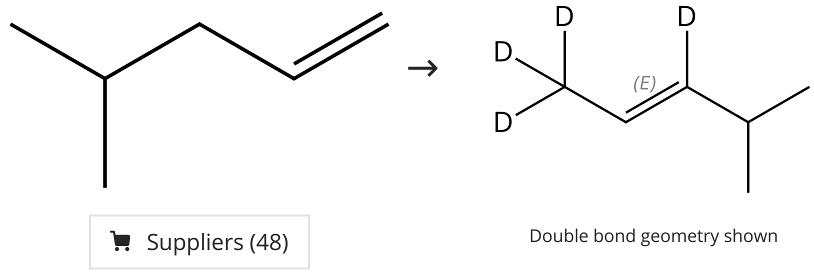
Efficient deuterium labelling of alcohols in deuterated water catalyzed by ruthenium pincer complexes

By: Zhang, Lei; et al

Catalysis Communications (2016), 84, 67-70.

Scheme 304 (1 Reaction)

Steps: **1**



31-116-CAS-6351590

Steps: **1**

1.1 **Reagents:** 1,1',1'',1'''-Methanetetrayltetrakis[1,1,1-trimethylsilane], Water-d_2
Catalysts: Ruthenium(1+), (acetonitrile)[2-[bis(1-methylethyl)phosphino-κ*P*]-4-(1,1-dimethylethyl)-1-methyl-1*H*-imidazole-κN^3](η^5-2,4-cyclopentadien-1-yl)-, hexafluorophosphate(1-) (1:1)
Solvents: Acetone-d_6; 24 h, rt

Experimental Protocols

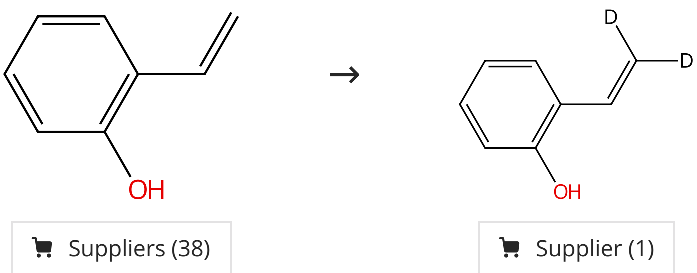
Mild and Selective Deuteration and Isomerization of Alkenes by a Bifunctional Catalyst and Deuterium Oxide

By: Erdogan, Gulin; et al

Journal of the American Chemical Society (2009), 131(30), 10354-10355.

Scheme 305 (1 Reaction)

Steps: **1**



31-614-CAS-35052446

Steps: **1**

1.1 **Reagents:** Water-d_2
Catalysts: Sodium acetate, Bis(dichloro(η^6-*p*-cymene)ruthenium)
Solvents: Acetonitrile; 24 h, rt

Experimental Protocols

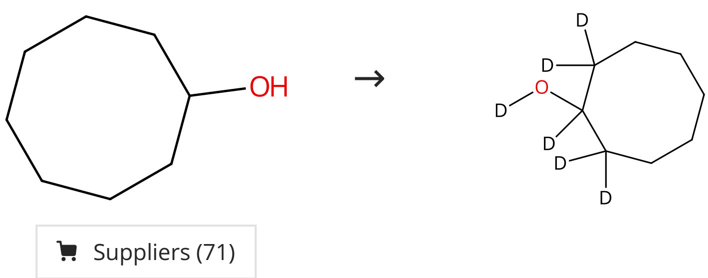
Ru(II)-Catalyzed Regioselective Annulation of 2-Hydroxystyrenes with Allenyl Acetates via Vinylic C- H Activation

By: Singh, Anurag; et al

Organic Letters (2022), 24(49), 8936-8941.

Scheme 306 (1 Reaction)

Steps: **1**



31-116-CAS-2590937

Steps: **1**

1.1 **Reagents:** Potassium *tert*-butoxide
Catalysts: (*OC*-6-52)-Carbonylchloro[2-(diphenylphosphino-κ*P*)-*N*-[2-(diphenylphosphino-κ*P*)ethyl]ethanamine-κ*N*]hydroruthenium
Solvents: Water-d_2; 12 h, 80 °C

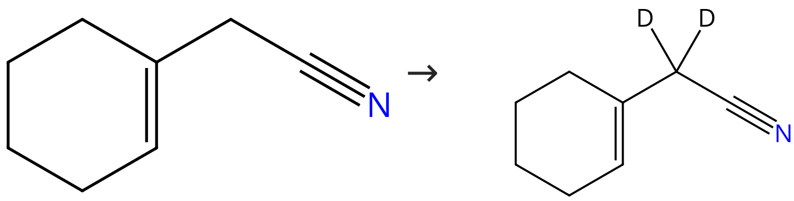
Experimental Protocols

Ruthenium Catalyzed Selective α- and α,β-Deuteration of Alcohols Using D_2O

By: Chatterjee, Basujit; et al

Organic Letters (2015), 17(19), 4794-4797.

Scheme 307 (1 Reaction) Steps: **1**



Suppliers (48)

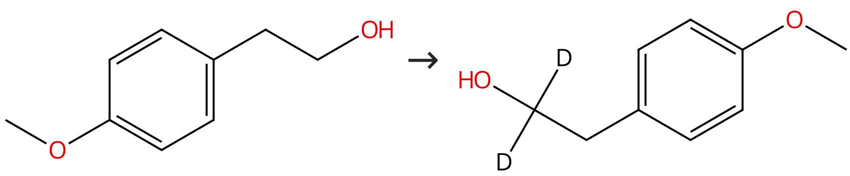
31-116-CAS-19660660	Steps: 1
1.1	**Reagents:** Potassium *tert*-butoxide, Water-d_2 **Catalysts:** (*OC*-6-52)-Carbonylchloro[2-(diphenylphosphino-κ*P*)-*N*-[2-(diphenylphosphino-κ*P*)ethyl]ethanamine-κ*N*]hydroruthenium; 24 h, 70 °C
Experimental Protocols	

Ruthenium-catalyzed selective α-deuteration of aliphatic nitriles using D_2O

By: Krishnakumar, Varadhan; et al

Chemical Communications (Cambridge, United Kingdom) (2018), 54(63), 8705-8708.

Scheme 308 (1 Reaction) Steps: **1**



Suppliers (100) Supplier (1)

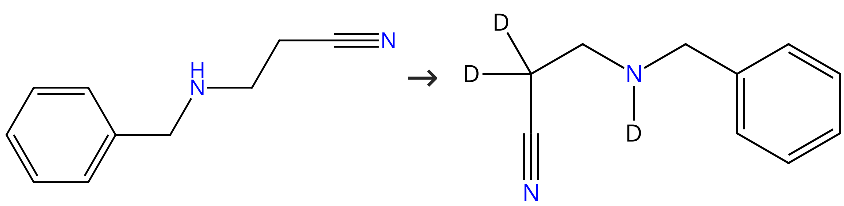
31-614-CAS-39042914	Steps: 1
1.1	**Reagents:** Potassium *tert*-butoxide, Water-d_2 **Catalysts:** (*OC*-6-52)-Carbonylchloro[2-(diphenylphosphino-κ*P*)-*N*-[2-(diphenylphosphino-κ*P*)ethyl]ethanamine-κ*N*]hydroruthenium; 5 h, 80 °C
Experimental Protocols	

Designing Cobalt(II) Complexes for Tandem Dehydrogenative Synthesis of Quinoline and Quinazoline Derivatives

By: Pal, Debjyoti; et al

Organic Letters (2024), 26(2), 514-518.

Scheme 309 (1 Reaction) Steps: **1**



Suppliers (58)

31-116-CAS-19660668	Steps: 1
1.1	**Reagents:** Potassium *tert*-butoxide, Water-d_2 **Catalysts:** (*OC*-6-52)-Carbonylchloro[2-(diphenylphosphino-κ*P*)-*N*-[2-(diphenylphosphino-κ*P*)ethyl]ethanamine-κ*N*]hydroruthenium; 24 h, 70 °C
Experimental Protocols	

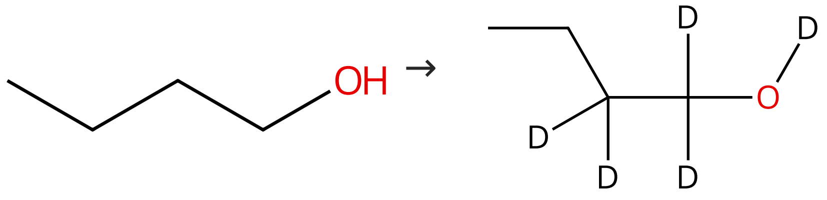
Ruthenium-catalyzed selective α-deuteration of aliphatic nitriles using D_2O

By: Krishnakumar, Varadhan; et al

Chemical Communications (Cambridge, United Kingdom) (2018), 54(63), 8705-8708.

Scheme 310 (1 Reaction)

Steps: **1**



Suppliers (215)

31-116-CAS-15666354

Steps: **1**

1.1 **Reagents:** Sodium hydroxide, Water-d_2
Catalysts: (*OC*-6-52)-Carbonylchloro[2-(diphenylphosphino-κ*P*)-*N*-[2-(diphenylphosphino-κ*P*)ethyl]ethanamine-κ*N*]hydroruthenium; 0.5 h, 120 °C

Experimental Protocols

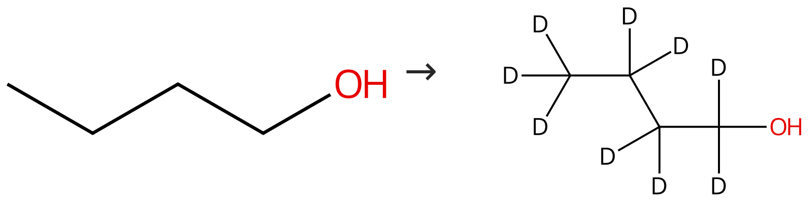
Efficient deuterium labelling of alcohols in deuterated water catalyzed by ruthenium pincer complexes

By: Zhang, Lei; et al

Catalysis Communications (2016), 84, 67-70.

Scheme 311 (1 Reaction)

Steps: **1**



Suppliers (215)

Suppliers (44)

31-614-CAS-38216502

Steps: **1**

1.1 **Reagents:** Hydrogen, Water-d_2
Catalysts: Ruthenium, *myo*-Inositol, 1,2,3,4,5,6-hexakis(dihydrogen phosphate), polymer with benzenamine; 5 h, 2 MPa, 100 °C

Experimental Protocols

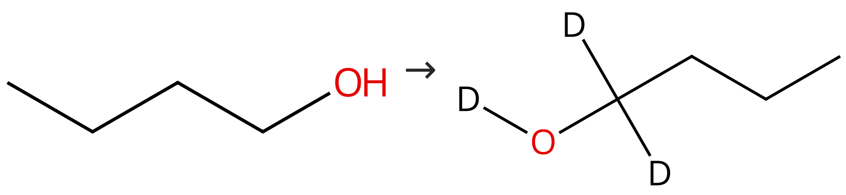
Phytic Acid-Modulated Ru Catalyzes Regioselective Deuteration of 1,6-Hexamethylenediamine

By: Shao, Fangjun; et al

ACS Catalysis (2023), 13(24), 15746-15757.

Scheme 312 (1 Reaction)

Steps: **1**



Suppliers (215)

31-116-CAS-15542641

Steps: **1**

1.1 **Reagents:** Potassium *tert*-butoxide
Catalysts: (*OC*-6-52)-Carbonylchloro[2-(diphenylphosphino-κ*P*)-*N*-[2-(diphenylphosphino-κ*P*)ethyl]ethanamine-κ*N*]hydroruthenium
Solvents: Water-d_2; 18 h, 80 °C

Experimental Protocols

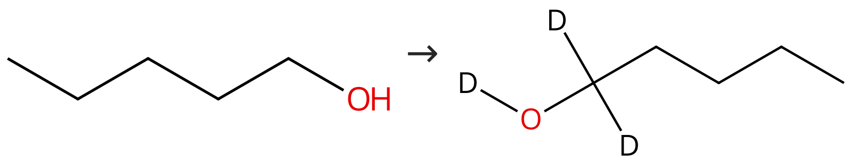
Ruthenium Catalyzed Selective α- and α,β-Deuteration of Alcohols Using D_2O

By: Chatterjee, Basujit; et al

Organic Letters (2015), 17(19), 4794-4797.

Scheme 313 (1 Reaction)

Steps: 1



Suppliers (86)

31-116-CAS-15596508

Steps: 1

1.1 **Reagents:** Sodium hydroxide, Water-*d*$_2$
Catalysts: (*OC*-6-52)-Carbonylchloro[2-(diphenylphosphino-κ*P*)-*N*-[2-(diphenylphosphino-κ*P*)ethyl]ethanamine-κ*N*]hydroruthenium; 0.5 h, 120 °C

Experimental Protocols

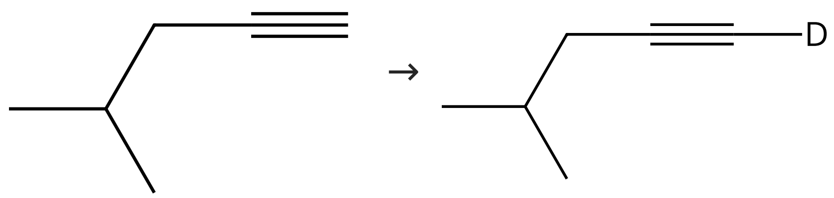
Efficient deuterium labelling of alcohols in deuterated water catalyzed by ruthenium pincer complexes

By: Zhang, Lei; et al

Catalysis Communications (2016), 84, 67-70.

Scheme 314 (1 Reaction)

Steps: 1



Suppliers (44)

31-116-CAS-95459

Steps: 1

1.1 **Reagents:** Potassium *tert*-butoxide, Water-*d*$_2$
Catalysts: (*OC*-6-52)-Carbonylchloro[2-(diphenylphosphino-κ*P*)-*N*-[2-(diphenylphosphino-κ*P*)ethyl]ethanamine-κ*N*]hydroruthenium
Solvents: 1,2-Dimethoxyethane; 24 h, 50 °C

Experimental Protocols

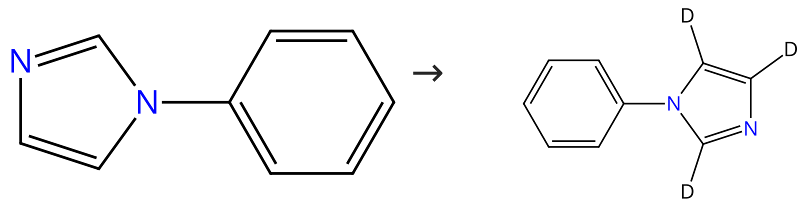
The ruthenium-catalysed selective synthesis of mono-deuterated terminal alkynes

By: Chatterjee, Basujit; et al

Chemical Communications (Cambridge, United Kingdom) (2016), 52(24), 4509-4512.

Scheme 315 (1 Reaction)

Steps: 1



Suppliers (83)

31-614-CAS-42727018

Steps: 1

1.1 **Reagents:** Pivalic acid, Cupric acetate, Water-*d*$_2$
Catalysts: Bis(dichloro(η^6-*p*-cymene)ruthenium)
Solvents: Ethanol; 15 h, 130 °C

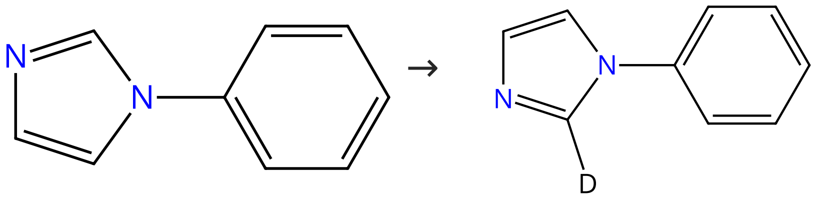
Experimental Protocols

Synthesis of π-Extended Imidazo[1,2-a]quinolines via Carboxylic Acid-Assisted Ru(II)-Catalyzed Dual C-H Activation and Alkyne Annulation

By: Hazarika, Nitumoni; et al

Organic Letters (2024), 26(49), 10447-10452.

Scheme 316 (1 Reaction)
Steps: 1



Suppliers (83)

31-614-CAS-42727006
Steps: 1

1.1 **Reagents:** Pivalic acid, Cupric acetate, Diphenylacetylene, Water-d_2
Catalysts: Bis(dichloro(η^6-*p*-cymene)ruthenium)
Solvents: Ethanol; 6 h, 130 °C

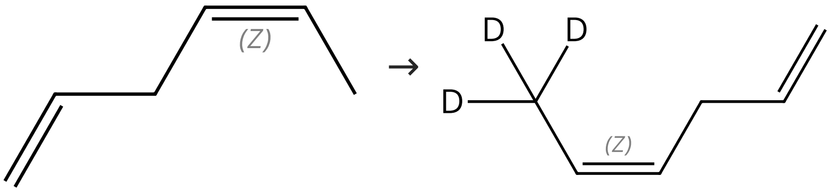
Experimental Protocols

Synthesis of π-Extended Imidazo[1,2-a]quinolines via Carboxylic Acid-Assisted Ru(II)-Catalyzed Dual C-H Activation and Alkyne Annulation

By: Hazarika, Nitumoni; et al

Organic Letters (2024), 26(49), 10447-10452.

Scheme 317 (2 Reactions)
Steps: 1



Double bond geometry shown
Double bond geometry shown

Suppliers (15)

31-116-CAS-17923459
Steps: 1

1.1 **Reagents:** Water-d_2
Catalysts: Ruthenium(1+), tris(acetonitrile)(η^5-2,4-cyclopentadien-1-yl)-, hexafluorophosphate(1-) (1:1)
Solvents: Acetone-d_6; 2 h, rt

Experimental Protocols

Site-Specific Deuteration of Polyunsaturated Alkenes

By: Smarun, A. V.; et al

Journal of Organic Chemistry (2017), 82(24), 13115-13120.

31-116-CAS-17923444
Steps: 1

1.1 **Reagents:** Water-d_2
Catalysts: Ruthenium(1+), tris(acetonitrile)(η^5-2,4-cyclopentadien-1-yl)-, hexafluorophosphate(1-) (1:1)
Solvents: Acetone; 2 h, rt

1.2 **Reagents:** Hydrochloric acid
Solvents: Water; 15 min, rt

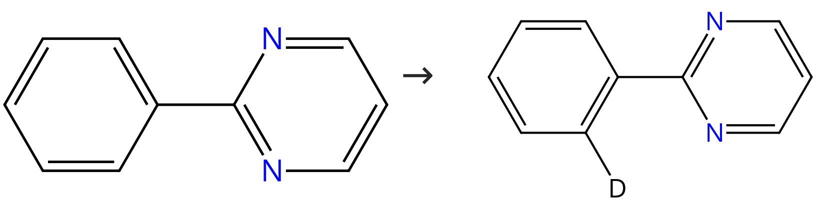
Experimental Protocols

Site-Specific Deuteration of Polyunsaturated Alkenes

By: Smarun, A. V.; et al

Journal of Organic Chemistry (2017), 82(24), 13115-13120.

Scheme 318 (1 Reaction)
Steps: 1



Suppliers (64)

31-116-CAS-19285134 Steps: **1**

1.1 **Reagents:** Sodium carbonate, Water-d_2
Catalysts: 1-Phenylcyclopentanecarboxylic acid, Triphenylphosphine, Bis(dichloro(η^6-*p*-cymene)ruthenium)
Solvents: Water; 5 min, 130 °C

Experimental Protocols

Microwave-Promoted ortho-C-H Bond (Hetero)arylation of Arylpyrimidines in Water Catalyzed by Ruthenium (II)-Carboxylate

By: Drev, Miha; et al

ChemCatChem (2018), 10(17), 3824-3832.

Scheme 319 (1 Reaction) Steps: **1**

Suppliers (91) Suppliers (94)

31-614-CAS-41194235 Steps: **1**

1.1 **Reagents:** Potassium acetate, Water-d_2
Catalysts: Lithium bromide, Bis(dichloro(η^6-*p*-cymene)ruthenium)
Solvents: 1,4-Dioxane; 2 h, 100 °C; 100 °C → rt

1.2 **Reagents:** Potassium carbonate
Solvents: *N*-Methyl-2-pyrrolidone; 2 h, 60 °C

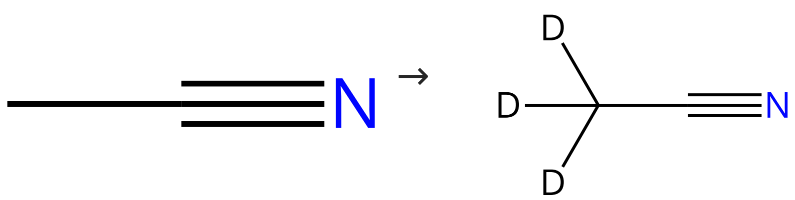
Experimental Protocols

Ligand-enabled ruthenium-catalyzed meta-C-H alkylation of (hetero)aromatic carboxylic acids

By: Luo, Xianglin; et al

Nature Communications (2024), 15(1), 5552.

Scheme 320 (1 Reaction) Steps: **1**



Suppliers (448) Suppliers (151)

31-116-CAS-19660647 Steps: **1**

1.1 **Reagents:** Potassium *tert*-butoxide, Water-d_2
Catalysts: (*OC*-6-52)-Carbonylchloro[2-(diphenylphosphino-κ*P*)-*N*-[2-(diphenylphosphino-κ*P*)ethyl]ethanamine-κ*N*]hydroruthenium; 24 h, 70 °C

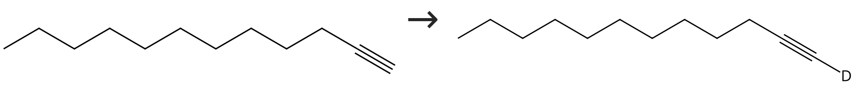
Experimental Protocols

Ruthenium-catalyzed selective α-deuteration of aliphatic nitriles using D_2O

By: Krishnakumar, Varadhan; et al

Chemical Communications (Cambridge, United Kingdom) (2018), 54(63), 8705-8708.

Scheme 321 (1 Reaction) Steps: **1**



Suppliers (72)

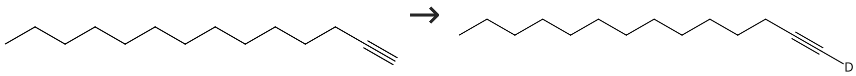
31-116-CAS-9549088	Steps: **1**
1.1	**Reagents:** Potassium *tert*-butoxide, Water-d_2 **Catalysts:** (*OC*-6-52)-Carbonylchloro[2-(diphenylphosphino-κ*P*)-*N*-[2-(diphenylphosphino-κ*P*)ethyl]ethanamine-κ*N*]hydroruthenium **Solvents:** 1,2-Dimethoxyethane; 24 h, 90 °C
Experimental Protocols	

The ruthenium-catalysed selective synthesis of mono-deuterated terminal alkynes

By: Chatterjee, Basujit; et al

Chemical Communications (Cambridge, United Kingdom) (2016), 52(24), 4509-4512.

Scheme 322 (1 Reaction) Steps: **1**



Suppliers (67)

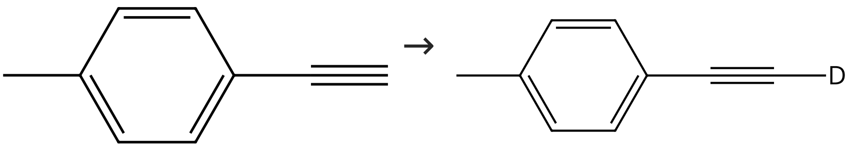
31-116-CAS-11059977	Steps: **1**
1.1	**Reagents:** Potassium *tert*-butoxide, Water-d_2 **Catalysts:** (*OC*-6-52)-Carbonylchloro[2-(diphenylphosphino-κ*P*)-*N*-[2-(diphenylphosphino-κ*P*)ethyl]ethanamine-κ*N*]hydroruthenium **Solvents:** 1,2-Dimethoxyethane; 24 h, 90 °C
Experimental Protocols	

The ruthenium-catalysed selective synthesis of mono-deuterated terminal alkynes

By: Chatterjee, Basujit; et al

Chemical Communications (Cambridge, United Kingdom) (2016), 52(24), 4509-4512.

Scheme 323 (1 Reaction) Steps: **1**



Suppliers (88) Supplier (1)

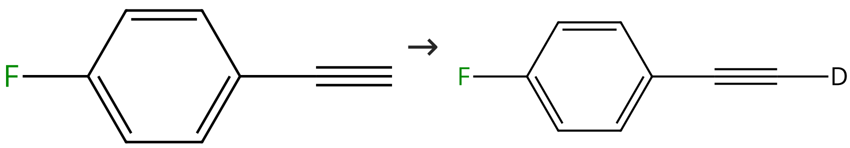
31-116-CAS-14487285	Steps: **1**
1.1	**Reagents:** Potassium *tert*-butoxide, Water-d_2 **Catalysts:** (*OC*-6-52)-Carbonylchloro[2-(diphenylphosphino-κ*P*)-*N*-[2-(diphenylphosphino-κ*P*)ethyl]ethanamine-κ*N*]hydroruthenium **Solvents:** 1,2-Dimethoxyethane; 16 h, 50 °C
Experimental Protocols	

The ruthenium-catalysed selective synthesis of mono-deuterated terminal alkynes

By: Chatterjee, Basujit; et al

Chemical Communications (Cambridge, United Kingdom) (2016), 52(24), 4509-4512.

Scheme 324 (1 Reaction) Steps: **1**



Suppliers (86)

31-116-CAS-10877240 Steps: 1

1.1 **Reagents:** Potassium *tert*-butoxide, Water-d_2
Catalysts: (*OC*-6-52)-Carbonylchloro[2-(diphenylphosphino-κ*P*)-*N*-[2-(diphenylphosphino-κ*P*)ethyl]ethanamine-κ*N*]hydroruthenium
Solvents: 1,2-Dimethoxyethane; 16 h, 50 °C

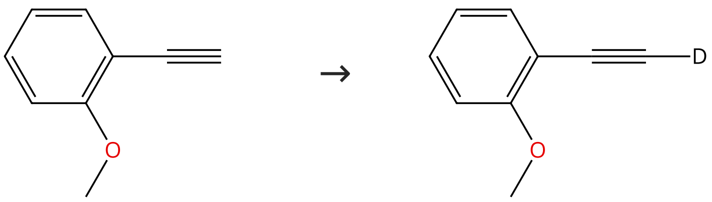
Experimental Protocols

The ruthenium-catalysed selective synthesis of mono-deuterated terminal alkynes

By: Chatterjee, Basujit; et al

Chemical Communications (Cambridge, United Kingdom) (2016), 52(24), 4509-4512.

Scheme 325 (1 Reaction) Steps: 1



Suppliers (78)

31-116-CAS-1046211 Steps: 1

1.1 **Reagents:** Potassium *tert*-butoxide, Water-d_2
Catalysts: (*OC*-6-52)-Carbonylchloro[2-(diphenylphosphino-κ*P*)-*N*-[2-(diphenylphosphino-κ*P*)ethyl]ethanamine-κ*N*]hydroruthenium
Solvents: 1,2-Dimethoxyethane; 16 h, 50 °C

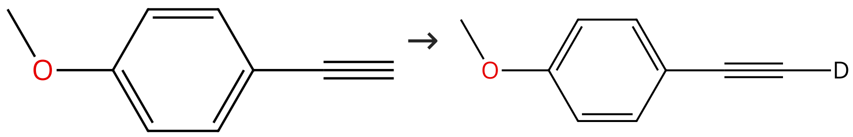
Experimental Protocols

The ruthenium-catalysed selective synthesis of mono-deuterated terminal alkynes

By: Chatterjee, Basujit; et al

Chemical Communications (Cambridge, United Kingdom) (2016), 52(24), 4509-4512.

Scheme 326 (1 Reaction) Steps: 1



Suppliers (109)

Supplier (1)

31-116-CAS-8426455 Steps: 1

1.1 **Reagents:** Potassium *tert*-butoxide, Water-d_2
Catalysts: (*OC*-6-52)-Carbonylchloro[2-(diphenylphosphino-κ*P*)-*N*-[2-(diphenylphosphino-κ*P*)ethyl]ethanamine-κ*N*]hydroruthenium
Solvents: 1,2-Dimethoxyethane; 16 h, 50 °C

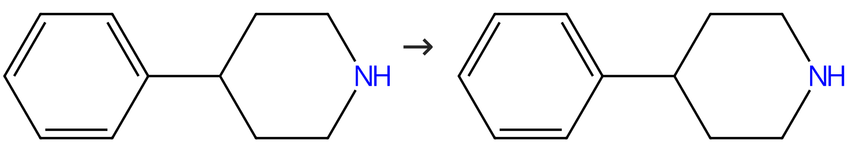
Experimental Protocols

The ruthenium-catalysed selective synthesis of mono-deuterated terminal alkynes

By: Chatterjee, Basujit; et al

Chemical Communications (Cambridge, United Kingdom) (2016), 52(24), 4509-4512.

Scheme 327 (3 Reactions) Steps: 1



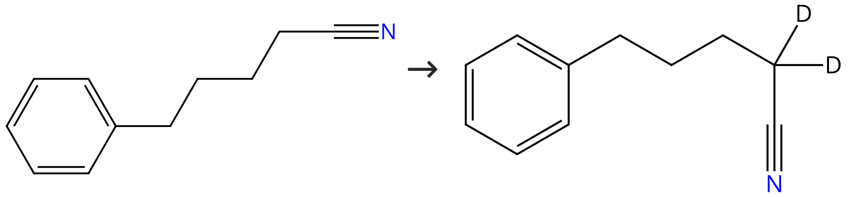
Suppliers (102)

31-614-CAS-29974941	Steps: **1**	**One-step exchange-labeling of piperidines, piperazines and dialkylamines with deuterium oxide: catalysis by various ruthenium complexes**
1.1	**Reagents:** Water-*d*$_2$ **Catalysts:** Hexacarbonyldi-μ-chlorodichlorodiruthenium **Solvents:** Dimethyl sulfoxide; 3 h, 150 °C	By: Alexakis, Efstathios; et al Tetrahedron Letters (2005), 46(25), 4291-4293.

31-614-CAS-25846257	Steps: **1**	**One-step exchange-labeling of piperidines, piperazines and dialkylamines with deuterium oxide: catalysis by various ruthenium complexes**
1.1	**Reagents:** Water-*d*$_2$ **Catalysts:** Bis(η^6-benzene)di-μ-chlorodichlorodiruthenium **Solvents:** Dimethyl sulfoxide; 3 h, 150 °C	By: Alexakis, Efstathios; et al Tetrahedron Letters (2005), 46(25), 4291-4293.

31-614-CAS-27582195	Steps: **1**	**One-step exchange-labeling of piperidines, piperazines and dialkylamines with deuterium oxide: catalysis by various ruthenium complexes**
1.1	**Reagents:** Water-*d*$_2$ **Catalysts:** Dichlorotris(triphenylphosphine)ruthenium **Solvents:** Dimethyl sulfoxide; 3 h, 150 °C	By: Alexakis, Efstathios; et al Tetrahedron Letters (2005), 46(25), 4291-4293.

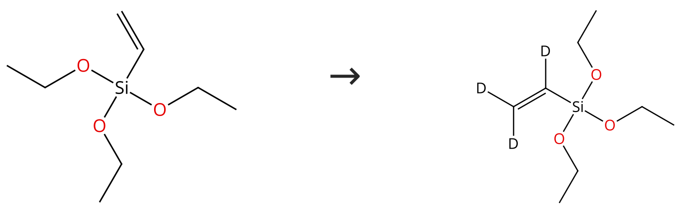
Scheme 328 (1 Reaction) Steps: **1**



Suppliers (14)

31-116-CAS-19660654	Steps: **1**	**Ruthenium-catalyzed selective α-deuteration of aliphatic nitriles using D_2O**
1.1	**Reagents:** Potassium *tert*-butoxide, Water-*d*$_2$ **Catalysts:** (*OC*-6-52)-Carbonylchloro[2-(diphenylphosphino-κ*P*)-*N*-[2-(diphenylphosphino-κ*P*)ethyl]ethanamine-κ*N*]hydroruthenium; 24 h, 70 °C	By: Krishnakumar, Varadhan; et al Chemical Communications (Cambridge, United Kingdom) (2018), 54(63), 8705-8708.
Experimental Protocols		

Scheme 329 (1 Reaction) Steps: **1**

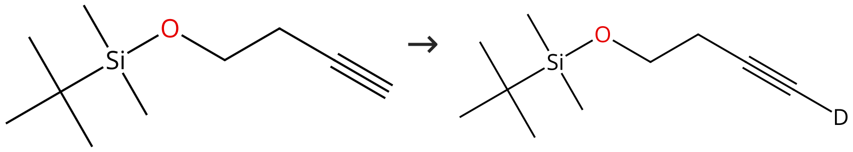


Suppliers (54)

31-116-CAS-10643416	Steps: **1**	**Hydrogen/Deuterium Exchange Reactions of Olefins with Deuterium Oxide Mediated by the Carbonylchlorohydridotris(triphenylphosphine)ruthenium(II) Complex**
1.1	**Reagents:** Water-*d*$_2$ **Catalysts:** (*OC*-6-34)-Carbonylchlorohydrotris(triphenylphosphine)ruthenium **Solvents:** 1,4-Dioxane; 3 h, 100 °C	By: Tse, Sunny Kai San; et al Advanced Synthesis & Catalysis (2010), 352(9), 1512-1522.
Experimental Protocols		

Scheme 330 (1 Reaction)

Steps: **1**



Suppliers (66)

31-116-CAS-14075363

Steps: **1**

1.1 **Reagents:** Potassium *tert*-butoxide, Water-d_2
Catalysts: (*OC*-6-52)-Carbonylchloro[2-(diphenylphosphino-κ*P*)-*N*-[2-(diphenylphosphino-κ*P*)ethyl]ethanamine-κ*N*]hydroruthenium
Solvents: 1,2-Dimethoxyethane; 24 h, 75 °C

Experimental Protocols

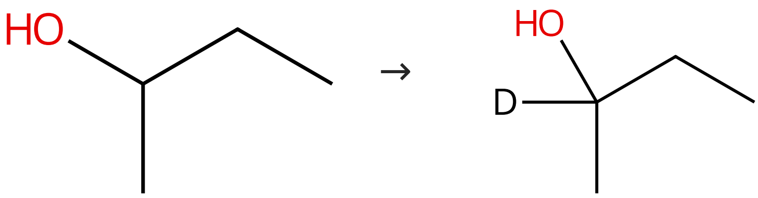
The ruthenium-catalysed selective synthesis of mono-deuterated terminal alkynes

By: Chatterjee, Basujit; et al

Chemical Communications (Cambridge, United Kingdom) (2016), 52(24), 4509-4512.

Scheme 331 (1 Reaction)

Steps: **1**



Suppliers (90)

31-614-CAS-38216508

Steps: **1**

1.1 **Reagents:** Hydrogen, Water-d_2
Catalysts: Ruthenium, *myo*-Inositol, 1,2,3,4,5,6-hexakis (dihydrogen phosphate), polymer with benzenamine; 5 h, 2 M Pa, 100 °C

Experimental Protocols

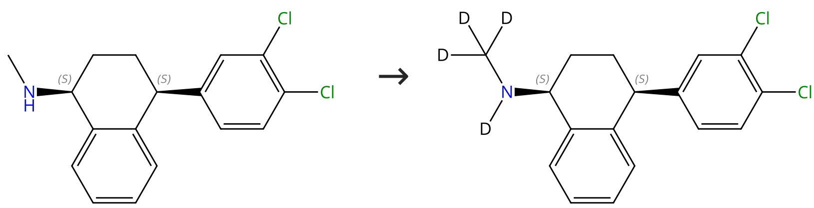
Phytic Acid-Modulated Ru Catalyzes Regioselective Deuteration of 1,6-Hexamethylenediamine

By: Shao, Fangjun; et al

ACS Catalysis (2023), 13(24), 15746-15757.

Scheme 332 (1 Reaction)

Steps: **1**



Absolute stereochemistry shown, Rotation (+)

Absolute stereochemistry shown

Suppliers (37)

31-116-CAS-16606125

Steps: **1**

1.1 **Reagents:** Potassium hydroxide
Solvents: Water-d_2; 30 min, rt

1.2 **Catalysts:** Ruthenium, μ-chlorodichloro-μ-hydrobis[(1,2,3,4,5,6-η)-1-methyl-4-(1-methylethyl)benzene]di-, (*Ru-Ru*)
Solvents: 1,4-Dioxane; 24 h, 150 °C

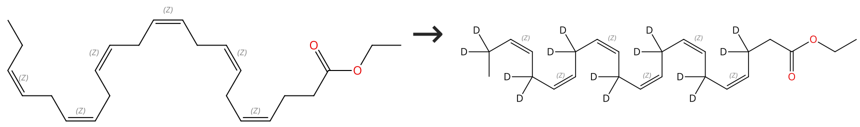
Experimental Protocols

Selective α-Deuteration of Amines and Amino Acids Using D_2O

By: Chatterjee, Basujit; et al

Organic Letters (2016), 18(22), 5892-5895.

Scheme 333 (1 Reaction) Steps: 1



Double bond geometry shown

Double bond geometry shown

Suppliers (61)

31-116-CAS-17923447 Steps: 1

1.1 **Reagents:** Water-d_2
Catalysts: Ruthenium(1+), tris(acetonitrile)(η^5-2,4-cyclopentadien-1-yl)-, hexafluorophosphate(1-) (1:1)
Solvents: Acetone-d_6; 18 h, rt

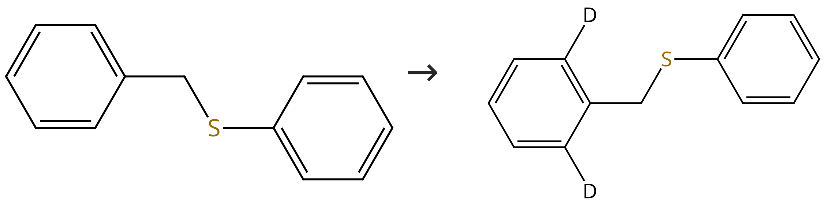
Experimental Protocols

Site-Specific Deuteration of Polyunsaturated Alkenes

By: Smarun, A. V.; et al

Journal of Organic Chemistry (2017), 82(24), 13115-13120.

Scheme 334 (1 Reaction) Steps: 1



Suppliers (79)

31-614-CAS-41211334 Steps: 1

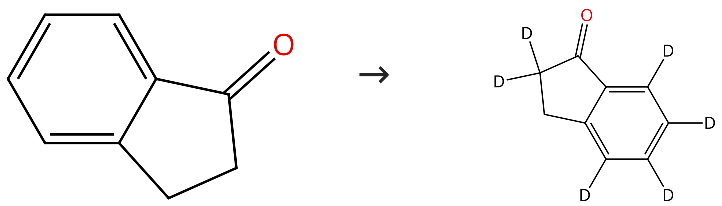
1.1 **Catalysts:** Silver hexafluoroantimonate, Bis(η^6-benzene)di-μ-chlorodichlorodiruthenium
Solvents: 1,2-Dichloroethane, Water-d_2; 4 h, 100 °C

Ru-Mediated and Sulfur-Directed ortho -C-H Activation of Benzyl Thioethers with Internal Alkynes and Selective Hydrothiolation of Acetylene Dicarboxylates

By: Kumari, Sangeeta; et al

Synthesis (2024), 56(23), 3575-3586.

Scheme 335 (1 Reaction) Steps: 1



Suppliers (116)

31-116-CAS-10271993 Steps: 1

1.1 **Reagents:** Water-d_2
Catalysts: Stereoisomer of dihydro[(1,2,3,3a,7a-η)-1-phenyl-1*H*-inden-1-yl](triethylsilyl)(triphenylphosphine)ruthenium
Solvents: Toluene; 16 h, 110 atm

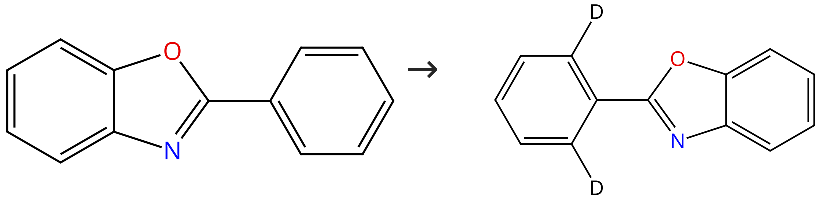
Experimental Protocols

Regioselective ruthenium catalysed H-D exchange using D_2O as the deuterium source

By: Piola, Lorenzo; et al

Organic & Biomolecular Chemistry (2014), 12(43), 8683-8688.

Scheme 336 (1 Reaction) Steps: **1**



Suppliers (75)

31-116-CAS-22952384 Steps: **1**

1.1 **Reagents:** Cupric acetate, Water-*d*$_2$
Catalysts: Silver tetrafluoroborate, Bis(dichloro(η^6-*p*-cymene) ruthenium)
Solvents: 1,2-Dichloroethane; 12 h, 85 °C

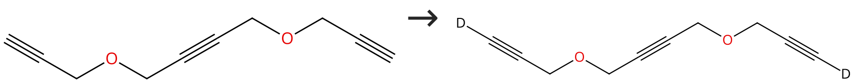
Experimental Protocols

Ruthenium (II) Catalyzed C(sp^2)-H Bond Alkenylation of 2-Arylbenzo[d]oxazole and 2-Arylbenzo[d]thiazole with Unactivated Olefins

By: Pipaliya, Bhavin V.; et al

Chemistry - An Asian Journal (2021), 16(1), 87-96.

Scheme 337 (1 Reaction) Steps: **1**



Suppliers (4)

31-116-CAS-4277680 Steps: **1**

1.1 **Reagents:** Potassium *tert*-butoxide, Water-*d*$_2$
Catalysts: (*OC*-6-52)-Carbonylchloro[2-(diphenylphosphino-κ*P*)-*N*-[2-(diphenylphosphino-κ*P*)ethyl]ethanamine-κ*N*]hydroruthenium
Solvents: 1,2-Dimethoxyethane; 24 h, 90 °C

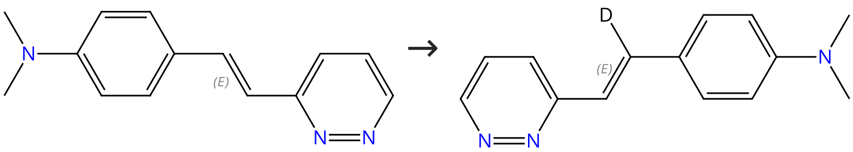
Experimental Protocols

The ruthenium-catalysed selective synthesis of mono-deuterated terminal alkynes

By: Chatterjee, Basujit; et al

Chemical Communications (Cambridge, United Kingdom) (2016), 52(24), 4509-4512.

Scheme 338 (1 Reaction) Steps: **1**



Double bond geometry shown

Double bond geometry shown

Suppliers (2)

31-116-CAS-18440858 Steps: **1**

1.1 **Reagents:** Potassium carbonate
Catalysts: Potassium acetate, Bis(dichloro(η^6-*p*-cymene) ruthenium)
Solvents: *N*-Methyl-2-pyrrolidone, Water-*d*$_2$; 3 h, 150 °C; 150 °C → rt

1.2 **Reagents:** Water; rt

Experimental Protocols

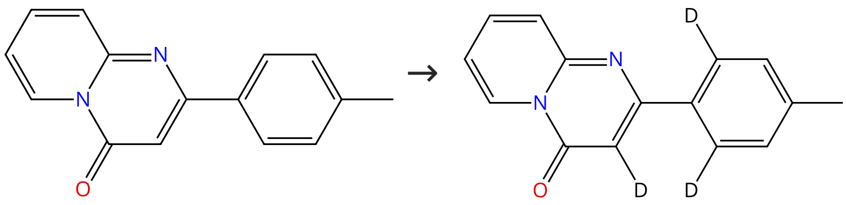
Ruthenium(II)-Catalyzed C-H (Hetero)Arylation of Alkenylic 1,n-Diazines (n = 2, 3, and 4): Scope, Mechanism, and Application in Tandem Hydrogenations

By: Gramage-Doria, Rafael; et al

Journal of Organic Chemistry (2018), 83(3), 1462-1477.

Scheme 339 (1 Reaction)

Steps: **1**



31-614-CAS-43162996

Steps: **1**

1.1 **Reagents:** Water-d_2
Catalysts: Bis(dichloro(η^6-*p*-cymene)ruthenium)
Solvents: 2,2,2-Trifluoroethanol; 12 h, 100 °C

Experimental Protocols

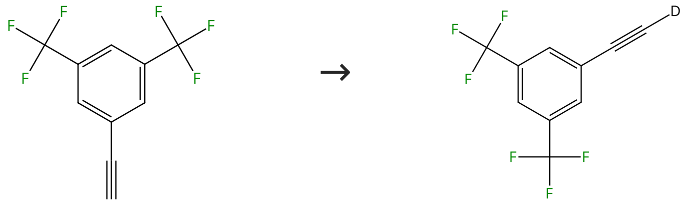
Ruthenium(II)-Catalyzed C-H/C-H (4+2) Annulation of 2-Aryl-N-heterocycles with Vinylene Carbonate

By: Nipate, Dhananjay S.; et al

Chemistry - An Asian Journal (2025), 20(3), e202401104.

Scheme 340 (1 Reaction)

Steps: **1**



31-116-CAS-11697796

Steps: **1**

1.1 **Reagents:** Potassium *tert*-butoxide, Water-d_2
Catalysts: (*OC*-6-52)-Carbonylchloro[2-(diphenylphosphino-κ*P*)-*N*-[2-(diphenylphosphino-κ*P*)ethyl]ethanamine-κ*N*]hydroruthenium
Solvents: 1,2-Dimethoxyethane; 16 h, 50 °C

Experimental Protocols

The ruthenium-catalysed selective synthesis of mono-deuterated terminal alkynes

By: Chatterjee, Basujit; et al

Chemical Communications (Cambridge, United Kingdom) (2016), 52(24), 4509-4512.

Scheme 341 (1 Reaction)

Steps: **1**

31-116-CAS-20858332

Steps: **1**

1.1 **Reagents:** Water-d_2
Catalysts: [(1,2,3,4,5,6-η)-1-Methyl-4-(1-methylethyl)benzene](tricyclo[3.3.1.1^{3,7}]decane-1-carboxylato-κ*O*)(tricyclo[3.3.1.1^{3,7}]decane-1-carboxylato-κ*O*,κ*O'*)ruthenium
Solvents: 1,4-Dioxane; 16 h, 100 °C

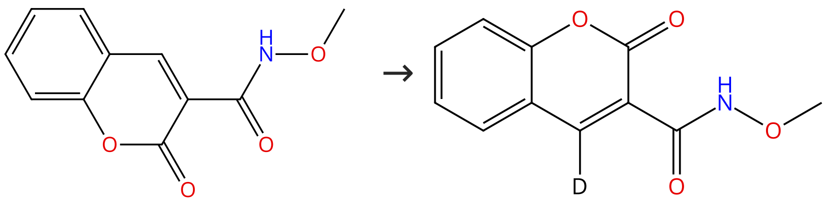
Experimental Protocols

Ruthenium(II)-Catalyzed Hydrogen Isotope Exchange of Pharmaceutical Drugs by C-H Deuteration and C-H Tritiation

By: Mueller, Valentin; et al

ChemCatChem (2020), 12(1), 100-104.

Scheme 342 (1 Reaction)
Steps: 1



Suppliers (3)

31-614-CAS-36848575
Steps: 1

1.1 **Reagents:** Zinc acetate, Water-d_2
Catalysts: Silver hexafluoroantimonate, Bis(dichloro(η^6-*p*-cymene)ruthenium)
Solvents: 1,2-Dichloroethane; 12 h, 90 °C

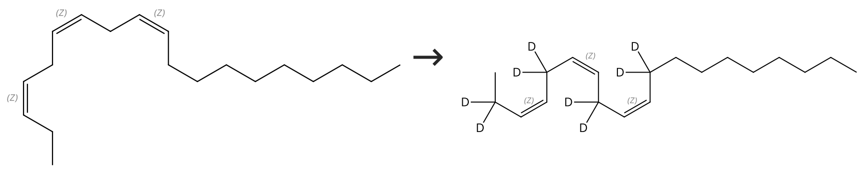
Experimental Protocols

A Ru(II)-catalyzed C-H activation and annulation cascade for the construction of highly coumarin-fused benzo[a]quinolizin-4-ones and pyridin-2-ones

By: Wang, Jing; et al

Organic Chemistry Frontiers (2023), 10(11), 2680-2687.

Scheme 343 (1 Reaction)
Steps: 1



Double bond geometry shown

Double bond geometry shown

Suppliers (8)

31-116-CAS-17923454
Steps: 1

1.1 **Reagents:** Water-d_2
Catalysts: Ruthenium(1+), tris(acetonitrile)(η^5-2,4-cyclopentadien-1-yl)-, hexafluorophosphate(1-) (1:1)
Solvents: Acetone-d_6; 18 h, rt

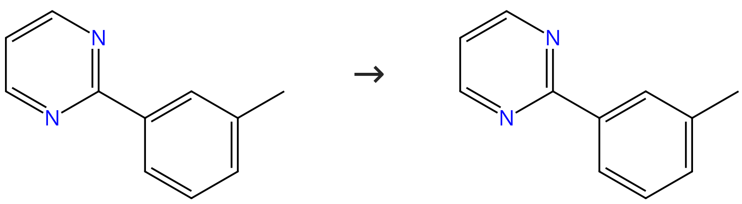
Experimental Protocols

Site-Specific Deuteration of Polyunsaturated Alkenes

By: Smarun, A. V.; et al

Journal of Organic Chemistry (2017), 82(24), 13115-13120.

Scheme 344 (2 Reactions)
Steps: 1



Suppliers (12)

31-614-CAS-25366715
Steps: 1

1.1 **Reagents:** Sodium carbonate, Water-d_2
Catalysts: 1-Phenylcyclopentanecarboxylic acid, Triphenylphosphine, Bis(dichloro(η^6-*p*-cymene)ruthenium)
Solvents: Water; 0.5 h, 180 °C

Experimental Protocols

Microwave-Promoted ortho-C-H Bond (Hetero)arylation of Arylpyrimidines in Water Catalyzed by Ruthenium(II)-Carboxylate

By: Drev, Miha; et al

ChemCatChem (2018), 10(17), 3824-3832.

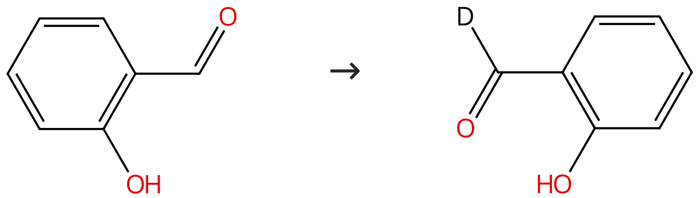
31-614-CAS-25881017	Steps: **1**
1.1	**Reagents:** Sodium carbonate, Water-d_2 **Catalysts:** 1-Phenylcyclopentanecarboxylic acid, Triphenylphosphine, Bis(dichloro(η[6]-*p*-cymene)ruthenium) **Solvents:** Water; 5 min, 130 °C
Experimental Protocols	

Microwave-Promoted ortho-C-H Bond (Hetero)arylation of Arylpyrimidines in Water Catalyzed by Ruthenium(II)-Carboxylate

By: Drev, Miha; et al

ChemCatChem (2018), 10(17), 3824-3832.

Scheme 345 (1 Reaction) Steps: **1**



Suppliers (101)

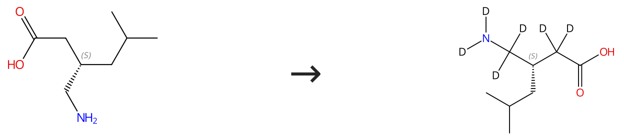
31-614-CAS-33446188	Steps: **1**
1.1	**Reagents:** Lithium acetate, Water-d_2 **Catalysts:** Bis(dichloro(η[6]-*p*-cymene)ruthenium) **Solvents:** 1,1,1,3,3,3-Hexafluoro-2-propanol; 1 h, 80 °C
Experimental Protocols	

Ru(II)-Catalyzed Decarbonylative Alkylation and Annulations of Benzaldehydes with Iodonium Ylides under Chelation Assistance

By: Li, Xiang; et al

Organic Letters (2022), 24(29), 5281-5286.

Scheme 346 (1 Reaction) Steps: **1**



• K

Absolute stereochemistry shown, Rotation (+)

• K

Absolute stereochemistry shown

Suppliers (3)

31-116-CAS-16606126	Steps: **1**
1.1	**Reagents:** Potassium hydroxide **Solvents:** Water-d_2; 30 min, rt
1.2	**Catalysts:** Ruthenium, μ-chlorodichloro-μ-hydrobis[(1,2,3,4,5,6-η)-1-methyl-4-(1-methylethyl)benzene]di-, (*Ru-Ru*) **Solvents:** 1,4-Dioxane; 24 h, 150 °C
Experimental Protocols	

Selective α-Deuteration of Amines and Amino Acids Using D_2O

By: Chatterjee, Basujit; et al

Organic Letters (2016), 18(22), 5892-5895.

Scheme 347 (1 Reaction) Steps: **1**

Suppliers (94)

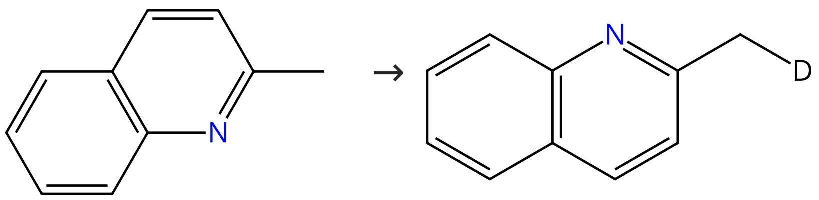
31-116-CAS-19098186	Steps: 1
1.1	**Solvents:** Tetrahydrofuran; 5 - 10 min, rt
1.2	**Reagents:** Water-d_2, Silver hexafluoroantimonate **Catalysts:** Cupric acetate, Bis(dichloro(η^6-*p*-cymene) ruthenium); rt → 110 °C; 18 h, 110 °C; 110 °C → rt
Experimental Protocols	

Ruthenium-Catalyzed C-H Functionalization of Benzoic Acids with Allyl Alcohols: A Controlled Reactivity Switch between C-H Alkenylation and C-H Alkylation Pathways

By: Kumar, Gangam Srikanth; et al

Organic Letters (2018), 20(16), 4934-4937.

Scheme 348 (1 Reaction) Steps: **1**



Suppliers (79)

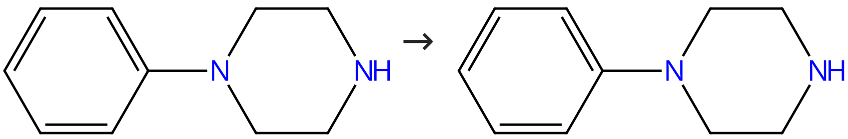
31-614-CAS-33724525	Steps: 1
1.1	**Reagents:** Potassium *tert*-butoxide, Water-d_2 **Catalysts:** Ruthenium, trichloro[4-(3,5-dimethyl-1*H*-pyrazol-1-yl-κN^2)-6-(4-methylphenyl)-*N*-(2-pyridinyl-κ*N*)-1,3,5-triazin-2-amine-κN^3]-, (*OC*-6-31)- **Solvents:** Toluene; 12 h, 120 °C

Ruthenium pincer complex catalyzed efficient synthesis of quinoline, 2-styrylquinoline and quinazoline derivatives via acceptorless dehydrogenative coupling reactions

By: Bhattacharyya, Dipanjan; et al

Catalysis Science & Technology (2022), 12(18), 5695-5702.

Scheme 349 (3 Reactions) Steps: **1**



Suppliers (86)

31-614-CAS-27563511	Steps: 1
1.1	**Reagents:** Water-d_2 **Catalysts:** Hexacarbonyldi-μ-chlorodichlorodiruthenium **Solvents:** Dimethyl sulfoxide; 3 h, 150 °C

One-step exchange-labeling of piperidines, piperazines and dialkylamines with deuterium oxide: catalysis by various ruthenium complexes

By: Alexakis, Efstathios; et al

Tetrahedron Letters (2005), 46(25), 4291-4293.

31-614-CAS-31039430	Steps: 1
1.1	**Reagents:** Water-d_2 **Catalysts:** Dichlorotris(triphenylphosphine)ruthenium **Solvents:** Dimethyl sulfoxide; 3 h, 150 °C

One-step exchange-labeling of piperidines, piperazines and dialkylamines with deuterium oxide: catalysis by various ruthenium complexes

By: Alexakis, Efstathios; et al

Tetrahedron Letters (2005), 46(25), 4291-4293.

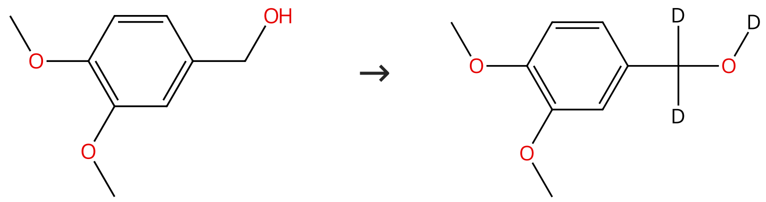
31-614-CAS-29297908	Steps: 1
1.1	**Reagents:** Water-d_2 **Catalysts:** Bis(η^6-benzene)di-μ-chlorodichlorodiruthenium **Solvents:** Dimethyl sulfoxide; 3 h, 150 °C

One-step exchange-labeling of piperidines, piperazines and dialkylamines with deuterium oxide: catalysis by various ruthenium complexes

By: Alexakis, Efstathios; et al

Tetrahedron Letters (2005), 46(25), 4291-4293.

Scheme 350 (1 Reaction) Steps: **1**



Suppliers (106)

31-116-CAS-20412443 Steps: **1**

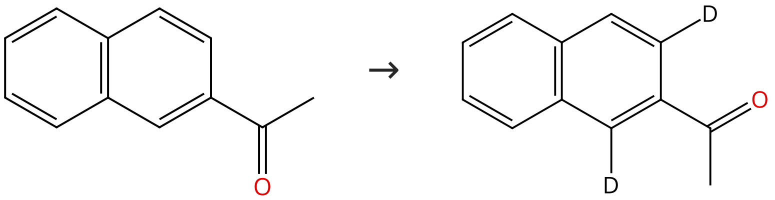
1.1 **Reagents:** Potassium *tert*-butoxide, Water-d_2
Catalysts: (*OC*-6-52)-Carbonylchloro[2-(diphenylphosphino-κ*P*)-*N*-[2-(diphenylphosphino-κ*P*)ethyl]ethanamine-κ*N*]hydroruthenium; 18 h, 130 °C

Nickel(II)-catalyzed direct olefination of benzyl alcohols with sulfones with the liberation of H_2

By: Landge, Vinod G.; et al

Chemical Communications (Cambridge, United Kingdom) (2019), 55(43), 6130-6133.

Scheme 351 (1 Reaction) Steps: **1**



Suppliers (95)

31-614-CAS-26477057 Steps: **1**

1.1 **Reagents:** Water-d_2
Catalysts: 4-Chlorobenzoic acid, Silver hexafluoroantimonate, Bis(dichloro(η^6-*p*-cymene)ruthenium), 2-Methyl-3-(trifluoromethyl)aniline
Solvents: 1,2-Dichloroethane; rt → 120 °C; 16 h, 120 °C

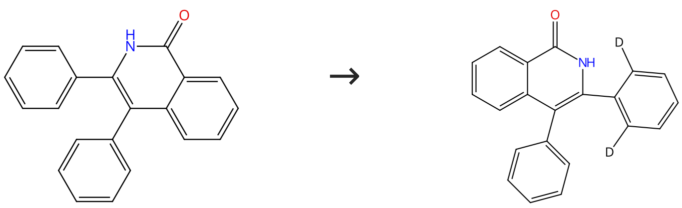
Experimental Protocols

Ruthenium-Catalyzed Deuteration of Aromatic Carbonyl Compounds with a Catalytic Transient Directing Group

By: Kopf, Sara; et al

Chemistry - A European Journal (2021), 27(38), 9768-9773.

Scheme 352 (1 Reaction) Steps: **1**



Suppliers (3)

31-614-CAS-39267424 Steps: **1**

1.1 **Reagents:** Potassium persulfate, Water-d_2
Catalysts: Bis(dichloro(η^6-*p*-cymene)ruthenium)
Solvents: *o*-Xylene; 12 h, 130 °C

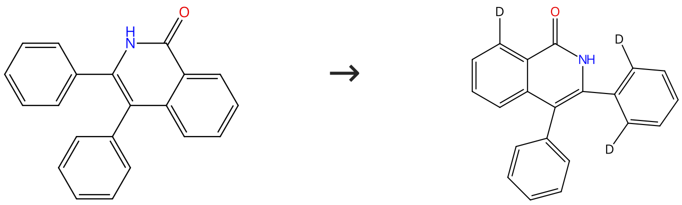
Experimental Protocols

Ru(II) Catalyzed Oxidative Dehydrogenative Annulation and Spirocyclization of Isoquinolones with N-Substituted Maleimides

By: Seal, Kaushik; et al

Advanced Synthesis & Catalysis (2024), 366(8), 1788-1808.

Scheme 353 (1 Reaction) Steps: **1**



Suppliers (3)

31-614-CAS-39267425 Steps: **1**

1.1 **Reagents:** Cupric acetate, Acetonitrile-*d*$_3$, Water-*d*$_2$
Catalysts: Bis(dichloro(η^6-*p*-cymene)ruthenium)
Solvents: Acetonitrile; 16 h, 110 °C

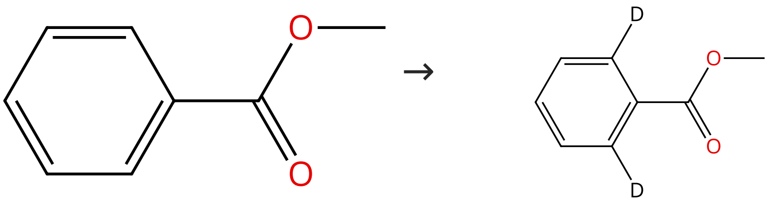
Experimental Protocols

Ru(II) Catalyzed Oxidative Dehydrogenative Annulation and Spirocyclization of Isoquinolones with N-Substituted Maleimides

By: Seal, Kaushik; et al

Advanced Synthesis & Catalysis (2024), 366(8), 1788-1808.

Scheme 354 (1 Reaction) Steps: **1**



Suppliers (92)

31-116-CAS-10319657 Steps: **1**

1.1 **Reagents:** Water-*d*$_2$
Catalysts: Stereoisomer of dihydro[(1,2,3,3a,7a-η)-1-phenyl-1*H*-inden-1-yl](triethylsilyl)(triphenylphosphine)ruthenium
Solvents: Toluene; 16 h, 110 atm

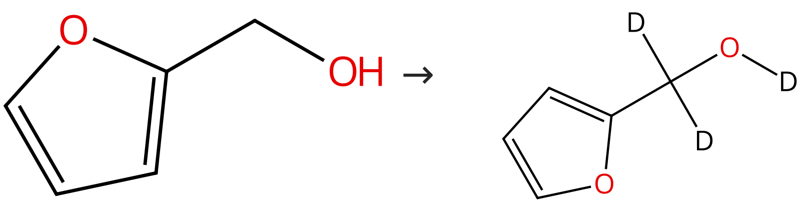
Experimental Protocols

Regioselective ruthenium catalysed H-D exchange using D_2O as the deuterium source

By: Piola, Lorenzo; et al

Organic & Biomolecular Chemistry (2014), 12(43), 8683-8688.

Scheme 355 (1 Reaction) Steps: **1**



Suppliers (76)

31-116-CAS-2310798 Steps: **1**

1.1 **Reagents:** Potassium *tert*-butoxide
Catalysts: (*OC*-6-52)-Carbonylchloro[2-(diphenylphosphino-κ*P*)-*N*-[2-(diphenylphosphino-κ*P*)ethyl]ethanamine-κ*N*]hydroruthenium
Solvents: Water-*d*$_2$; 18 h, 80 °C

Experimental Protocols

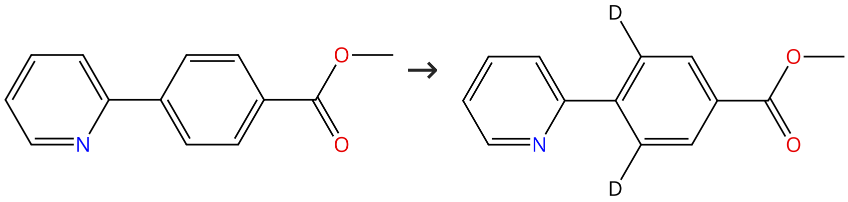
Ruthenium Catalyzed Selective α- and α,β-Deuteration of Alcohols Using D_2O

By: Chatterjee, Basujit; et al

Organic Letters (2015), 17(19), 4794-4797.

Scheme 356 (1 Reaction)

Steps: **1**



Suppliers (43)

31-116-CAS-13431865

Steps: **1**

1.1 **Reagents:** Water-*d*$_2$
Catalysts: Stereoisomer of dihydro[(1,2,3,3a,7a-η)-1-phenyl-1*H*-inden-1-yl](triethylsilyl)(triphenylphosphine)ruthenium
Solvents: Toluene; 16 h, 110 °C

Experimental Protocols

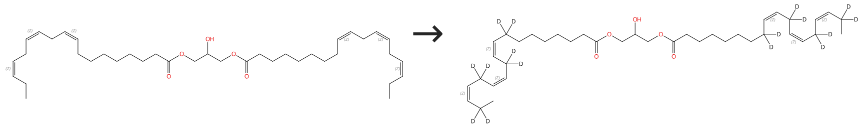
Regioselective ruthenium catalysed H-D exchange using D_2O as the deuterium source

By: Piola, Lorenzo; et al

Organic & Biomolecular Chemistry (2014), 12(43), 8683-8688.

Scheme 357 (1 Reaction)

Steps: **1**



Double bond geometry shown

Double bond geometry shown

Suppliers (14)

31-116-CAS-17923452

Steps: **1**

1.1 **Reagents:** Water-*d*$_2$
Catalysts: Ruthenium(1+), tris(acetonitrile)(η^5-2,4-cyclopentadien-1-yl)-, hexafluorophosphate(1-) (1:1)
Solvents: Acetone-d$_6$; 4 h, rt

Experimental Protocols

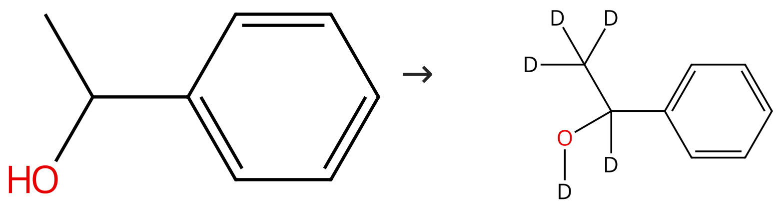
Site-Specific Deuteration of Polyunsaturated Alkenes

By: Smarun, A. V.; et al

Journal of Organic Chemistry (2017), 82(24), 13115-13120.

Scheme 358 (1 Reaction)

Steps: **1**



Suppliers (75)

Supplier (1)

31-116-CAS-9582687

Steps: **1**

1.1 **Reagents:** Potassium *tert*-butoxide
Catalysts: (*OC*-6-52)-Carbonylchloro[2-(diphenylphosphino-κ*P*)-*N*-[2-(diphenylphosphino-κ*P*)ethyl]ethanamine-κ*N*]hydroruthenium
Solvents: Water-*d*$_2$; 12 h, 80 °C

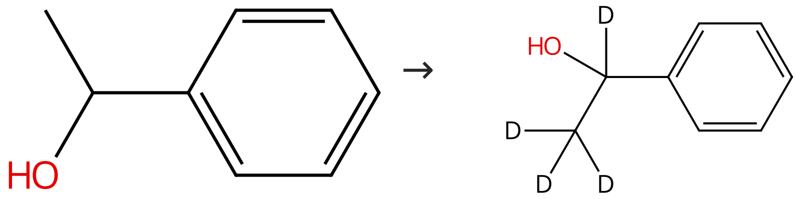
Experimental Protocols

Ruthenium Catalyzed Selective α- and α,β-Deuteration of Alcohols Using D_2O

By: Chatterjee, Basujit; et al

Organic Letters (2015), 17(19), 4794-4797.

Scheme 359 (1 Reaction) Steps: **1**



Suppliers (75) Suppliers (18)

31-116-CAS-23541008 Steps: **1**

1.1 **Reagents:** Potassium hydroxide, Water-d_2
Catalysts: (*OC*-6-52)-Carbonylchloro[2-(diphenylphosphino-κ*P*)-*N*-[2-(diphenylphosphino-κ*P*)ethyl]ethanamine-κ*N*]hydroruthenium; 18 h, 130 °C

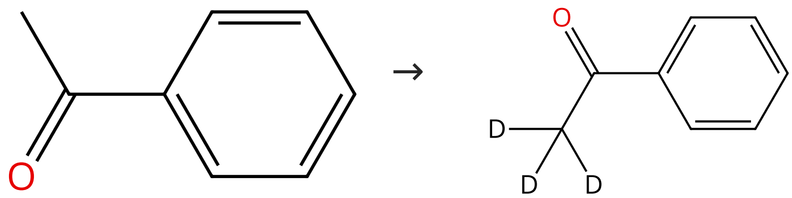
Experimental Protocols

Nickel-Catalyzed Guerbet Type Reaction: C-Alkylation of Secondary Alcohols via Double (de)Hydrogenation

By: Babu, Reshma; et al

Organic Letters (2021), 23(9), 3320-3325.

Scheme 360 (1 Reaction) Steps: **1**



Suppliers (109) Suppliers (41)

31-116-CAS-24182371 Steps: **1**

1.1 **Reagents:** Water-d_2
Catalysts: 4-Chlorobenzoic acid, Silver hexafluoroantimonate, Bis(dichloro(η^6-*p*-cymene)ruthenium), 2-Methyl-3-(trifluoromethyl)aniline
Solvents: 1,2-Dichloroethane; rt → 120 °C; 16 h, 120 °C

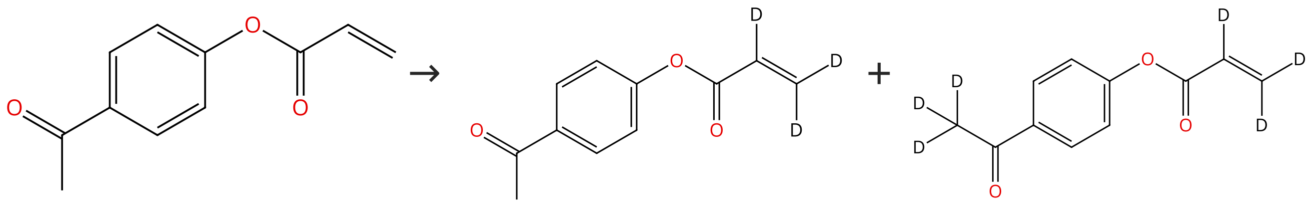
Experimental Protocols

Ruthenium-Catalyzed Deuteration of Aromatic Carbonyl Compounds with a Catalytic Transient Directing Group

By: Kopf, Sara; et al

Chemistry - A European Journal (2021), 27(38), 9768-9773.

Scheme 361 (1 Reaction) Steps: **1** Yield: **95%**



Suppliers (8)

31-116-CAS-19573246 Steps: **1** Yield: **95%**

1.1 **Reagents:** Benzene-d_6, Water-d_2
Catalysts: 3-(Trifluoromethyl)benzoic acid, Bis(dichloro(η^6-*p*-cymene)ruthenium), Benzoic acid, 3-(trifluoromethyl)-, potassium salt (1:1); 18 h, rt → 80 °C

Experimental Protocols

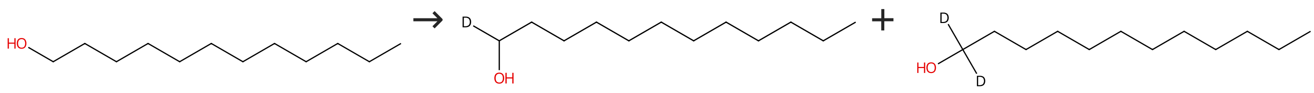
Ruthenium(II)biscarboxylate-Catalyzed Hydrogen-Isotope Exchange by Alkene C-H Activation

By: Bechtoldt, Alexander; et al

ChemCatChem (2019), 11(1), 435-438.

Scheme 362 (2 Reactions)

Steps: **1** Yield: **92%**



Suppliers (101)

Suppliers (3)

31-116-CAS-22781783	Steps: **1** Yield: **92%**
1.1	**Reagents:** Deuterium **Catalysts:** Ruthenium (on carbon) **Solvents:** Water-d_2; 24 h, 2 bar, 55 °C

Experimental Protocols

Tuning the Reactivity of a Heterog eneous Catalyst using N-Heterocyclic Carbene Ligands for C-H Activation Reactions

By: Palazzolo, Alberto; et al

Angewandte Chemie, International Edition (2020), 59(47), 20879-20884.

31-116-CAS-22781781	Steps: **1** Yield: **92%**
1.1	**Reagents:** Deuterium **Catalysts:** Ruthenium (on carbon) **Solvents:** Water-d_2; 24 h, 2 bar, 55 °C

Experimental Protocols

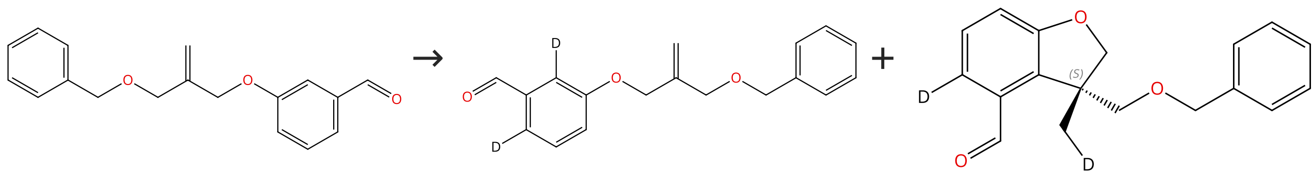
Tuning the Reactivity of a Heterog eneous Catalyst using N-Heterocyclic Carbene Ligands for C-H Activation Reactions

By: Palazzolo, Alberto; et al

Angewandte Chemie, International Edition (2020), 59(47), 20879-20884.

Scheme 363 (1 Reaction)

Steps: **1** Yield: **83%**



Absolute stereochemistry shown

31-085-CAS-21558228	Steps: **1** Yield: **83%**
1.1	**Reagents:** Water-d_2 **Catalysts:** Trifluoroacetic acid, (-)-1-(1-Naphthyl)ethylamine, Silver hexafluoroantimonate, Bis(dichloro(η^6-*p*-cymene) ruthenium) **Solvents:** 1,2-Dichloroethane; 5 min, 30 °C; 20 h, 60 °C

Experimental Protocols

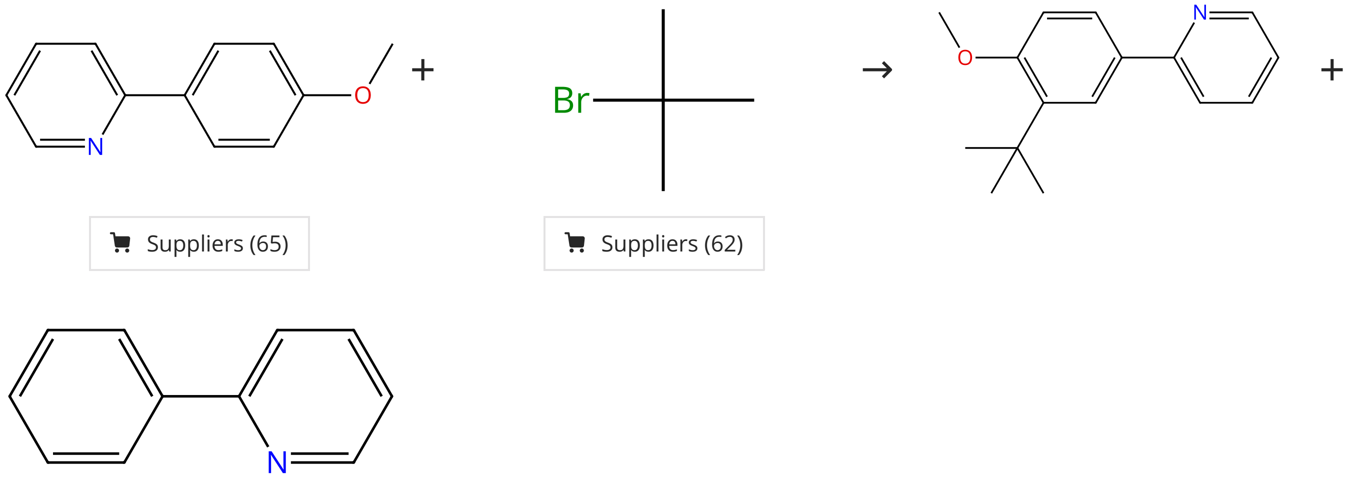
Ruthenium(II)-Catalyzed Asymmetric Inert C-H Bond Activation Assisted by a Chiral Transient Directing Group

By: Li, Guozhu; et al

Angewandte Chemie, International Edition (2020), 59(9), 3475-3479.

Scheme 364 (1 Reaction)

Steps: **1** Yield: **82%**



31-614-CAS-27827038

Steps: **1** Yield: **82%**

1.1 **Reagents:** Potassium carbonate, Water-d_2
Catalysts: *N*-(2,2-Dimethyl-1-oxopropyl)-L-valine, Bis(dichloro(η[6]-*p*-cymene)ruthenium)
Solvents: 1,4-Dioxane; 20 h, 100 °C

Experimental Protocols

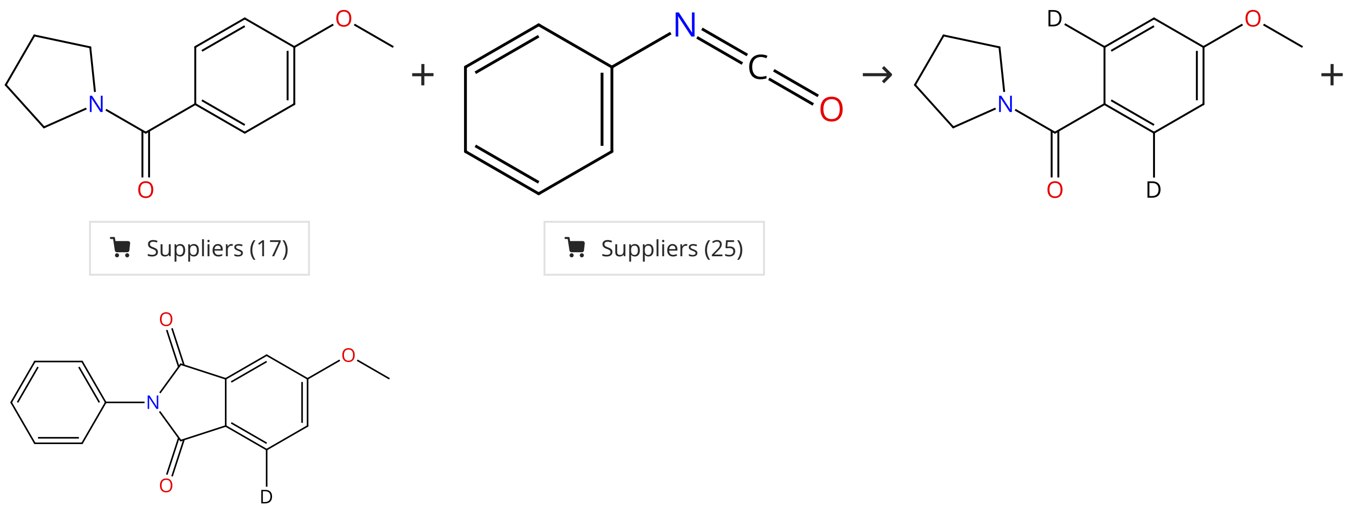
N-Acyl Amino Acid Ligands for Ruthenium(II)-Catalyzed meta-C-H tert-Alkylation with Removable Auxiliaries

By: Li, Jie; et al

Journal of the American Chemical Society (2015), 137(43), 13894-13901.

Scheme 365 (1 Reaction)

Steps: **1** Yield: **81%**



31-116-CAS-1344721

Steps: **1** Yield: **81%**

1.1 **Reagents:** Water-d_2
Catalysts: Silver hexafluoroantimonate, Bis(dichloro(η[6]-*p*-cymene)ruthenium)
Solvents: 1,2-Dichloroethane; 24 h, 100 °C

Experimental Protocols

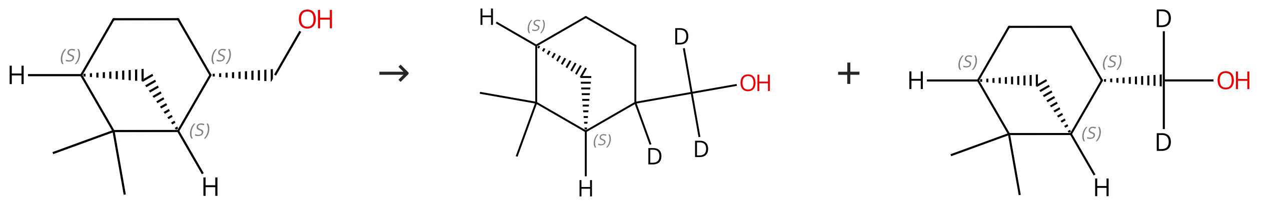
Ruthenium(II)-Catalyzed C-H Activation with Isocyanates: A Versatile Route to Phthalimides

By: De Sarkar, Suman; et al

Chemistry - A European Journal (2014), 20(43), 13932-13936.

Scheme 366 (1 Reaction)

Steps: **1** Yield: **81%**



Suppliers (18)

31-116-CAS-10019674

Steps: **1** Yield: **81%**

1.1 **Reagents:** Water-*d*$_2$
Catalysts: Dichlorobis(triphenylphosphine)ruthenium; 10 min, 150 °C

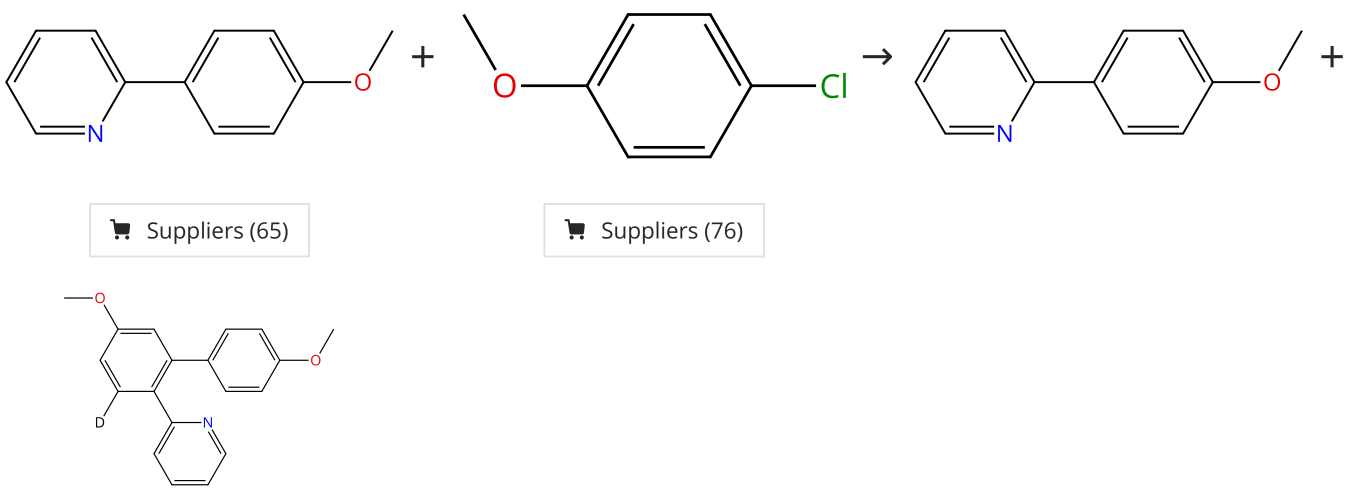
Ruthenium catalyzed deuterium labeling of α-carbon in primary alcohol and primary/secondary amine in D_2O

By: Takahashi, Masaaki; et al

Chemistry Letters (2005), 34(2), 192-193.

Scheme 367 (1 Reaction)

Steps: **1** Yield: **79%**



Suppliers (65)

Suppliers (76)

31-614-CAS-27115410

Steps: **1** Yield: **79%**

1.1 **Reagents:** Potassium carbonate
Catalysts: [(1,2,3,4,5,6-η)-1-Methyl-4-(1-methylethyl)benzene](2,4,6-trimethylbenzoato-κ*O*)(2,4,6-trimethylbenzoato-κ*O*,κ*O'*)ruthenium
Solvents: Toluene, Water-*d*$_2$; 18 h, 120 °C

Experimental Protocols

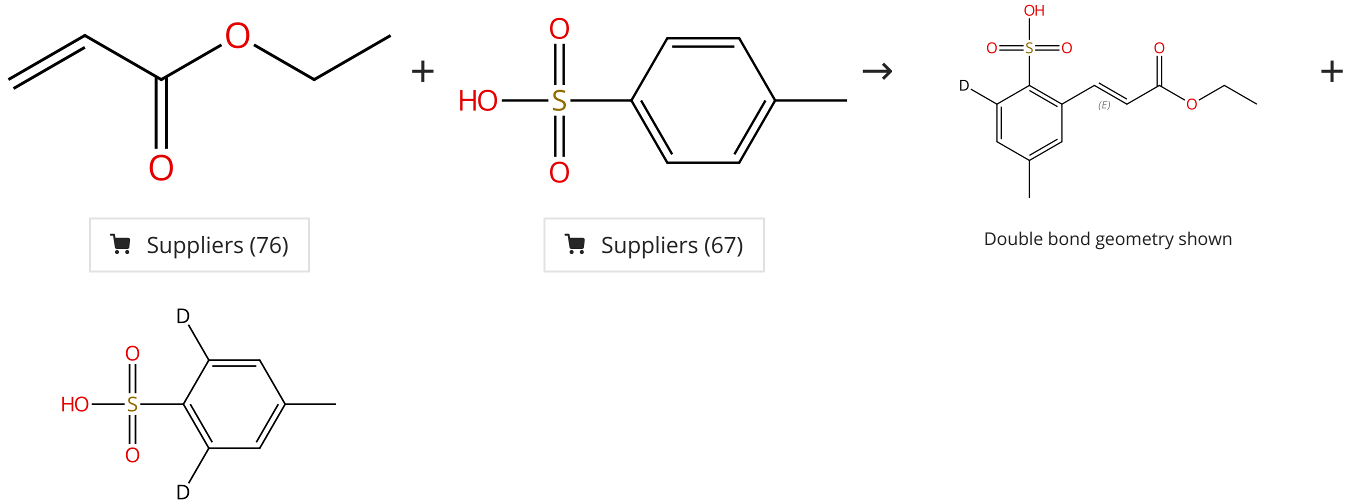
Mechanistic Insight into Direct Arylations with Ruthenium(II) Carboxylate Catalysts

By: Ackermann, Lutz; et al

Organic Letters (2010), 12(21), 5032-5035.

Scheme 368 (1 Reaction)

Steps: **1** Yield: **78%**



31-116-CAS-15323709	Steps: **1** Yield: **78%**
1.1	**Reagents:** Acetic acid, copper(2+) salt, hydrate **Catalysts:** Silver hexafluoroantimonate, Bis(dichloro(η^6-*p*-cymene)ruthenium) **Solvents:** Dimethylacetamide, Water-*d*$_2$; 5 min, rt; 16 h, 120 °C

Experimental Protocols

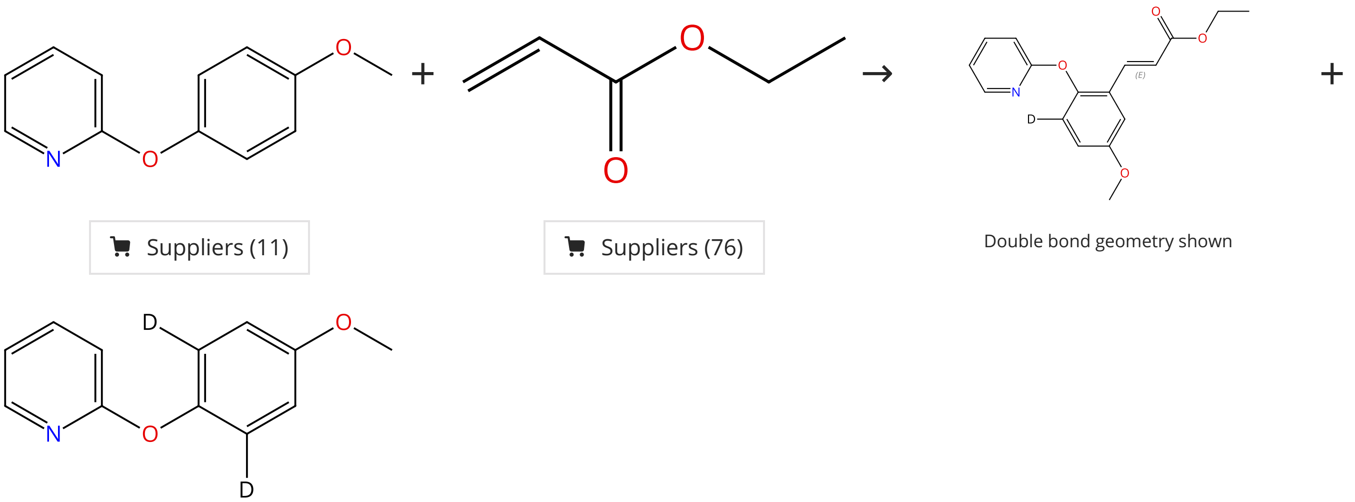
Ruthenium(II)-Catalyzed Oxidative C-H Alkenylations of Sulfonic Acids, Sulfonyl Chlorides and Sulfonamides

By: Ma, Wenbo; et al

Chemistry - A European Journal (2014), 20(46), 15248-15251.

Scheme 369 (1 Reaction)

Steps: **1** Yield: **78%**



31-614-CAS-29661005	Steps: **1** Yield: **78%**
1.1	**Reagents:** Cupric acetate, Oxygen, Water-*d*$_2$ **Catalysts:** Silver hexafluoroantimonate, Bis(dichloro(η^6-*p*-cymene)ruthenium) **Solvents:** 2-Methyl-2-butanol; 5 min, rt; 16 h, 120 °C

Experimental Protocols

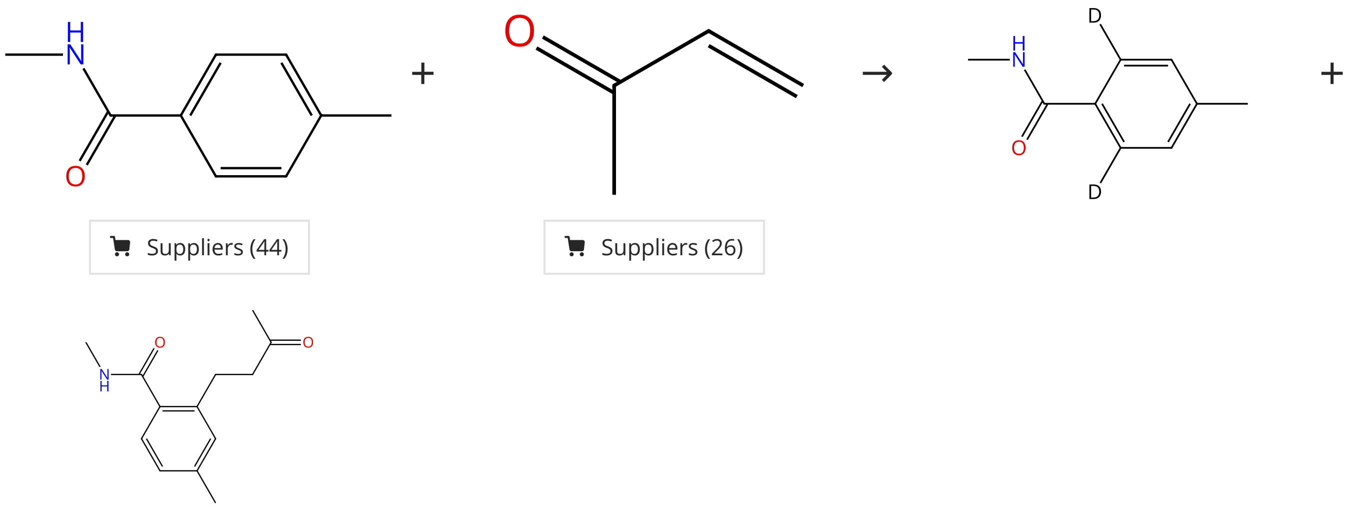
Ruthenium(II)-Catalyzed C-H Alkenylations of Phenols with Removable Directing Groups

By: Ma, Wenbo; et al

Chemistry - A European Journal (2013), 19(41), 13925-13928.

Scheme 370 (1 Reaction)

Steps: **1** Yield: **78%**



31-614-CAS-25494861

Steps: **1** Yield: **78%**

1.1 **Catalysts:** Bis(dichloro(η^6-*p*-cymene)ruthenium), Carbonothioic acid, *S*-methyl ester, Carbonothioic acid, *S*-methyl ester, potassium salt
Solvents: Water-d_2; 20 h, 120 °C

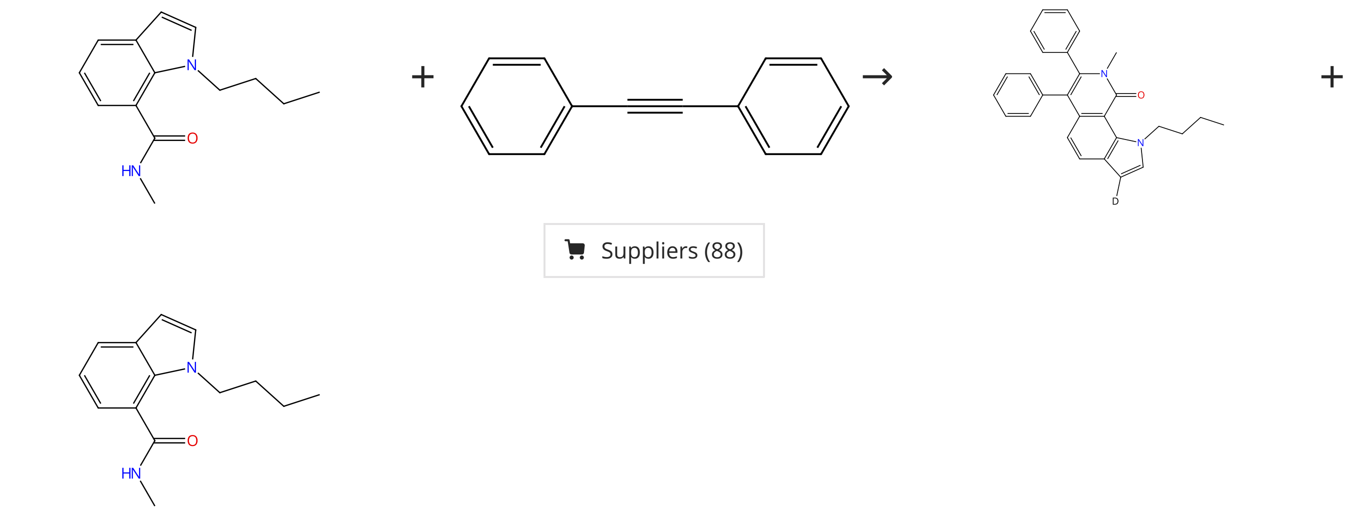
Carboxylate-assisted ruthenium(II)-catalyzed C-H activations of monodentate amides with conjugated alkenes

By: Li, Jie; et al

Organic Chemistry Frontiers (2015), 2(9), 1035-1039.

Scheme 371 (1 Reaction)

Steps: **1** Yield: **78%**



31-614-CAS-43511860

Steps: **1** Yield: **78%**

1.1 **Reagents:** Water-d_2
Catalysts: Cupric acetate, Bis(dichloro(η^6-*p*-cymene)ruthenium)
Solvents: 1,2-Dichloroethane; 24 h, 120 °C

Experimental Protocols

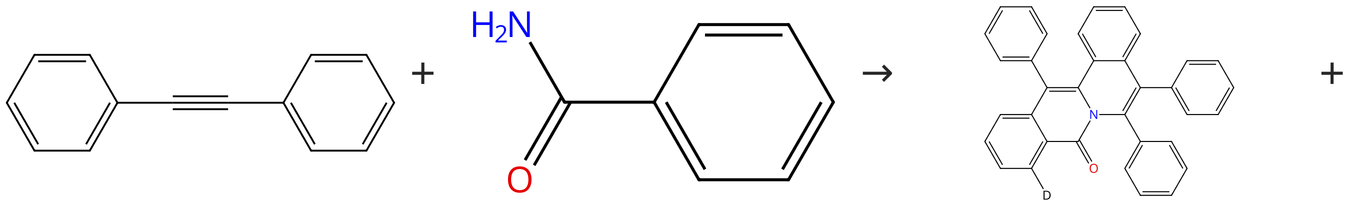
Ru(II)-Catalysed Highly Regioselective C6 C-H/N-H Annulation of Indole-7-carboxamides with Alkynes for the Synthesis of Pyrrolo[3,2-h]isoquinolin-9-ones

By: Jadhav, Pankaj; et al

Chemistry - An Asian Journal (2025), 20(4), e202401340.

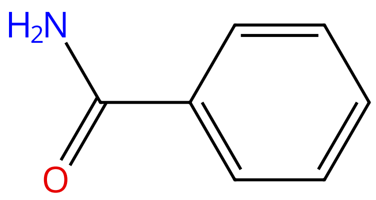
Scheme 372 (1 Reaction)

Steps: **1** Yield: **78%**



Suppliers (88)

Suppliers (115)



31-614-CAS-30178920

Steps: **1** Yield: **78%**

1.1 **Reagents:** Tetrabutylammonium perchlorate, Water-d_2, Propanoic acid, 2,2-dimethyl-, sodium salt, hydrate (1:1:?)
Catalysts: Bis(dichloro(η^6-*p*-cymene)ruthenium)
Solvents: Isopropanol, Water; 6 h, 100 °C

Experimental Protocols

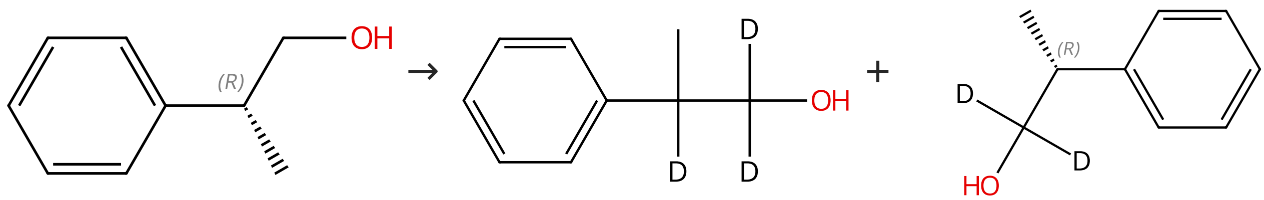
Electrochemically Enabled Double C-H Activation of Amides: Chemoselective Synthesis of Polycyclic Isoquino linones

By: Wang, Zi-Qiang; et al

Organic Letters (2019), 21(24), 9841-9845.

Scheme 373 (1 Reaction)

Steps: **1** Yield: **76%**



Absolute stereochemistry shown, Rotation (+)

Absolute stereochemistry shown

Suppliers (57)

31-116-CAS-12156427

Steps: **1** Yield: **76%**

1.1 **Reagents:** Water-d_2
Catalysts: Dichlorobis(triphenylphosphine)ruthenium; 10 min, 150 °C

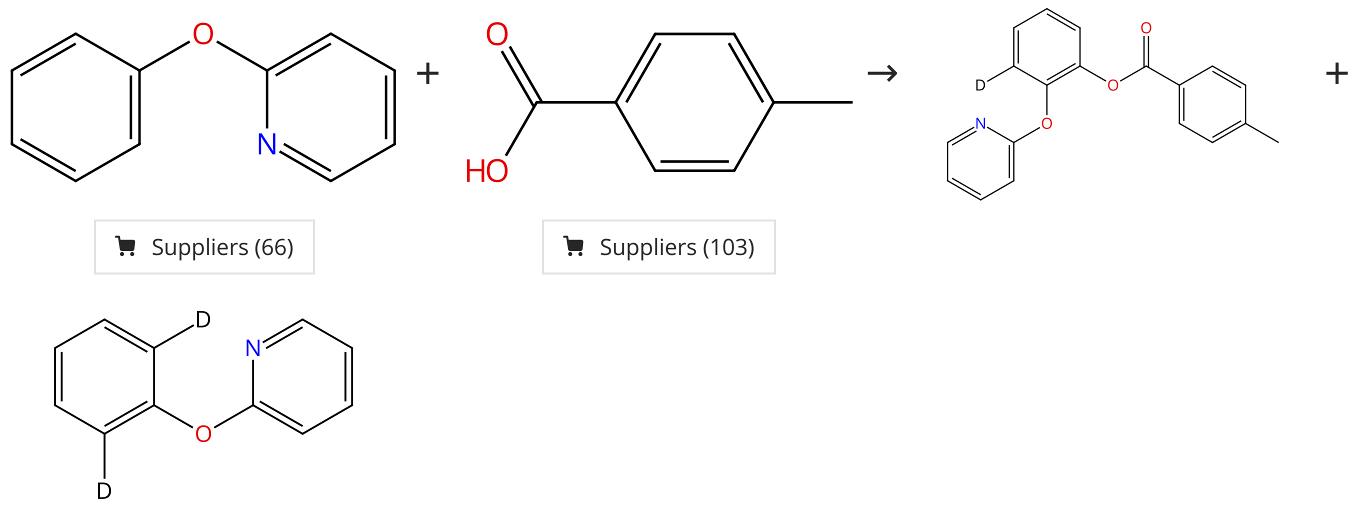
Ruthenium catalyzed deuterium labeling of α-carbon in primary alcohol and primary/secondary amine in D_2O

By: Takahashi, Masaaki; et al

Chemistry Letters (2005), 34(2), 192-193.

Scheme 374 (1 Reaction)

Steps: **1** Yield: **73%**



31-116-CAS-400930	Steps: **1** Yield: **73%**
1.1	**Reagents:** Potassium persulfate, Water-d_2 **Catalysts:** Silver hexafluoroantimonate, Bis(dichloro(η^6-*p*-cymene)ruthenium) **Solvents:** 1,2-Dichloroethane; 18 h, 100 °C

Experimental Protocols

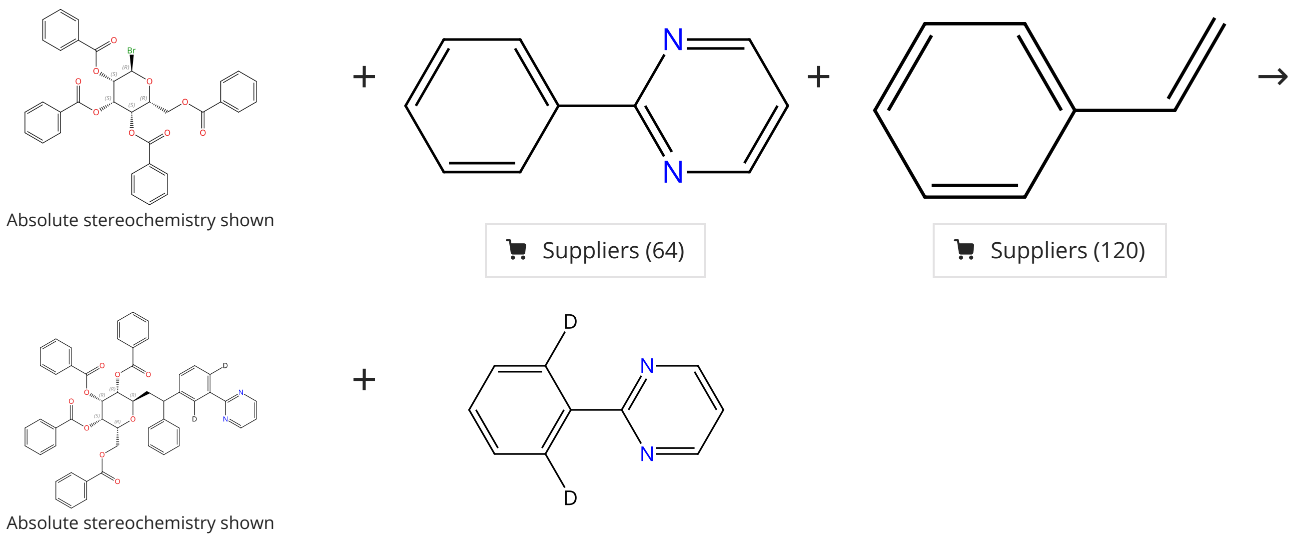
Ruthenium(II)-Catalyzed C-H Acyloxylation of Phenols with Removable Auxiliary

By: Raghuvanshi, Keshav; et al

Chemistry - A European Journal (2015), 21(4), 1790-1794.

Scheme 375 (1 Reaction)

Steps: **1** Yield: **71%**



31-614-CAS-39832415	Steps: **1** Yield: **71%**
1.1	**Reagents:** Potassium carbonate, Water-d_2 **Catalysts:** Tris[4-(trifluoromethyl)phenyl]phosphine, Bis(dichloro(η^6-*p*-cymene)ruthenium) **Solvents:** 1,4-Dioxane; 4 h, 60 °C

Experimental Protocols

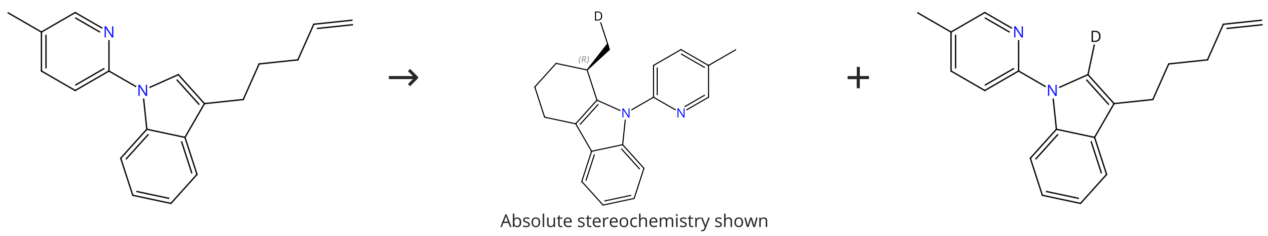
Domino meta-C-H Ethyl Glycosylation by Ruthenium(II/III) Catalysis: Modular Assembly of meta-C-Alkyl Glycosides

By: Wu, Jun; et al

Angewandte Chemie, International Edition (2023), 62(20), e202219319.

Scheme 376 (1 Reaction)

Steps: **1** Yield: **71%**



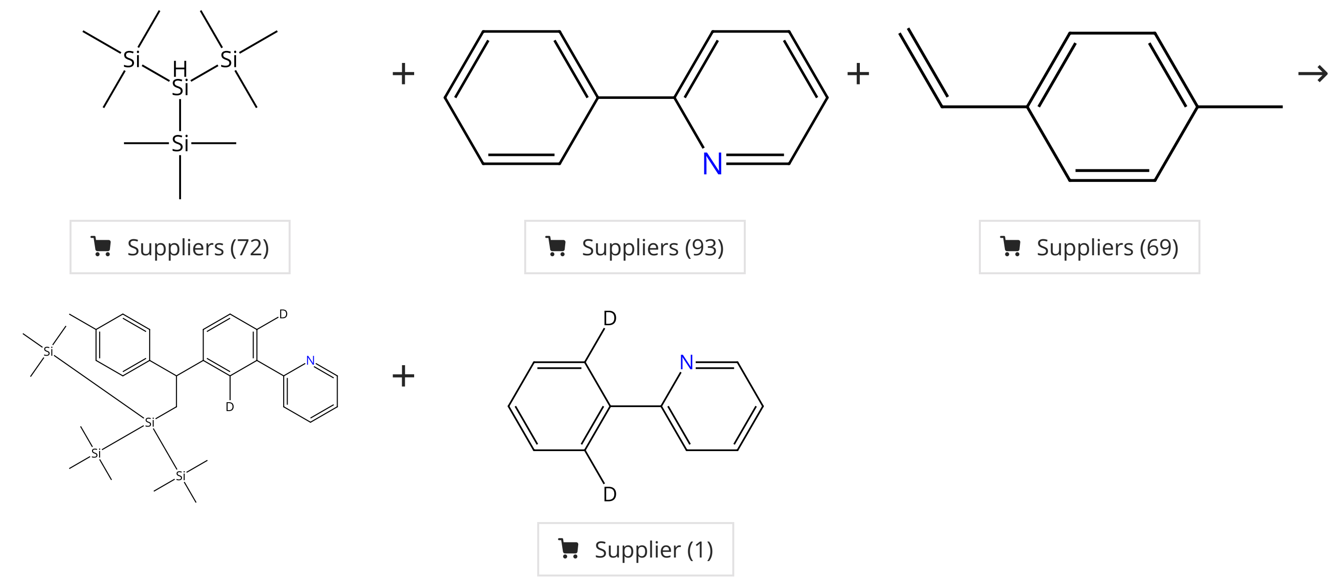
31-614-CAS-35437440	Steps: **1** Yield: **71%**
1.1	**Reagents:** Water-*d*$_2$ **Catalysts:** Silver hexafluoroantimonate, Bis(dichloro(η^6-*p*-cymene)ruthenium), (4*S*,5*S*)-1,3-Bis(4-methylbenzoyl)-4,5-diphenyl-2-imidazolidinecarboxylic acid **Solvents:** Toluene; 12 h, 25 °C
Experimental Protocols	

Enantioselective Ruthenium-Catalyzed C-H Alkylations by a Chiral Carboxylic Acid with Attractive Dispersive Interactions

By: Dhawa, Uttam; et al

Organic Letters (2021), 23(7), 2760-2765.

Scheme 377 (1 Reaction) Steps: **1** Yield: **70%**



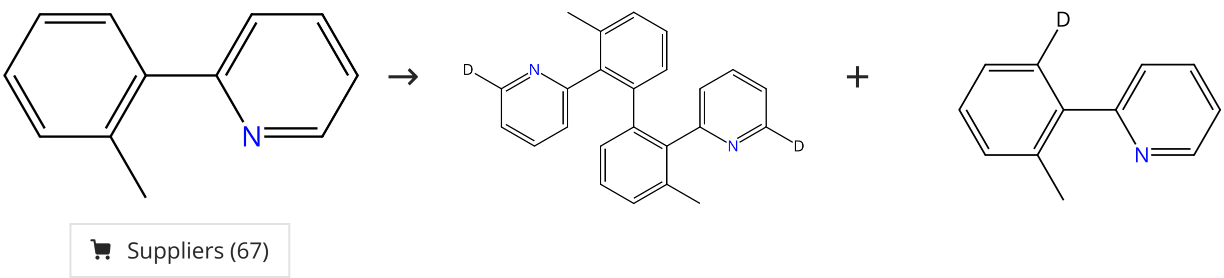
31-614-CAS-39657549	Steps: **1** Yield: **70%**
1.1	**Reagents:** *tert*-Butyl peroxide, 2,4,6-Trimethylbenzoic acid, Potassium carbonate, Water-*d*$_2$ **Catalysts:** Ferrous chloride, Tris[4-(trifluoromethyl)phenyl] phosphine, Bis(dichloro(η^6-*p*-cymene)ruthenium) **Solvents:** (Trifluoromethyl)benzene; 6 h, 100 °C
Experimental Protocols	

Silylarylation of Alkenes via meta-Selective C-H Activation of Arenes under Ruthenium/Iron Cooperative Catalysis: Mechanistic Insights from Combined Experimental and Computational Studies

By: Neogi, Sukanya; et al

ACS Catalysis (2024), 14(7), 4510-4522.

Scheme 378 (1 Reaction) Steps: **1** Yield: **69%**



31-089-CAS-20723653	Steps: **1** Yield: **69%**
1.1	**Reagents:** Potassium carbonate, 2-Bromobenzonitrile, Water-*d*$_2$ **Catalysts:** 2,4,6-Trimethylbenzoic acid, Bis(dichloro(η^6-*p*-cymene)ruthenium) **Solvents:** Toluene; 30 min, 120 °C

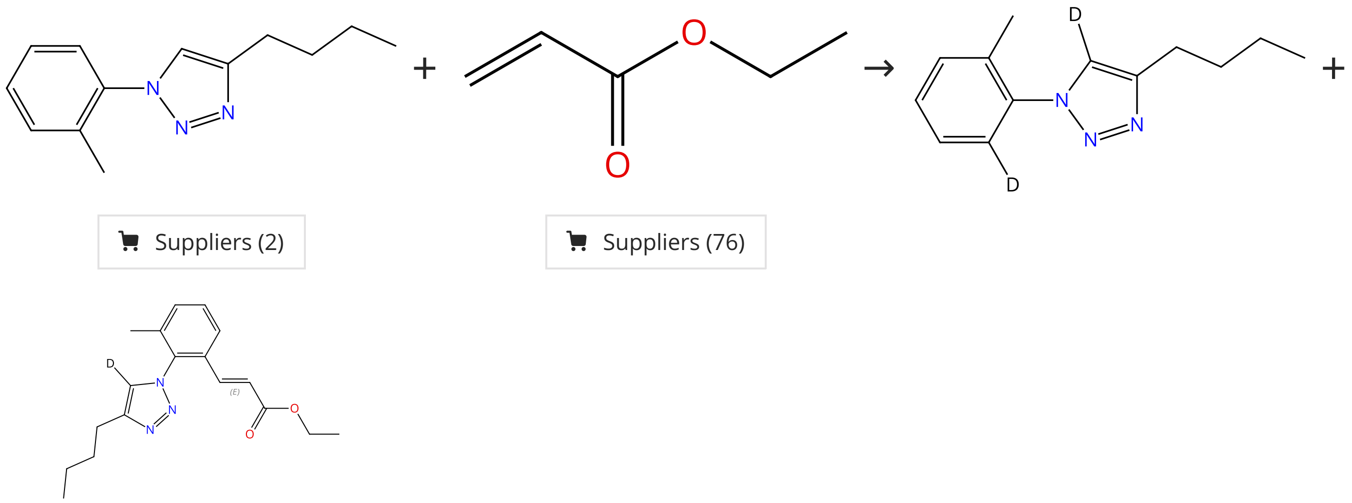
Arene-Free Ruthenium(II/IV)-Catalyzed Bifurcated Arylation for Oxidative C-H/C-H Functionalizations

By: Rogge, Torben; et al

Angewandte Chemie, International Edition (2019), 58(44), 15640-15645.

Scheme 379 (1 Reaction)

Steps: **1** Yield: **68%**



Suppliers (2)

Suppliers (76)

Double bond geometry shown

31-116-CAS-13832691

Steps: **1** Yield: **68%**

1.1 **Reagents:** Cupric acetate, Water-d_2
Catalysts: Silver hexafluoroantimonate, Bis(dichloro(η^6-*p*-cymene)ruthenium)
Solvents: Toluene; 6 h, 100 °C

Experimental Protocols

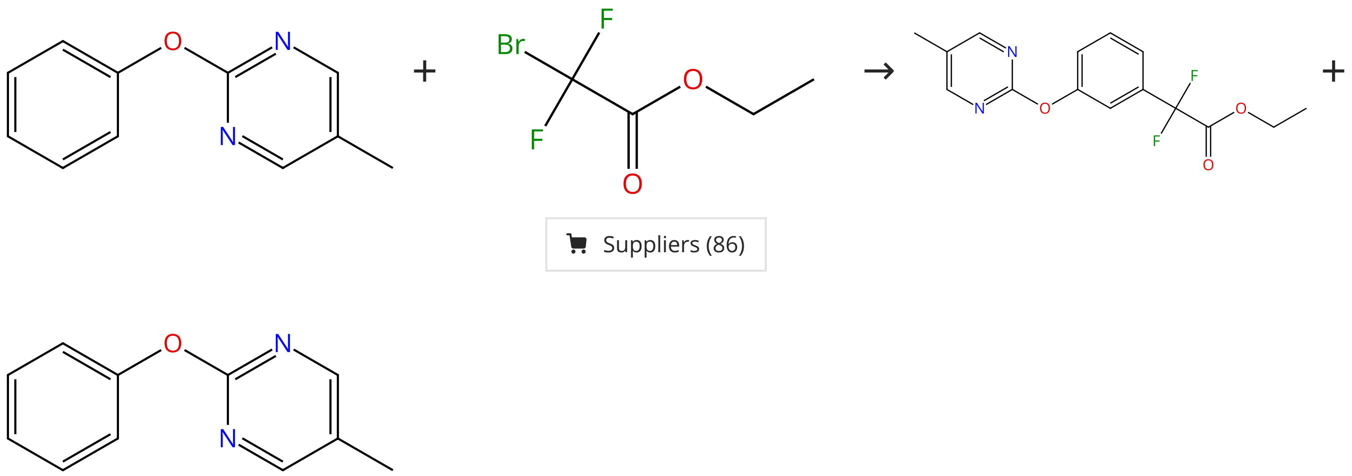
Ruthenium(II)-catalyzed cross-dehydrogenative C-H alkenylations by triazole assistance

By: Tirler, Carina; et al

Tetrahedron (2015), 71(26-27), 4543-4551.

Scheme 380 (1 Reaction)

Steps: **1** Yield: **65%**



Suppliers (86)

31-614-CAS-27449089

Steps: **1** Yield: **65%**

1.1 **Reagents:** Sodium carbonate, Water-d_2
Catalysts: 2,4,6-Trimethylbenzoic acid, Bis(dichloro(η^6-*p*-cymene)ruthenium), [1,1,1-Trifluoro-*N*-[(trifluoromethyl)sulfonyl-κ*O*]methanesulfonamidato-κ*O*]silver
Solvents: Toluene; 5 h, 150 °C

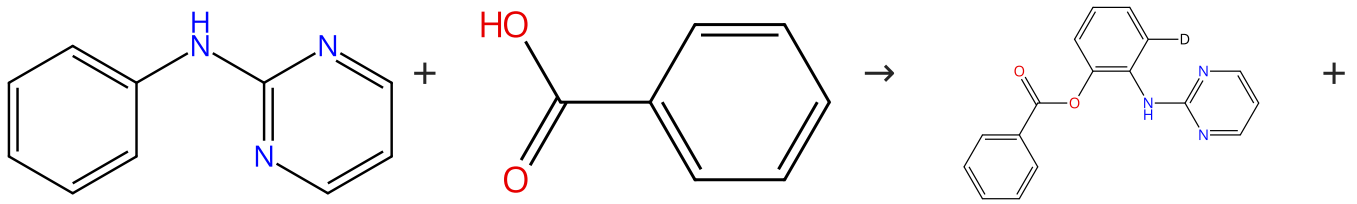
Experimental Protocols

Ruthenium-Catalyzed Meta-Selective C-H Difluoromethylation of Phenol Derivatives

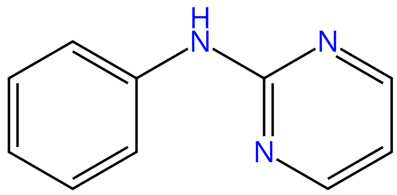
By: Xu, Xu; et al

Journal of Organic Chemistry (2020), 85(21), 13868-13876.

Scheme 381 (1 Reaction)
Steps: **1** Yield: **65%**



Suppliers (63)
Suppliers (192)



31-614-CAS-27108785
Steps: **1** Yield: **65%**

1.1 **Reagents:** Silver carbonate
Catalysts: Silver hexafluoroantimonate, Bis(dichloro(η^6-*p*-cymene)ruthenium)
Solvents: 1,2-Dichloroethane, Water-d_2; 15 h, 110 °C

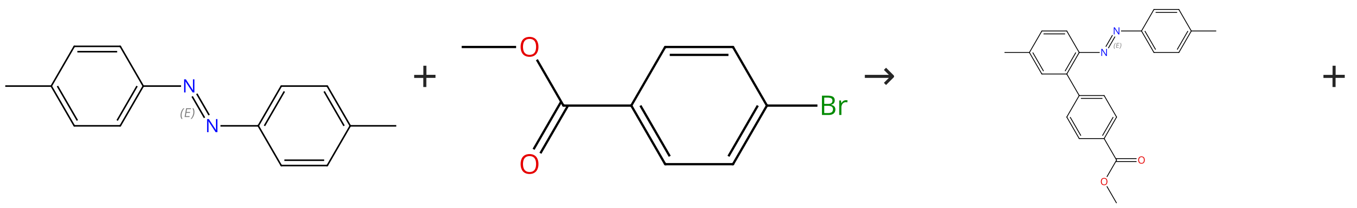
Experimental Protocols

Ruthenium(II)-Catalyzed Positional Selective C-H Oxygenation of N-Aryl-2-pyrimidines

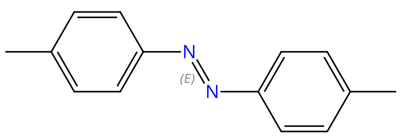
By: Sarkar, Tanumay; et al

Journal of Organic Chemistry (2018), 83(12), 6444-6453.

Scheme 382 (1 Reaction)
Steps: **1** Yield: **63%**



Double bond geometry shown
Suppliers (21)
Suppliers (105)
Double bond geometry shown



Double bond geometry shown

31-614-CAS-30146869
Steps: **1** Yield: **63%**

1.1 **Reagents:** Potassium carbonate
Catalysts: 2,4,6-Trimethylbenzoic acid, Bis(dichloro(η^6-*p*-cymene)ruthenium)
Solvents: 1,4-Dioxane, Water-d_2; 18 h, 120 °C

Experimental Protocols

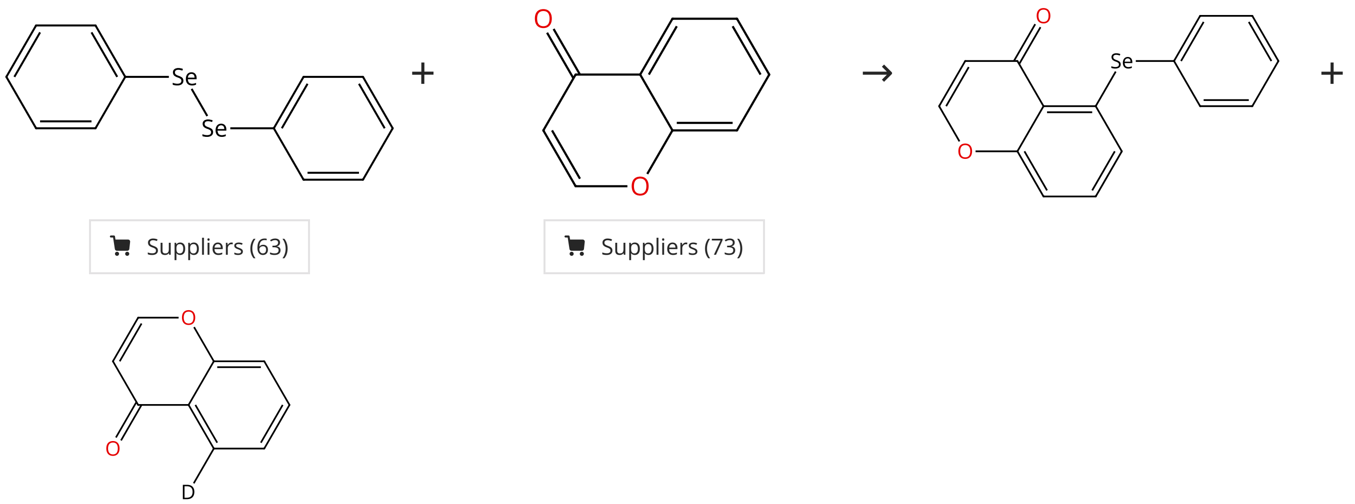
Ruthenium(II)-Catalyzed C-H Arylation of Azoarenes by Carboxylate Assistance

By: Hubrich, Jonathan; et al

ACS Catalysis (2015), 5(7), 4089-4093.

Scheme 383 (1 Reaction)

Steps: **1** Yield: **62%**



31-614-CAS-34330121

Steps: **1** Yield: **62%**

1.1 **Reagents:** Cupric acetate, Cuprous chloride, Water-d_2, [1,1,1-Trifluoro-*N*-[(trifluoromethyl)sulfonyl-κ*O*]methanesulfonamidato-κ*O*]silver
Catalysts: Bis(dichloro(η^6-*p*-cymene)ruthenium)
Solvents: Chlorobenzene; 24 h, 120 °C

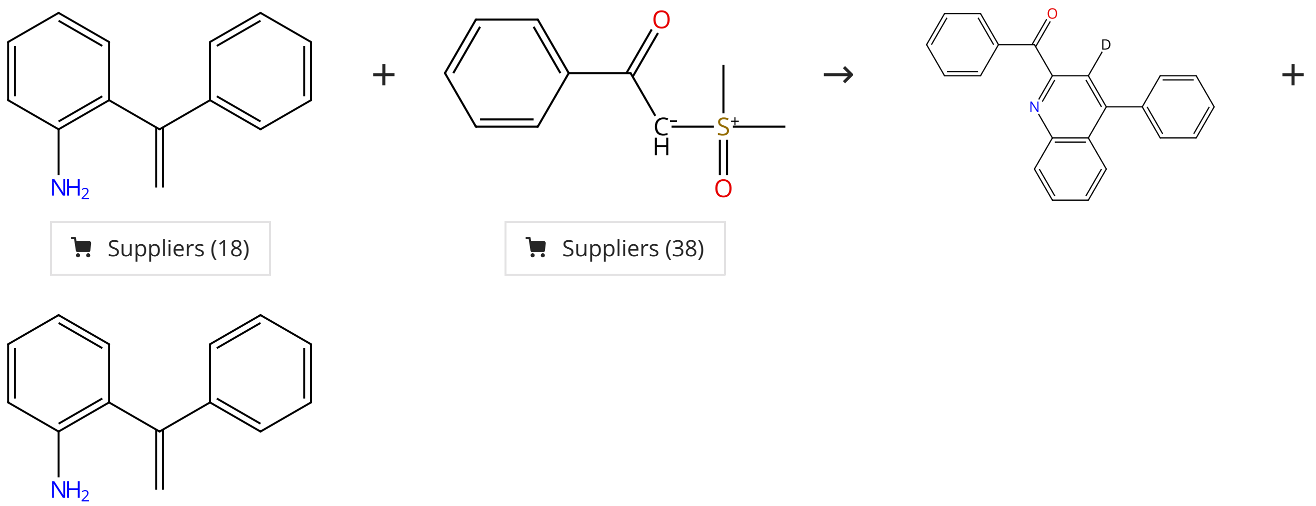
Regioselective peri-C-H selenylation of aromatic compounds with weakly coordinating ketone groups

By: Duan, Bingbing; et al

Chemical Communications (Cambridge, United Kingdom) (2022), 58(82), 11555-11558.

Scheme 384 (1 Reaction)

Steps: **1** Yield: **62%**



31-614-CAS-29768824

Steps: **1** Yield: **62%**

1.1 **Reagents:** Potassium carbonate, Oxygen
Catalysts: Bis(dichloro(η^6-*p*-cymene)ruthenium)
Solvents: Tetrahydrofuran, Water-d_2; 12 h, 120 °C; 120 °C → rt

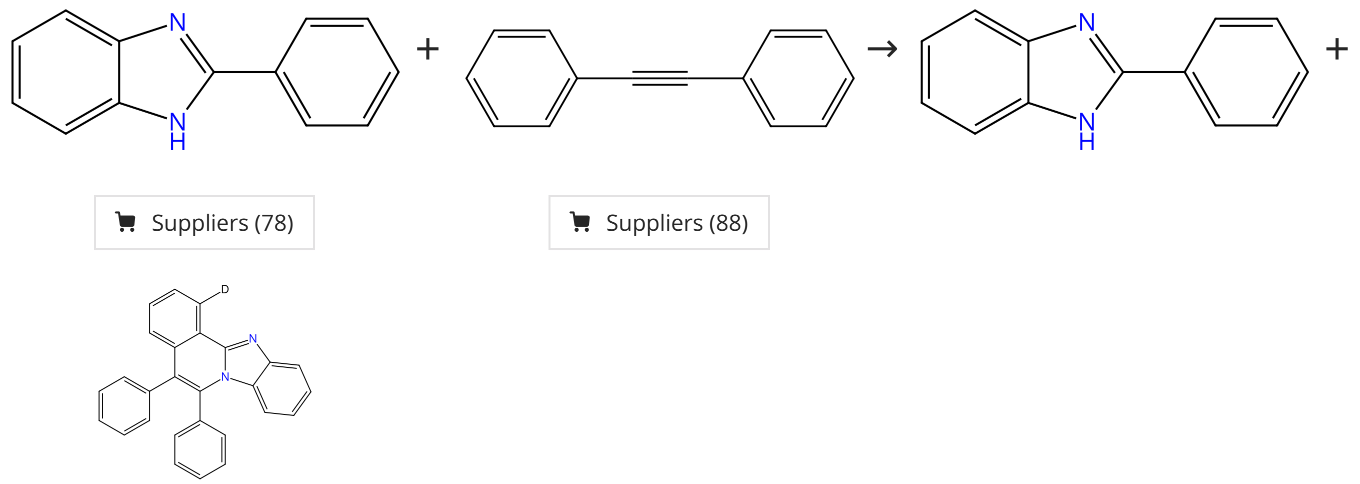
Ru^{II}-Catalyzed/NH_2-Assisted Selective Alkenyl C-H [5 + 1] Annulation of Alkenylanilines with Sulfoxonium Ylides to Quinolines

By: Chen, Pu; et al

Organic Letters (2019), 21(12), 4812-4815.

Scheme 385 (2 Reactions)

Steps: **1** Yield: **62%**



31-614-CAS-26429390

Steps: **1** Yield: **62%**

1.1 **Reagents:** Potassium acetate
Catalysts: 1-Adamantanecarboxylic acid, Bis(dichloro(η^6-*p*-cymene)ruthenium)
Solvents: 2-Methyl-2-butanol, Water-d_2; 1 h, 100 °C

Experimental Protocols

Azaruthena(II)-bicyclo[3.2.0]heptadiene: Key Intermediate for Ruthenaelectro(II/III/I)-catalyzed Alkyne Annulations

By: Yang, Long; et al

Angewandte Chemie, International Edition (2020), 59(27), 11130-11135.

31-614-CAS-34212056

Steps: **1**

1.1 **Reagents:** Potassium acetate, Water-d_2
Catalysts: Bis(dichloro(η^6-*p*-cymene)ruthenium)
Solvents: Methanol, Chloroform; rt

1.2 **Solvents:** Methanol, Chloroform; 60.5 min, 30 °C

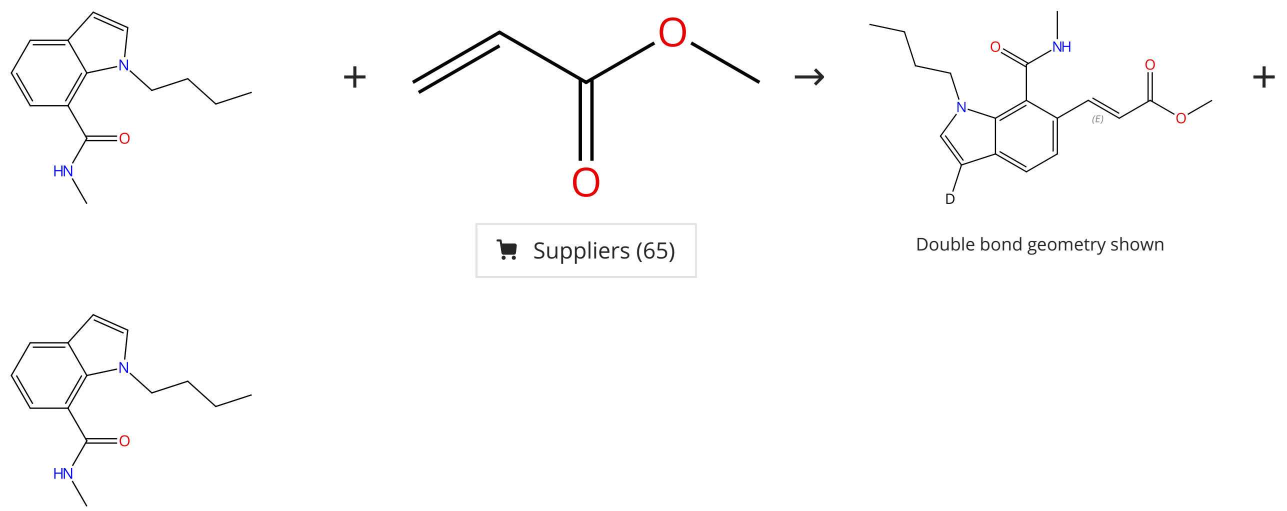
Micro-photo-flow reactor system for fused N-heteroaryl scaffold synthesis and late-stage functionalization of pyrazolopyridines

By: Kumar, Sanjeev; et al

Chemical Communications (Cambridge, United Kingdom) (2022), 58(80), 11268-11271.

Scheme 386 (1 Reaction)

Steps: **1** Yield: **61%**



31-614-CAS-24623193

Steps: **1** Yield: **61%**

1.1 **Reagents:** Copper diacetate monohydrate, Water-d_2
Catalysts: Silver hexafluoroantimonate, Bis(dichloro(η^6-*p*-cymene)ruthenium)
Solvents: 1,2-Dichloroethane; 24 h, 120 °C

Experimental Protocols

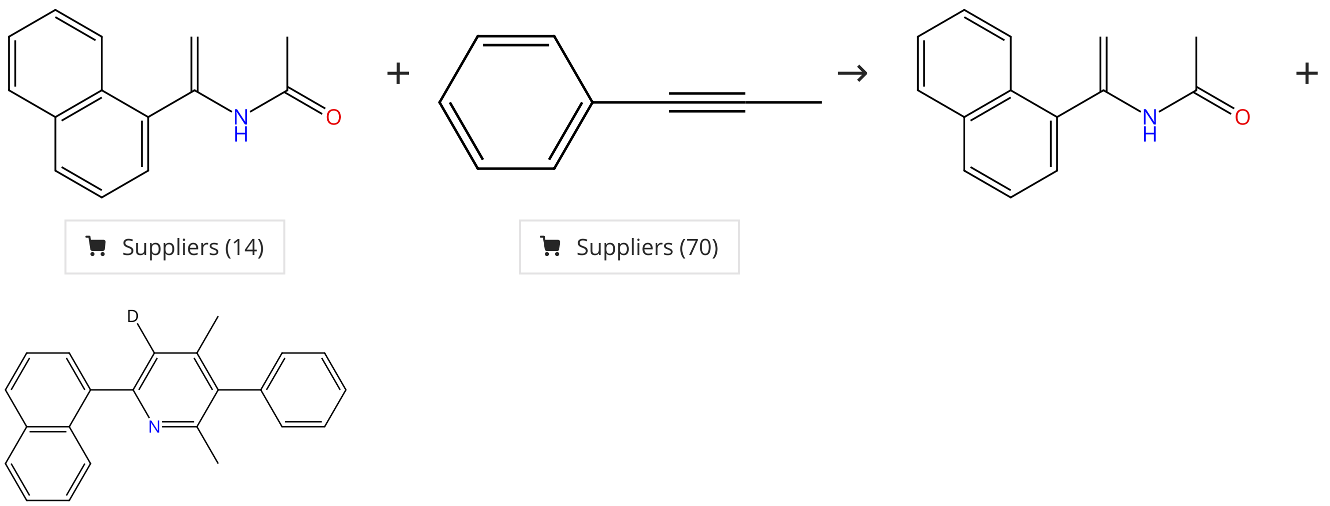
Ruthenium(II)-Catalyzed Highly Chemo- and Regioselective Oxidative C6 Alkenylation of Indole-7-carboxamides

By: Jadhav, Pankaj P.; et al

Organic Letters (2021), 23(22), 8673-8677.

Scheme 387 (1 Reaction)

Steps: 1 Yield: 61%



31-614-CAS-26065790

Steps: 1 Yield: 61%

1.1 **Reagents:** Potassium acetate, Sodium carbonate, Water- d_2
Catalysts: Bis(dichloro(η^6-*p*-cymene)ruthenium)
Solvents: Toluene; 24 h, 100 °C

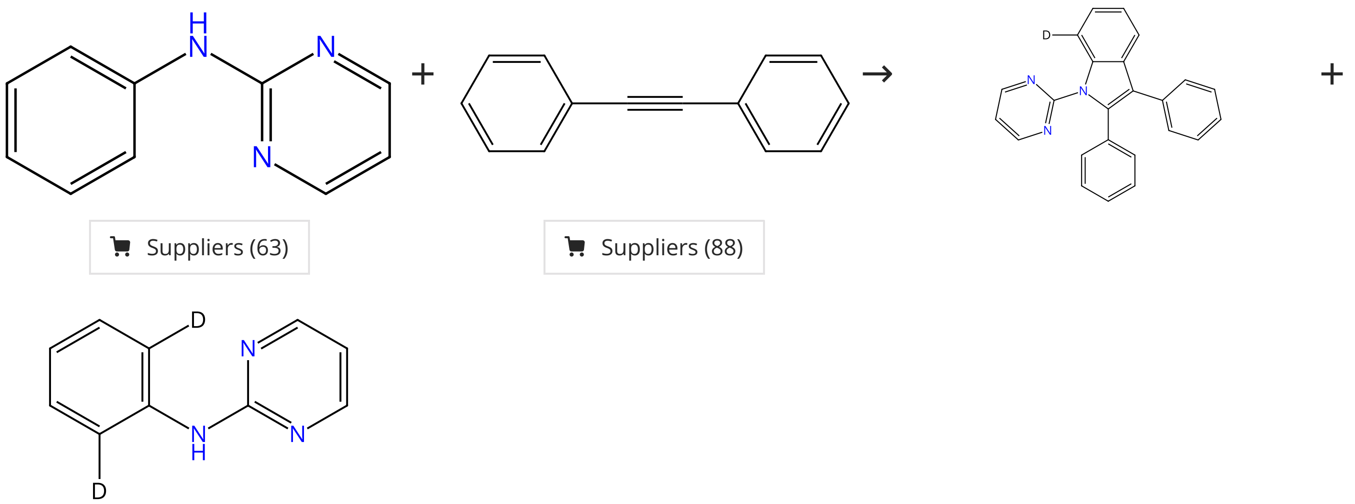
Ruthenium-Catalyzed Formal Dehydrative [4 + 2] Cycloaddition of Enamides and Alkynes for the Synthesis of Highly Substituted Pyridines: Reaction Development and Mechanistic Study

By: Wu, Jicheng; et al

Journal of the American Chemical Society (2015), 137(29), 9489-9496.

Scheme 388 (1 Reaction)

Steps: 1 Yield: 60%



31-116-CAS-19225358

Steps: 1 Yield: 60%

1.1 **Reagents:** 2-Propan-*1,1,1,2,3,3,3*-d_7-ol-*d*
Catalysts: Sodium acetate, Potassium hexafluorophosphate, Bis(dichloro(η^6-*p*-cymene)ruthenium)
Solvents: Water-d_2; 30 min, reflux

Experimental Protocols

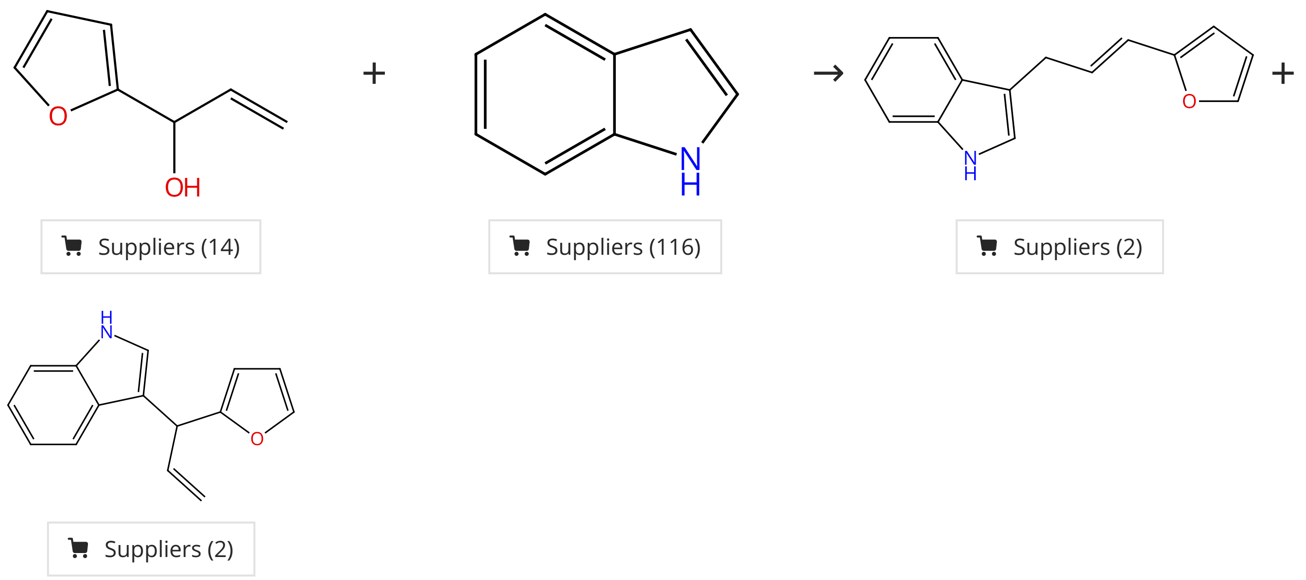
Ruthenium-Catalyzed Electrochemical Dehydrogenative Alkyne Annulation

By: Xu, Fan; et al

ACS Catalysis (2018), 8(5), 3820-3824.

Scheme 389 (1 Reaction)

Steps: **1** Yield: **59%**



31-085-CAS-1555230

Steps: **1** Yield: **59%**

1.1 **Catalysts:** (±)-1,1'-Binaphthyl-2,2'-diyl hydrogen phosphate, Ruthenium(1+), tris(acetonitrile)[(1,2,3,4,5-η)-1,2,3,4,5-pentamethyl-2,4-cyclopentadien-1-yl]-, hexafluorophosphate(1-) (1:1)
Solvents: Dimethylformamide, Acetonitrile-*d*3, Water-*d*2; 30 min, rt

Experimental Protocols

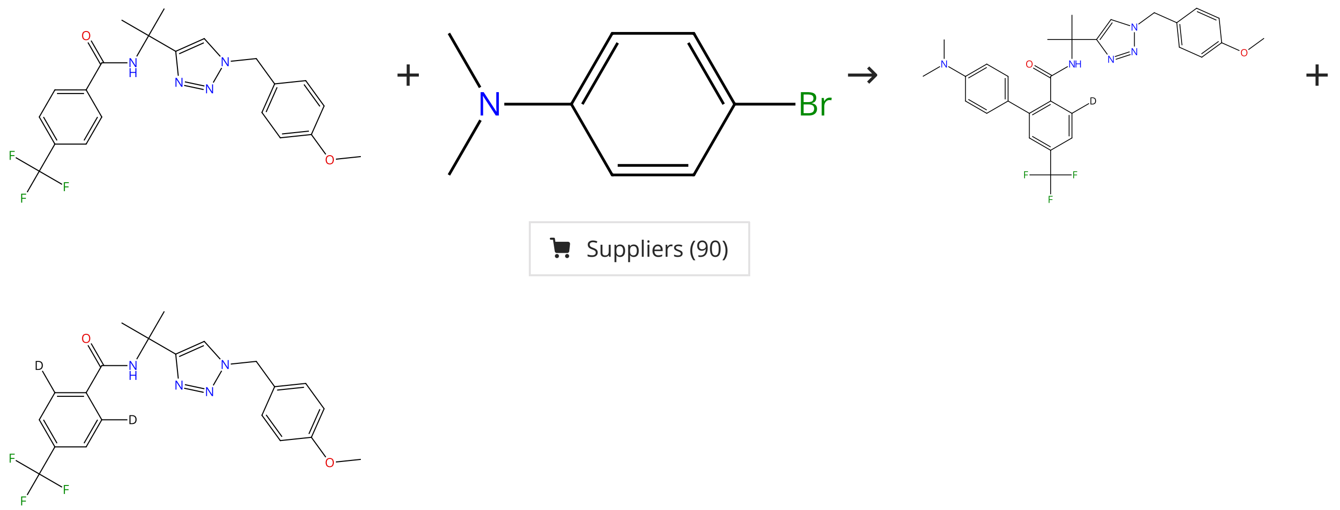
Rapid, Selective Ru-Sulfonate-Catalyzed Allylation of Indoles Using Alcohols as Substrates

By: Gruber, Stefan; et al

Organometallics (2009), 28(12), 3437-3448.

Scheme 390 (1 Reaction)

Steps: **1** Yield: **58%**



31-116-CAS-1417449

Steps: **1** Yield: **58%**

1.1 **Reagents:** Sodium carbonate, Water- *d*2
Catalysts: Dichlorotris(triphenylphosphine)ruthenium
Solvents: *o*-Xylene; 22 h, 120 °C

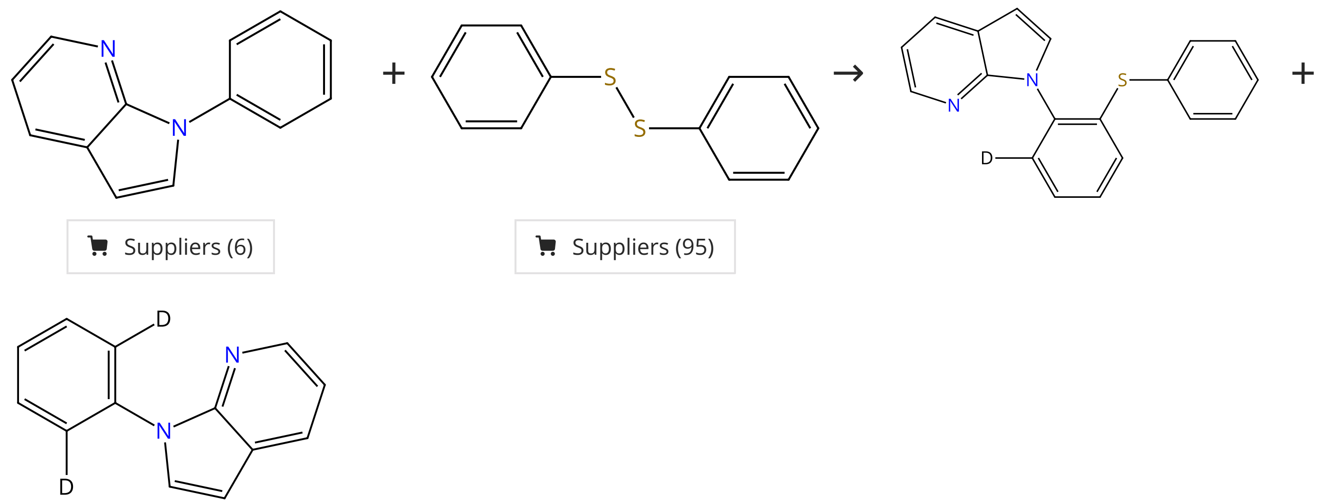
Triazole-assisted ruthenium-catalyzed C-H arylation of aromatic amides

By: Al Mamari, Hamad H.; et al

Chemistry - A European Journal (2014), 20(31), 9739-9743.

Scheme 391 (1 Reaction)

Steps: **1** Yield: **57%**



31-116-CAS-20858439

Steps: **1** Yield: **57%**

1.1 **Reagents:** Silver carbonate, Water-d_2
Catalysts: BINOL, Silver hexafluoroantimonate, Bis(dichloro (η^6-*p*-cymene)ruthenium)
Solvents: Toluene; 3 h, 100 °C

Experimental Protocols

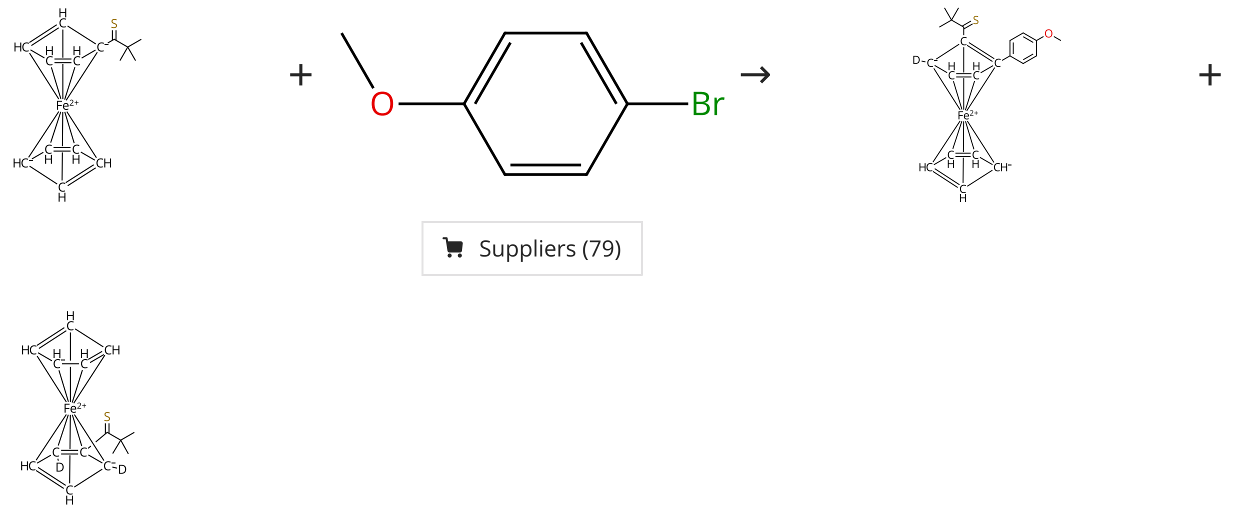
BINOL accelerated Ru(II)-catalyzed regioselective C-H functionalization of arenes with disulfides and diselenides

By: Bag, Raghunath; et al

Journal of Chemical Sciences (Berlin, Germany) (2019), 131(12), 115pp..

Scheme 392 (1 Reaction)

Steps: **1** Yield: **55%**



31-116-CAS-20076180

Steps: **1** Yield: **55%**

1.1 **Reagents:** Potassium carbonate
Catalysts: [(1,2,3,4,5,6-η)-1-Methyl-4-(1-methylethyl)benzene](tricyclo[3.3.1.1^{3,7}]decane-1-carboxylato-κ*O*)(tricyclo[3.3.1.1^{3,7}]decane-1-carboxylato-κ*O*,κ*O'*)ruthenium, Poly(oxy-1,2-ethanediyl), α-[4-[[3,4-dihydro-2,5,7,8-tetramethyl-2-(4,8,12-trimethyltridecyl)-2*H*-1-benzopyran-6-yl]oxy]-1,4-dioxobutyl]-ω-methoxy-
Solvents: Water-d_2; 12 h, 100 °C

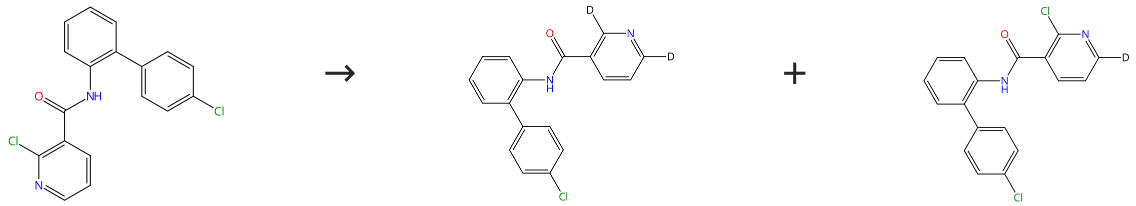
Micellar Catalysis for Ruthenium(II)-Catalyzed C-H Arylation: Weak-Coordination-Enabled C-H Activation in H_2O

By: Yetra, Santhivardhana Reddy; et al

Angewandte Chemie, International Edition (2019), 58(22), 7490-7494.

Scheme 393 (1 Reaction)

Steps: **1** Yield: **54%**



Suppliers (79)

31-113-CAS-20984036	Steps: **1** Yield: **54%**
1.1	**Reagents:** Zinc, Water-*d*$_2$, Potassium hydroxide (K(OD)) **Catalysts:** Dichlorotris(triphenylphosphine)ruthenium **Solvents:** 1,4-Dioxane; 16 h, 80 °C
Experimental Protocols	

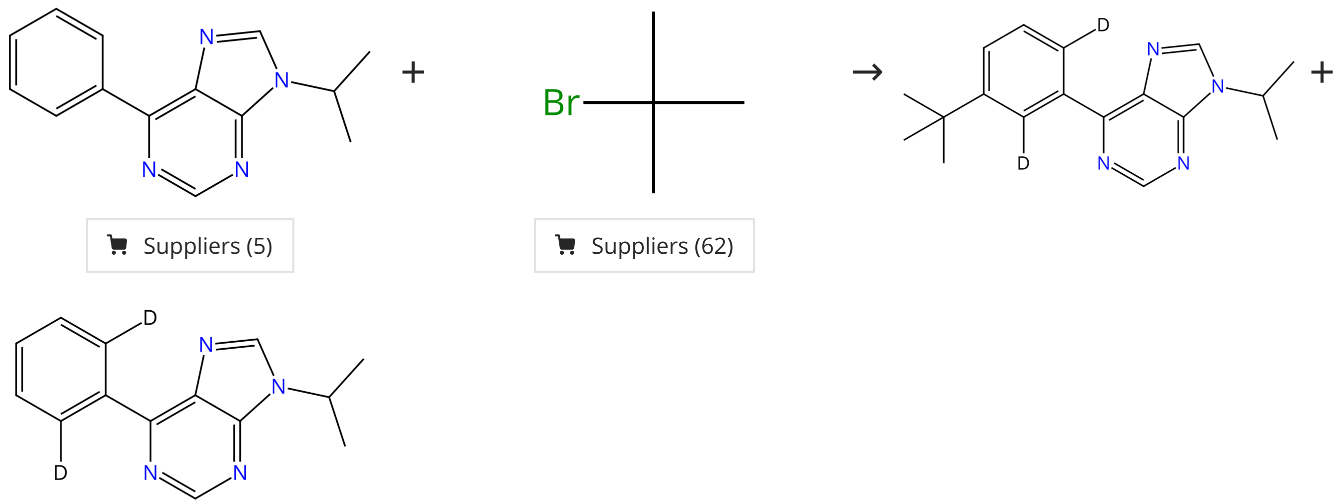
Mild, Selective Ru-Catalyzed Deuteration Using D_2O as a Deuterium Source

By: Eisele, Pascal; et al

Chemistry - A European Journal (2019), 25(72), 16550-16554.

Scheme 394 (1 Reaction)

Steps: **1** Yield: **53%**



Suppliers (5)

Suppliers (62)

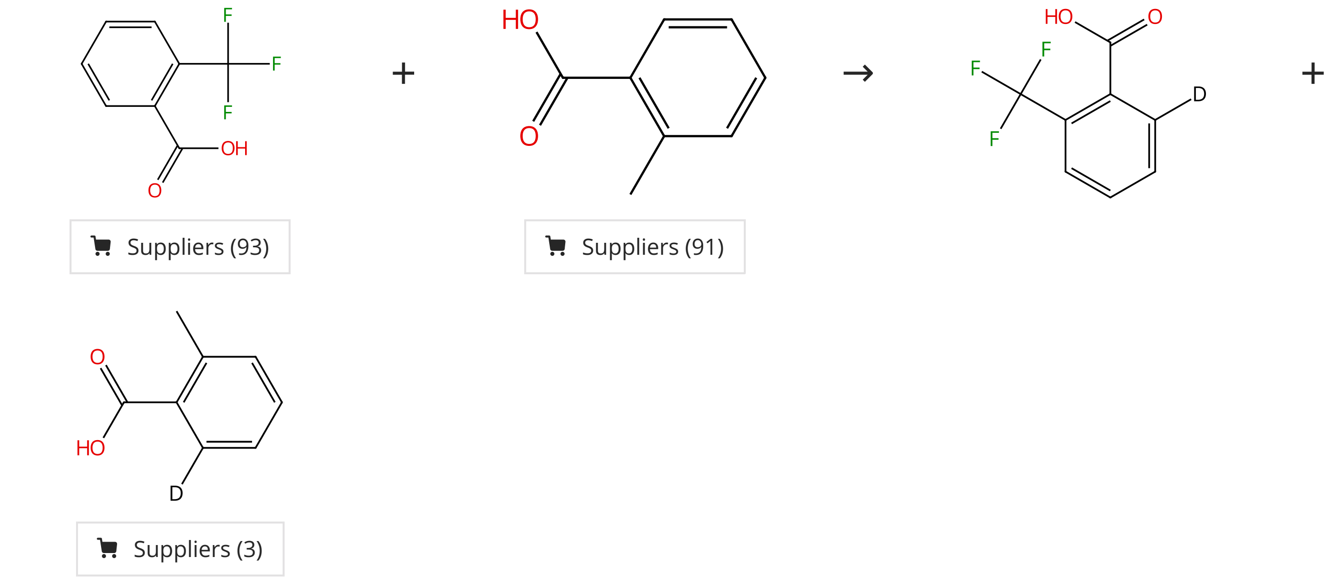
31-085-CAS-19291906	Steps: **1** Yield: **53%**
1.1	**Reagents:** Tripotassium phosphate, Water-*d*$_2$ **Catalysts:** Bis(acetato-κ*O*)bis(triphenylphosphine)ruthenium **Solvents:** 1,4-Dioxane; 18 h, 100 °C
Experimental Protocols	

Arene-Ligand-Free Ruthenium(II/III) Manifold for meta-C-H Alkylation: Remote Purine Diversification

By: Fumagalli, Fernando; et al

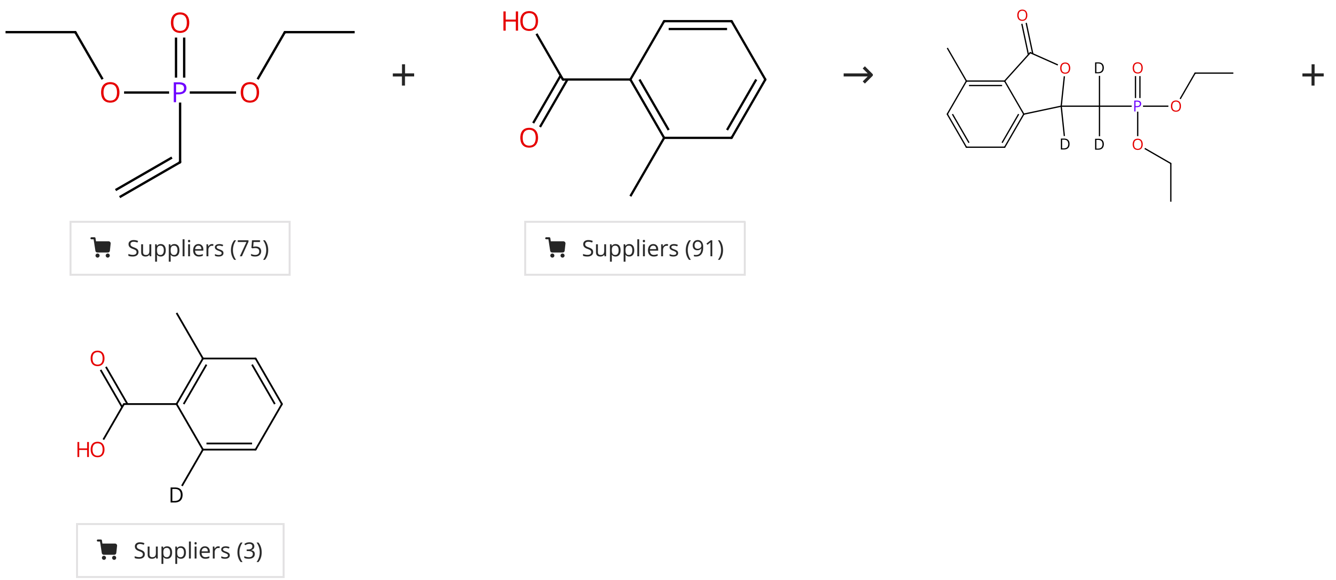
Chemistry - A European Journal (2018), 24(16), 3984-3988.

Scheme 395 (1 Reaction) Steps: **1** Yield: **52%**



31-116-CAS-20858330 Steps: **1** Yield: **52%**	**Ruthenium(II)-Catalyzed Hydrogen Isotope Exchange of Pharmaceutical Drugs by C-H Deuteration and C-H Tritiation**
1.1 **Reagents:** Water-d_2 **Catalysts:** [(1,2,3,4,5,6-η)-1-Methyl-4-(1-methylethyl)benzene](tricyclo[3.3.1.1^{3,7}]decane-1-carboxylato-κ*O*)(tricyclo[3.3.1.1^{3,7}]decane-1-carboxylato-κ*O*,κ*O'*)ruthenium **Solvents:** 1,4-Dioxane; 1.5 h, 100 °C	By: Mueller, Valentin; et al ChemCatChem (2020), 12(1), 100-104.
Experimental Protocols	

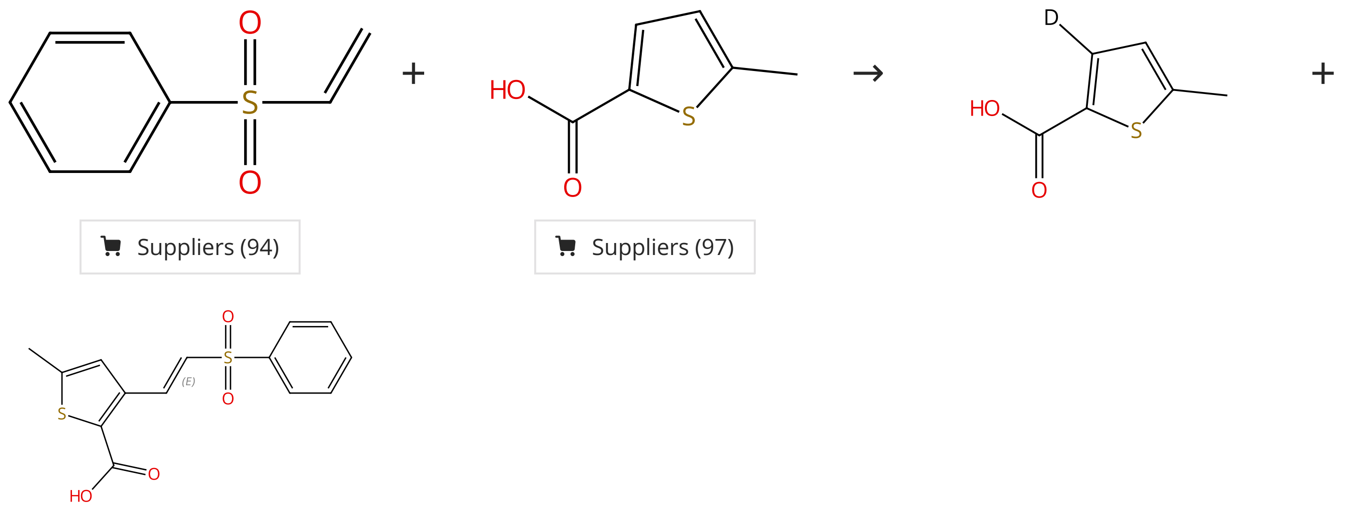
Scheme 396 (1 Reaction) Steps: **1** Yield: **52%**



31-085-CAS-22784730 Steps: **1** Yield: **52%**	**Cross-Dehydrogenative Coupling/Annulation of Arene Carboxylic Acids and Alkenes in Water with Ruthenium(II) Catalyst and Air**
1.1 **Reagents:** Potassium acetate, Oxygen **Catalysts:** Bis(dichloro(η^6-*p*-cymene)ruthenium) **Solvents:** Water-d_2; 12 h, 100 °C 1.2 **Reagents:** Hydrochloric acid **Solvents:** Water	By: Mandal, Anup; et al Chemistry - An Asian Journal (2020), 15(23), 4009-4013.
Experimental Protocols	

Scheme 397 (1 Reaction)

Steps: **1** Yield: **52%**



Double bond geometry shown

31-116-CAS-22937348

Steps: **1** Yield: **52%**

1.1 **Reagents:** Cupric acetate, Water-d_2
Catalysts: Bis(dichloro(η^6-*p*-cymene)ruthenium); 35 min, 100 °C; 100 °C → rt

1.2 **Reagents:** Acetic acid; rt

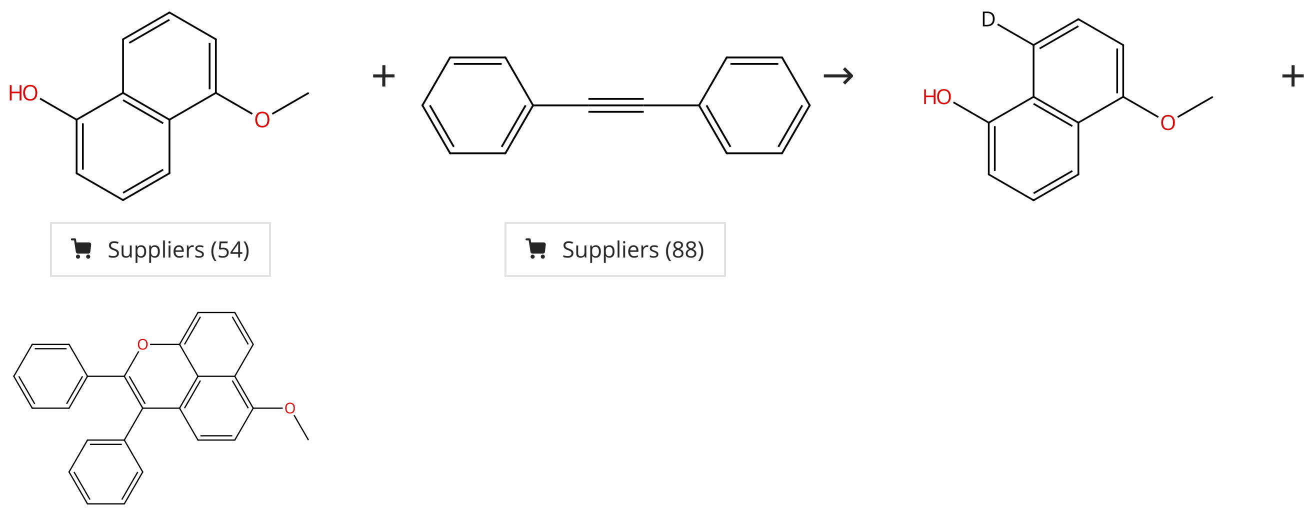
Regioselective C-H Alkenylation and Unsymmetrical Bis-olefination of Heteroarene Carboxylic Acids with Ruthenium Catalysis in Water

By: Mandal, Anup; et al

Journal of Organic Chemistry (2021), 86(1), 62-73.

Scheme 398 (1 Reaction)

Steps: **1** Yield: **52%**



31-116-CAS-15259028

Steps: **1** Yield: **52%**

1.1 **Reagents:** Cupric acetate, Water-d_2
Catalysts: Bis(dichloro(η^6-*p*-cymene)ruthenium)
Solvents: *m*-Xylene; 22 h, 80 °C

Experimental Protocols

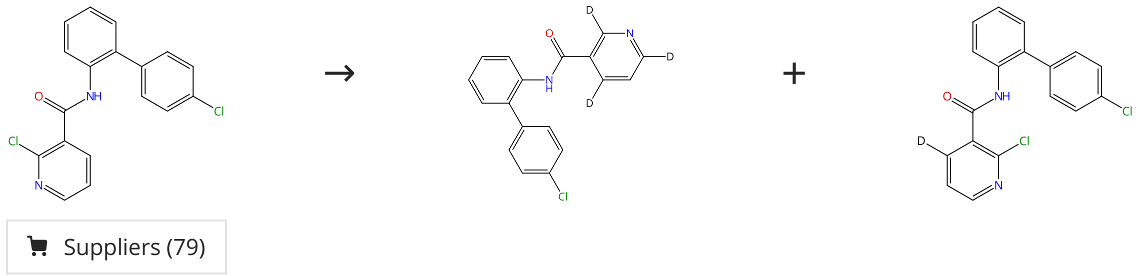
Hydroxyl-Directed Ruthenium-Catalyzed C-H Bond Functionalization: Versatile Access to Fluorescent Pyrans

By: Thirunavukkarasu, Vedhagiri S.; et al

Organic Letters (2012), 14(13), 3416-3419.

Scheme 399 (1 Reaction)

Steps: **1** Yield: **50%**



31-113-CAS-20984037

Steps: **1** Yield: **50%**

1.1 **Reagents:** Zinc, Water-d_2
Catalysts: Cuprous iodide, Dichlorotris(triphenylphosphine)ruthenium
Solvents: 1,4-Dioxane; 16 h, 80 °C

Experimental Protocols

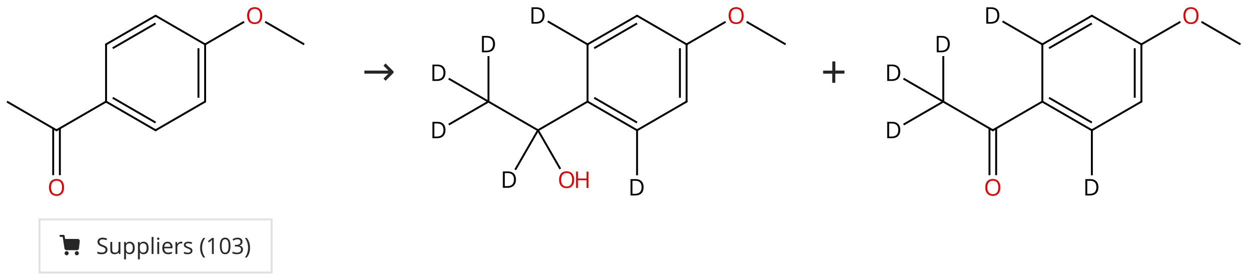
Mild, Selective Ru-Catalyzed Deuteration Using D_2O as a Deuterium Source

By: Eisele, Pascal; et al

Chemistry - A European Journal (2019), 25(72), 16550-16554.

Scheme 400 (1 Reaction)

Steps: **1** Yield: **49%**



31-116-CAS-20984006

Steps: **1** Yield: **49%**

1.1 **Reagents:** Zinc, Water-d_2, Potassium hydroxide (K(OD))
Catalysts: Dichlorotris(triphenylphosphine)ruthenium
Solvents: 1,4-Dioxane; 16 h, 80 °C

Experimental Protocols

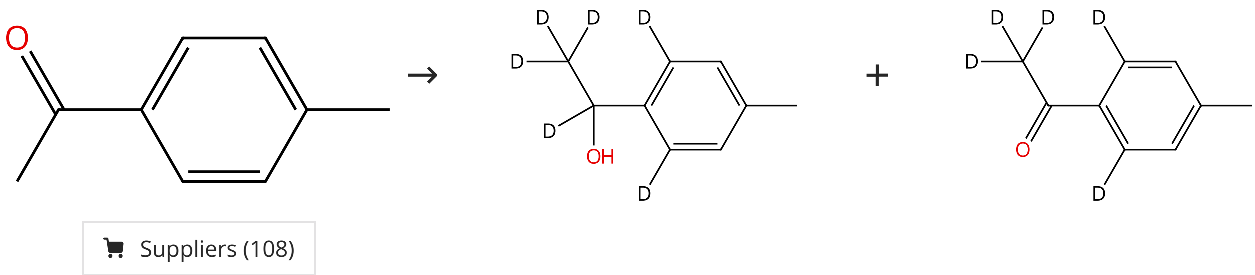
Mild, Selective Ru-Catalyzed Deuteration Using D_2O as a Deuterium Source

By: Eisele, Pascal; et al

Chemistry - A European Journal (2019), 25(72), 16550-16554.

Scheme 401 (1 Reaction)

Steps: **1** Yield: **49%**



31-116-CAS-20984003

Steps: **1** Yield: **49%**

1.1 **Reagents:** Zinc, Water-d_2, Potassium hydroxide (K(OD))
Catalysts: Dichlorotris(triphenylphosphine)ruthenium
Solvents: 1,4-Dioxane; 16 h, 80 °C

Experimental Protocols

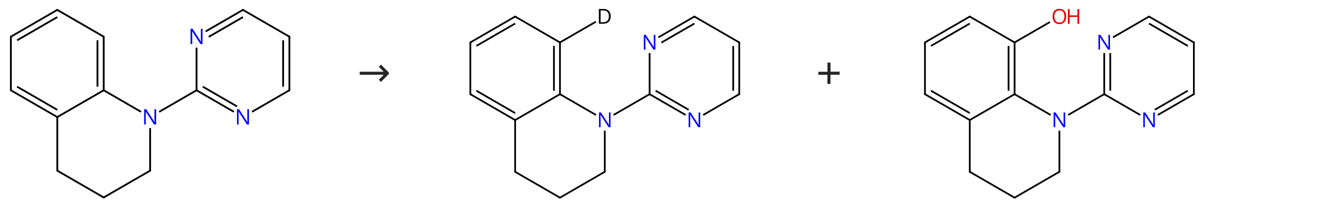
Mild, Selective Ru-Catalyzed Deuteration Using D_2O as a Deuterium Source

By: Eisele, Pascal; et al

Chemistry - A European Journal (2019), 25(72), 16550-16554.

Scheme 402 (1 Reaction)

Steps: **1** Yield: **48%**



Supplier (1)

31-100-CAS-19371236

Steps: **1** Yield: **48%**

1.1 **Reagents:** Potassium persulfate, Water-*d*$_2$, Tetrafluoroboric acid
Catalysts: Bis(dichloro(η^6-*p*-cymene)ruthenium)
Solvents: Acetone, 1,2-Dichloroethane; 7 h, 100 °C

Experimental Protocols

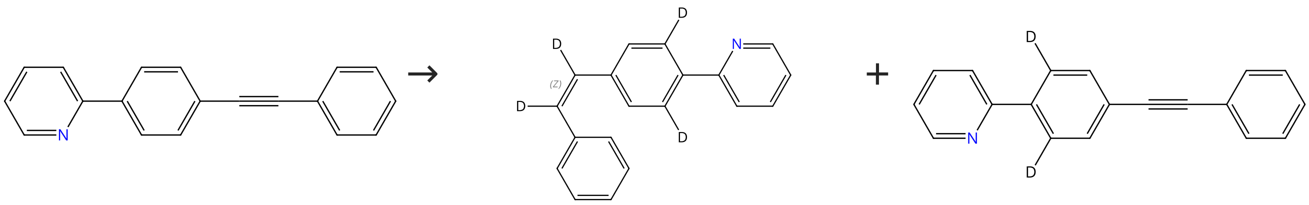
Ruthenium(II)-Catalyzed Regioselective C-8 Hydroxylation of 1, 2,3,4-Tetrahydroquinolines

By: Chen, Changjun; et al

Organic Letters (2018), 20(21), 6799-6803.

Scheme 403 (1 Reaction)

Steps: **1** Yield: **47%**



Suppliers (2)

Double bond geometry shown

31-116-CAS-20984030

Steps: **1** Yield: **47%**

1.1 **Reagents:** Zinc, Water-*d*$_2$
Catalysts: Cuprous iodide, Dichlorotris(triphenylphosphine) ruthenium
Solvents: 1,4-Dioxane; 16 h, 80 °C

Experimental Protocols

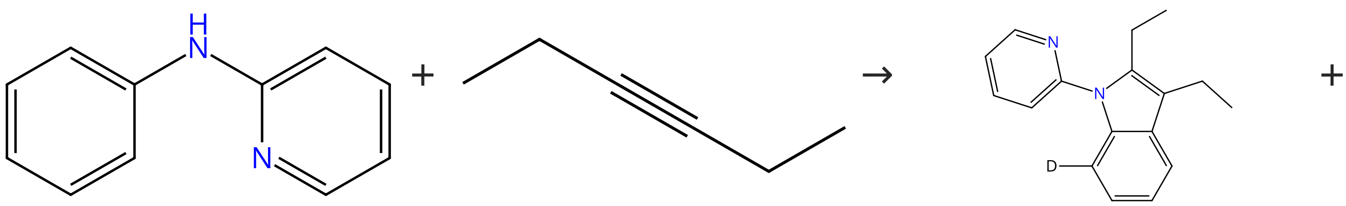
Mild, Selective Ru-Catalyzed Deuteration Using D_2O as a Deuterium Source

By: Eisele, Pascal; et al

Chemistry - A European Journal (2019), 25(72), 16550-16554.

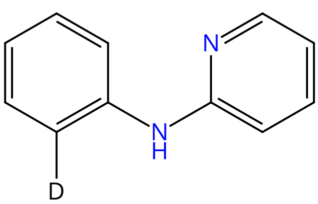
Scheme 404 (1 Reaction)

Steps: **1** Yield: **45%**



Suppliers (73)

Suppliers (53)



Supplier (1)

31-116-CAS-3420473 Steps: **1** Yield: **45%**

1.1 **Reagents:** Cupric acetate, (*SP*-5-41)-[1,3-Bis(2,4,6-trimethylphenyl)-2-imidazolidinylidene]dichloro[[2-(1-methylethoxy-κ*O*)phenyl]methylene-κ*C*]ruthenium
Catalysts: Ruthenium(1+), tri-μ-chlorobis[(1,2,3,4,5,6-η)-1-methyl-4-(1-methylethyl)benzene]di-, hexafluorophosphate(1-) (1:1)
Solvents: Water-d_2; 10 min, 100 °C

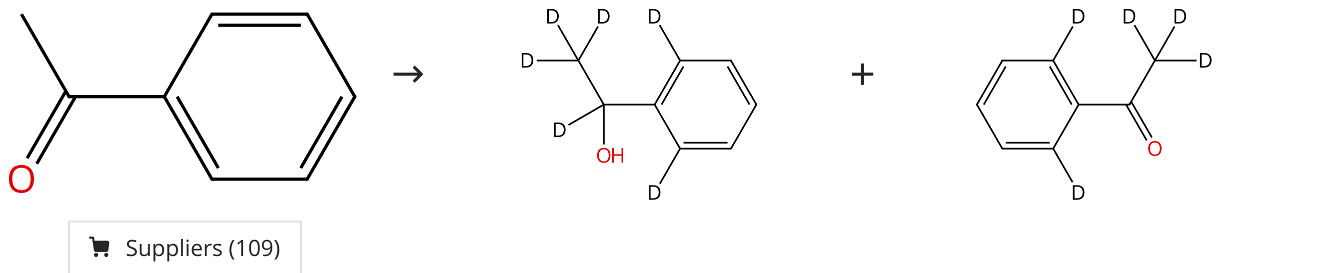
Experimental Protocols

Cationic Ruthenium(II) Catalysts for Oxidative C-H/N-H Bond Functionalizations of Anilines with Removable Directing Group: Synthesis of Indoles in Water

By: Ackermann, Lutz; et al

Organic Letters (2012), 14(3), 764-767.

Scheme 405 (1 Reaction) Steps: **1** Yield: **45%**



31-116-CAS-20984000 Steps: **1** Yield: **45%**

1.1 **Reagents:** Zinc, Water-d_2, Potassium hydroxide (K(OD))
Catalysts: Dichlorotris(triphenylphosphine)ruthenium
Solvents: 1,4-Dioxane; 16 h, 80 °C

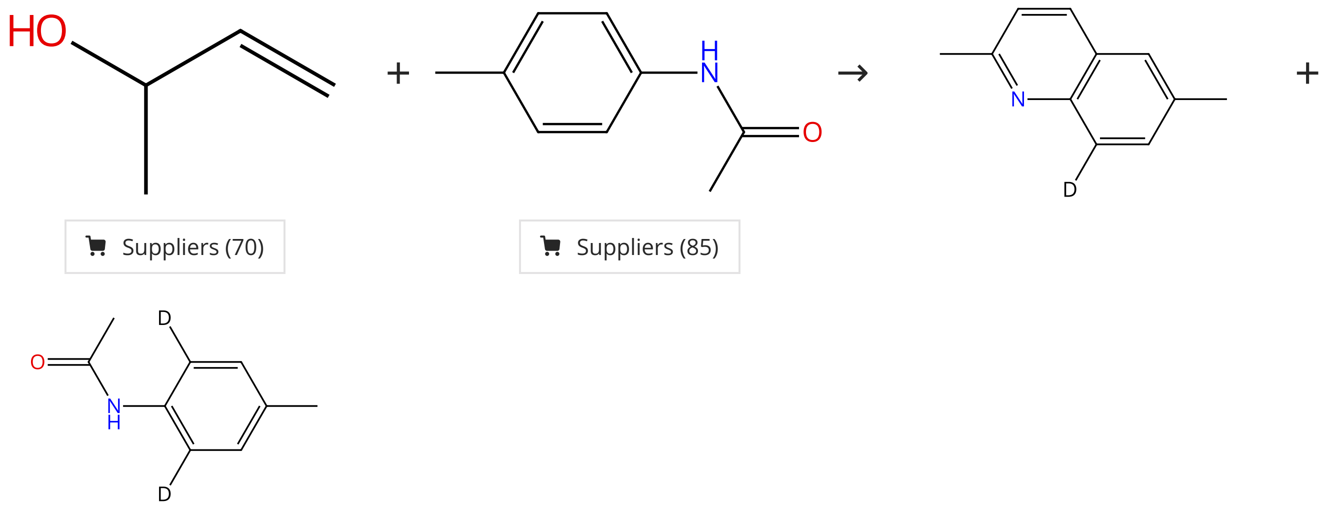
Experimental Protocols

Mild, Selective Ru-Catalyzed Deuteration Using D_2O as a Deuterium Source

By: Eisele, Pascal; et al

Chemistry - A European Journal (2019), 25(72), 16550-16554.

Scheme 406 (1 Reaction) Steps: **1** Yield: **44%**



31-032-CAS-17135863 Steps: **1** Yield: **44%**

1.1 **Reagents:** Copper diacetate monohydrate, Water-d_2, Silver hexafluoroantimonate
Catalysts: Bis(dichloro(η^6-*p*-cymene)ruthenium)
Solvents: Tetrahydrofuran; rt → 120 °C; 6 h, 120 °C

Experimental Protocols

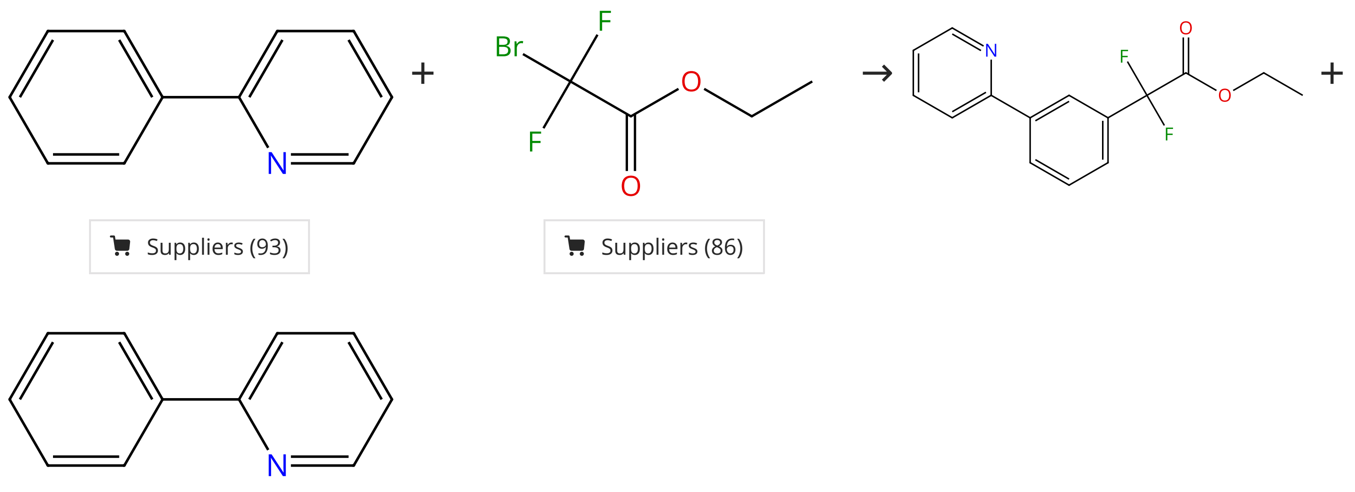
Traceless Directing-Group Strategy in the Ru-Catalyzed, Formal [3 + 3] Annulation of Anilines with Allyl Alcohols: A One-Pot, Domino Approach for the Synthesis of Quinolines

By: Kumar, Gangam Srikanth; et al

Organic Letters (2017), 19(10), 2494-2497.

Scheme 407 (1 Reaction)

Steps: **1** Yield: **43%**



31-614-CAS-29904744	Steps: **1** Yield: **43%**

1.1 **Reagents:** Sodium carbonate, Water-d_2
Catalysts: Tris[4-(trifluoromethyl)phenyl]phosphine, [(1,2,3,4,5,6-η)-1-Methyl-4-(1-methylethyl)benzene](2,4,6-trimethylbenzoato-κ*O*)(2,4,6-trimethylbenzoato-κ*O*,κ*O*')ruthenium
Solvents: 1,4-Dioxane; 1 h, 60 °C

Experimental Protocols

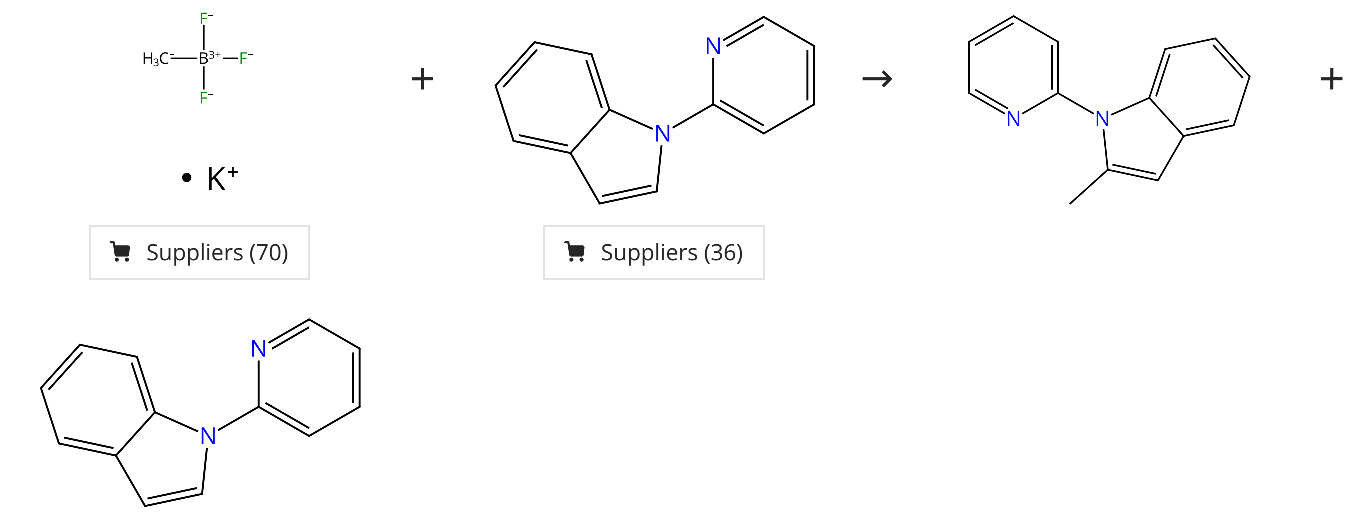
Ruthenium(II)-Catalyzed meta C-H Mono- and Difluoromethylations by Phosphine/Carboxylate Cooperation

By: Ruan, Zhixiong; et al

Angewandte Chemie, International Edition (2017), 56(8), 2045-2049.

Scheme 408 (1 Reaction)

Steps: **1** Yield: **41%**



31-614-CAS-29075871	Steps: **1** Yield: **41%**

1.1 **Reagents:** Silver fluoride, Water-d_2
Catalysts: Silver hexafluoroantimonate, Bis(dichloro(η^6-*p*-cymene)ruthenium)
Solvents: 1,2-Dichloroethane; 20 h, 120 °C

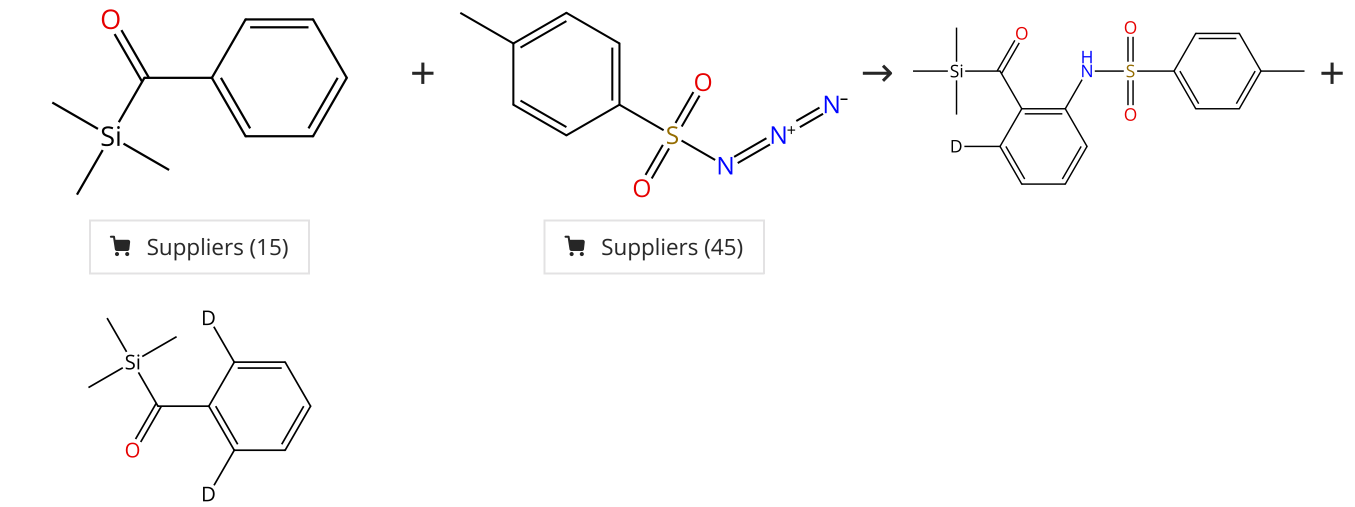
Ruthenium(II)-Catalyzed C-H Methylation with Trifluoroborates

By: Tonin, Marlon Daniel Lima; et al

Synthesis (2017), 49(1), 127-134.

Scheme 409 (1 Reaction)

Steps: **1** Yield: **41%**



31-614-CAS-23926404

Steps: **1** Yield: **41%**

1.1 **Reagents:** Cupric acetate, Water-d_2
Catalysts: Sodium acetate, Silver hexafluoroantimonate, Bis (dichloro(η^6-*p*-cymene)ruthenium)
Solvents: Dichloromethane; 12 h, rt → 90 °C

Experimental Protocols

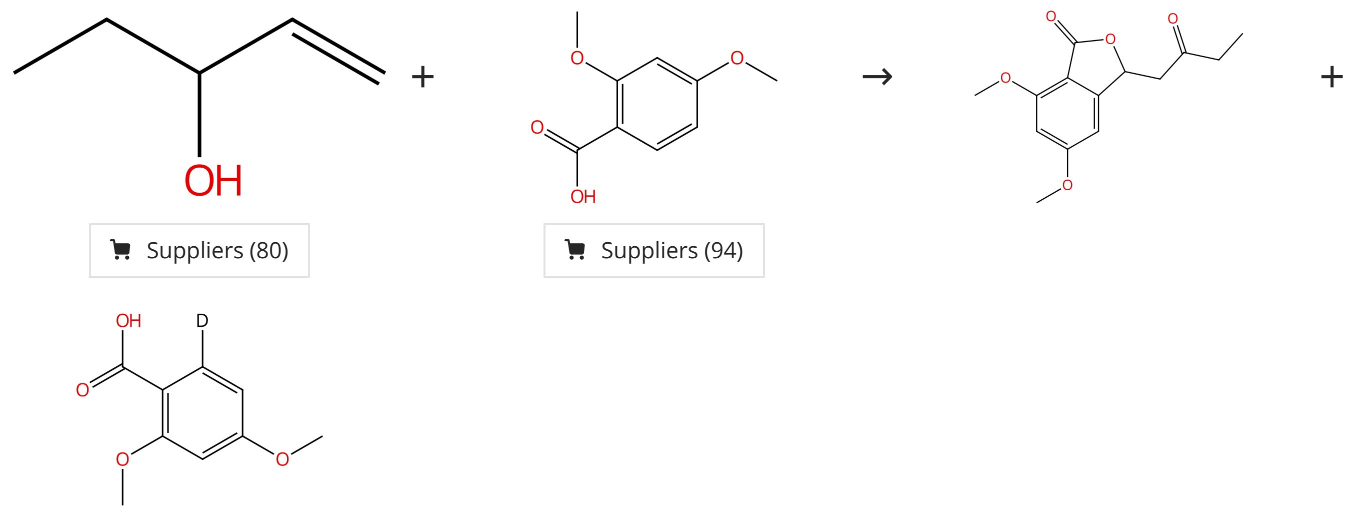
Ruthenium-catalyzed C-H amination of aroylsilanes

By: Yu, Feifei; et al

Organic & Biomolecular Chemistry (2021), 19(28), 6313-6321.

Scheme 410 (1 Reaction)

Steps: **1** Yield: **41%**



31-614-CAS-30933433

Steps: **1** Yield: **41%**

1.1 **Solvents:** Tetrahydrofuran; 5 - 10 min, rt

1.2 **Reagents:** Water-d_2, Silver hexafluoroantimonate
Catalysts: Cupric acetate, Bis(dichloro(η^6-*p*-cymene) ruthenium); rt → 110 °C; 18 h, 110 °C; 110 °C → rt

Experimental Protocols

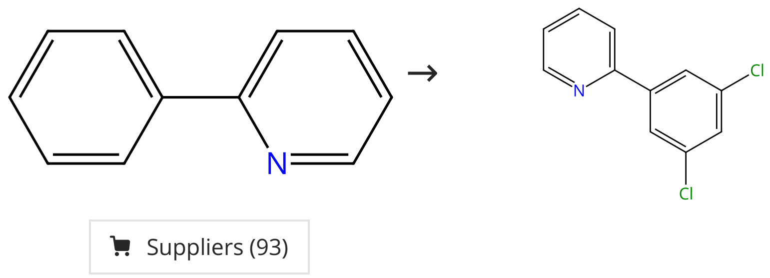
Ruthenium-Catalyzed C-H Functionalization of Benzoic Acids with Allyl Alcohols: A Controlled Reactivity Switch between C-H Alkenylation and C-H Alkylation Pathways

By: Kumar, Gangam Srikanth; et al

Organic Letters (2018), 20(16), 4934-4937.

Scheme 411 (1 Reaction)

Steps: 1 Yield: 37%



31-614-CAS-27418086

Steps: 1 Yield: 37%

1.1 **Reagents:** Bis(trifluoroacetoxy)iodobenzene, Water-d_2, 3*H*-3a,6-Methano-2,1-benzisothiazole, 1-chlorohexahydro-8,8-dimethyl-, 2,2-dioxide, (3a*R*,6*S*,7a*S*)-
Catalysts: Triruthenium dodecacarbonyl, 1*H*-Imidazolium, 4,5-dihydro-1,3-bis(2,4,6-trimethylphenyl)-, chloride (1:1)
Solvents: Bromobenzene; 48 h, 95 °C

Experimental Protocols

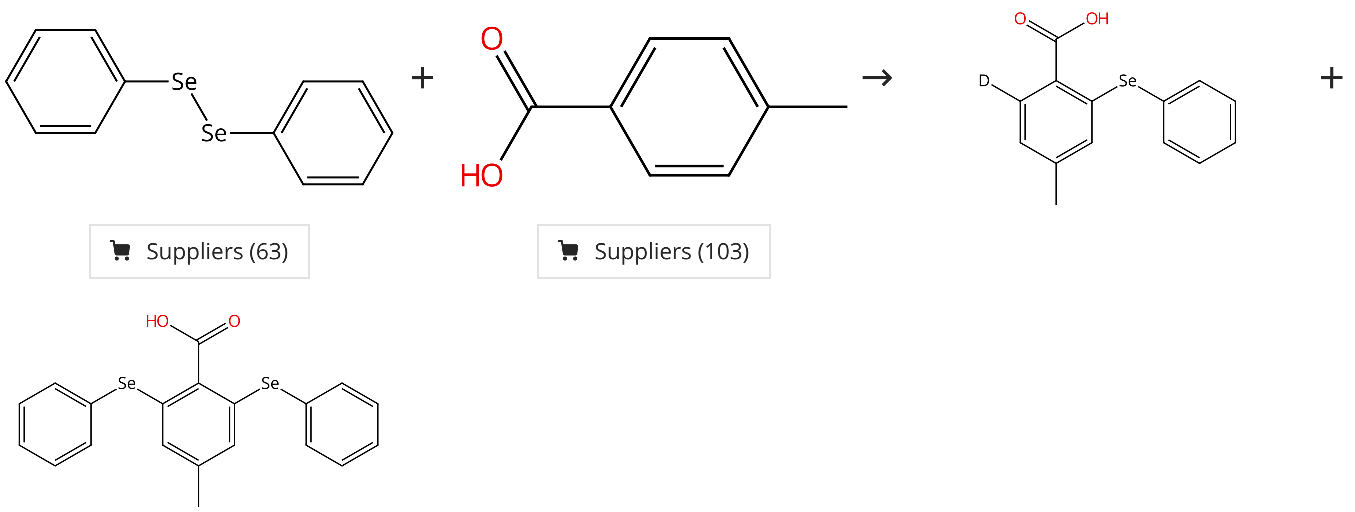
Ligand-promoted ruthenium-catalyzed meta C-H chlorination of arenes using N-chloro-2,10-camphorsultam

By: Fan, Zhoulong; et al

Chemical Communications (Cambridge, United Kingdom) (2018), 54(47), 6008-6011.

Scheme 412 (1 Reaction)

Steps: 1 Yield: 31%



31-116-CAS-17088130

Steps: 1 Yield: 31%

1.1 **Reagents:** Sodium bicarbonate, Water-d_2
Catalysts: Tricyclohexylphosphine, Bis(dichloro(η^6-*p*-cymene) ruthenium)
Solvents: Dimethylformamide; 6 h, 100 °C; 100 °C → rt

1.2 **Reagents:** Acetic acid

Experimental Protocols

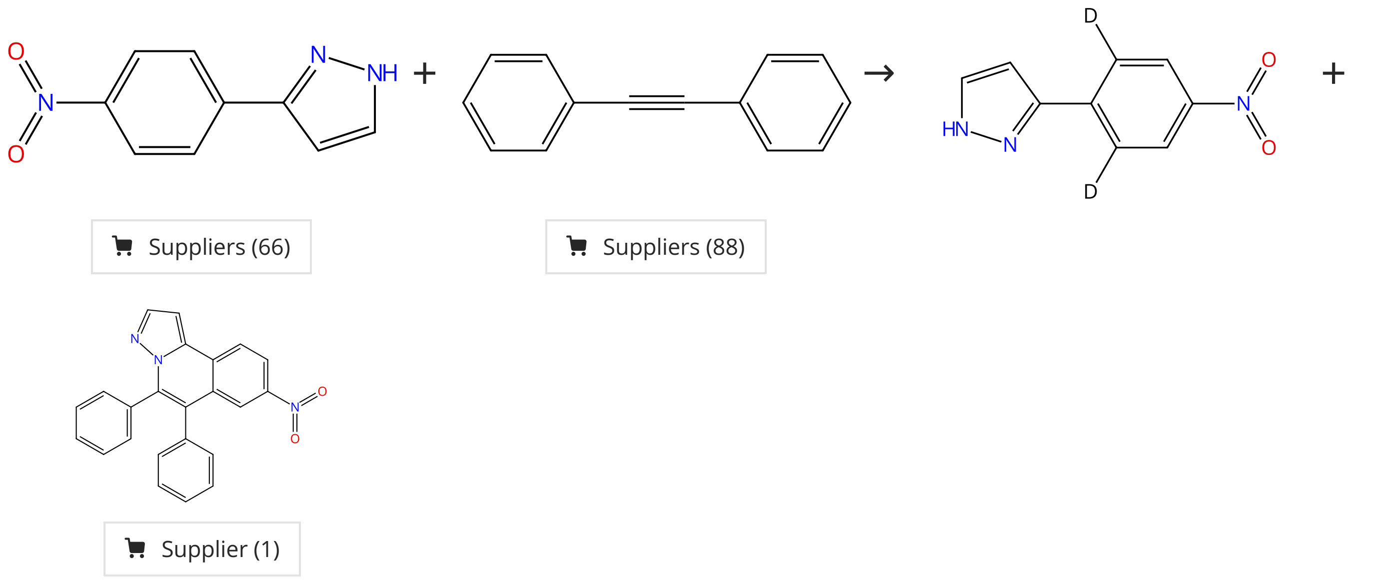
Ruthenium(II)-Catalyzed ortho-C-H Chalcogenation of Benzoic Acids via Weak O-Coordination: Synthesis of Chalcogeno xanthones

By: Mandal, Anup; et al

Organic Letters (2017), 19(9), 2430-2433.

Scheme 413 (1 Reaction)

Steps: **1** Yield: **28%**



31-116-CAS-7001455	Steps: **1** Yield: **28%**
1.1	**Reagents:** Copper diacetate monohydrate, Oxygen **Catalysts:** Silver hexafluoroantimonate, Bis(dichloro(η^6-*p*-cymene)ruthenium) **Solvents:** 1,2-Dichloroethane, Water-d_2; 5 min, rt; 8 h, 100 °C
Experimental Protocols	

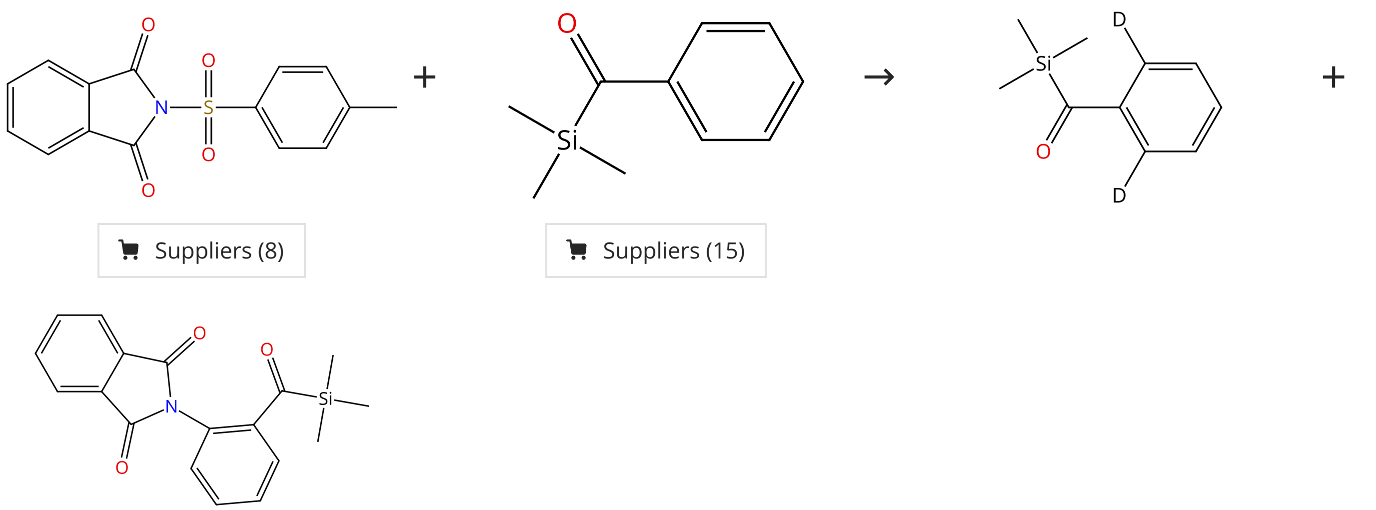
Ruthenium-catalyzed alkyne annulations with substituted 1H-pyrazoles by C-H/N-H bond functionalizations

By: Ma, Wenbo; et al

Organic Letters (2012), 14(24), 6318-6321.

Scheme 414 (1 Reaction)

Steps: **1** Yield: **28%**



31-614-CAS-23926354	Steps: **1** Yield: **28%**
1.1	**Reagents:** Water-d_2 **Catalysts:** Silver oxide (Ag_2O), Bis(dichloro(η^6-*p*-cymene) ruthenium), [1,1,1-Trifluoro-*N*-[(trifluoromethyl)sulfonyl-κ*O*] methanesulfonamidato-κ*O*]silver **Solvents:** Dichloromethane; 12 h, rt → 90 °C
Experimental Protocols	

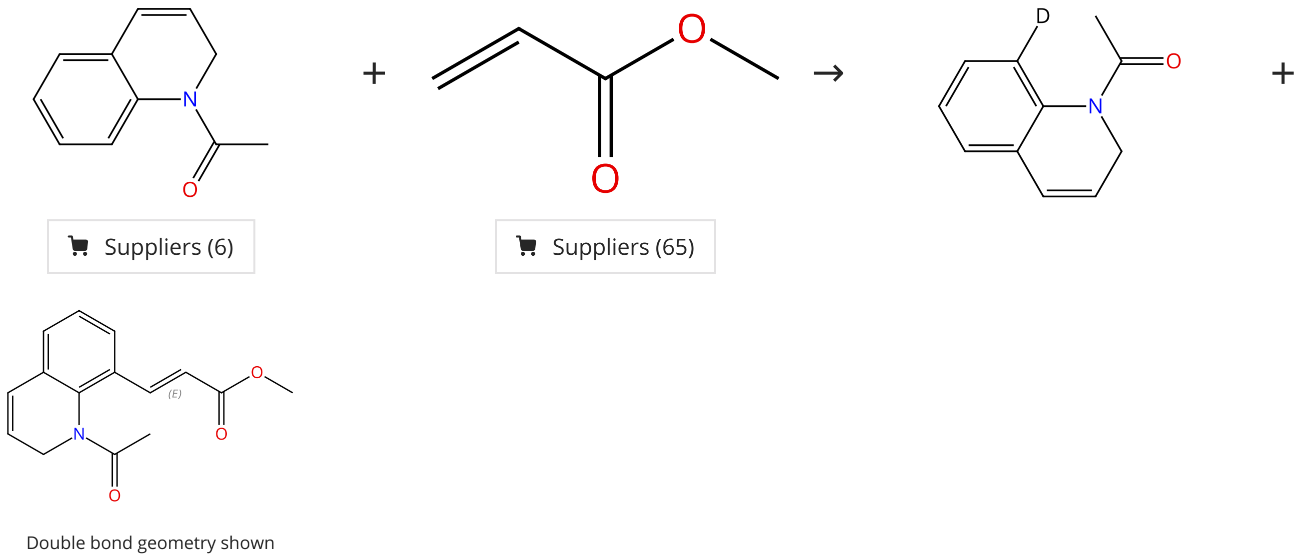
Ruthenium-catalyzed C-H amination of aroylsilanes

By: Yu, Feifei; et al

Organic & Biomolecular Chemistry (2021), 19(28), 6313-6321.

Scheme 415 (1 Reaction)

Steps: **1** Yield: **25%**



Double bond geometry shown

31-116-CAS-21440455

Steps: **1** Yield: **25%**

1.1 **Reagents:** Cupric acetate, Water-d_2
Catalysts: Silver hexafluoroantimonate, Bis(dichloro(η^6-*p*-cymene)ruthenium)
Solvents: Toluene; rt → 100 °C; 12 h, 100 °C

Experimental Protocols

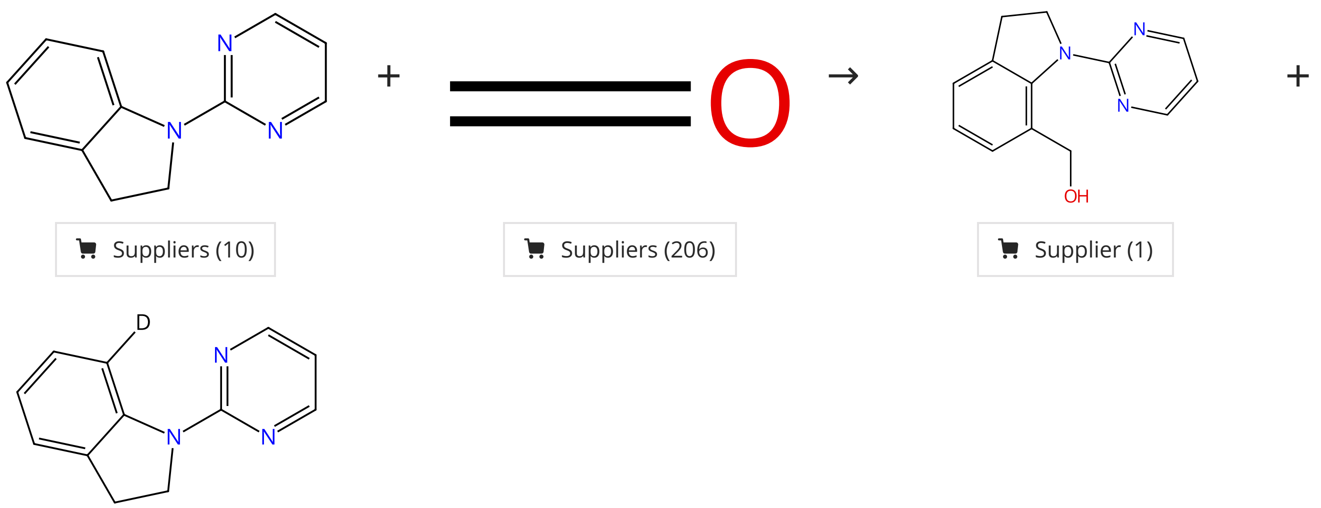
Catalyst Control in Switching the Site Selectivity of C-H Olefinations of 1,2-Dihydroquinolines: An Approach to Positional-Selective Functionalization of Quinolines

By: Das, Riki; et al

Chemistry - A European Journal (2020), 26(4), 927-938.

Scheme 416 (1 Reaction)

Steps: **1** Yield: **22%**



31-116-CAS-20134503

Steps: **1** Yield: **22%**

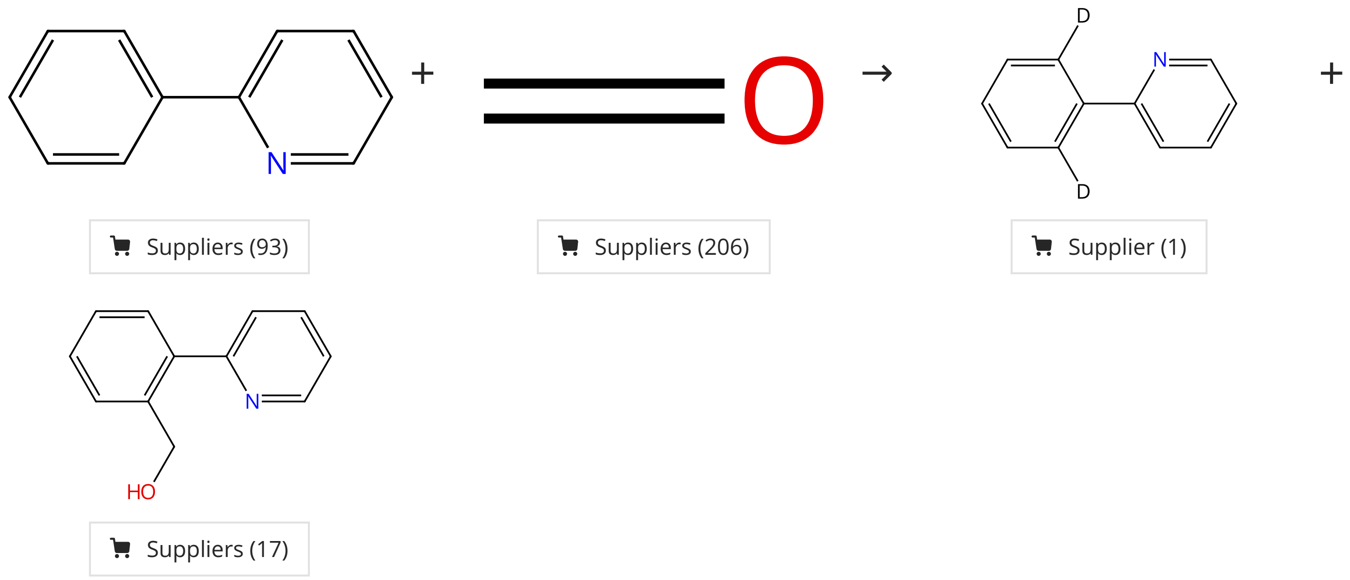
1.1 **Reagents:** Water-d_2
Catalysts: Sodium acetate, Copper(II) triflate, Bis(dichloro(η^6-*p*-cymene)ruthenium)
Solvents: 1,2-Dichloroethane; 30 min, 60 °C

Ru(II)-catalyzed regioselective C-7 hydroxymethylation of indolines with formaldehyde

By: Chen, Yanni; et al

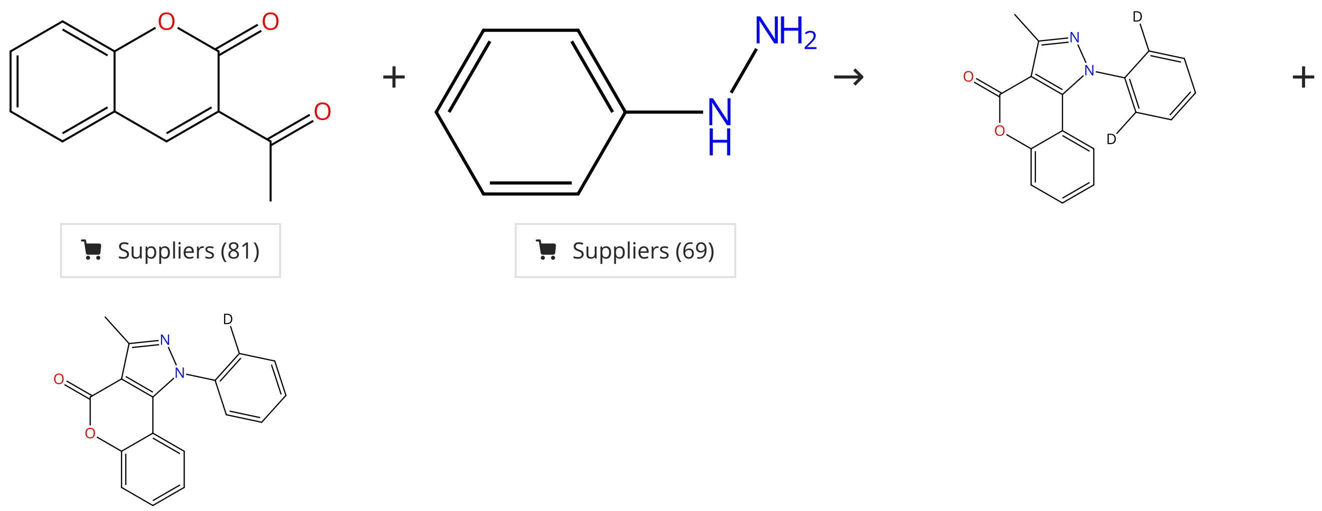
Tetrahedron Letters (2019), 60(22), 1481-1486.

Scheme 417 (1 Reaction) Steps: **1** Yield: **15%**



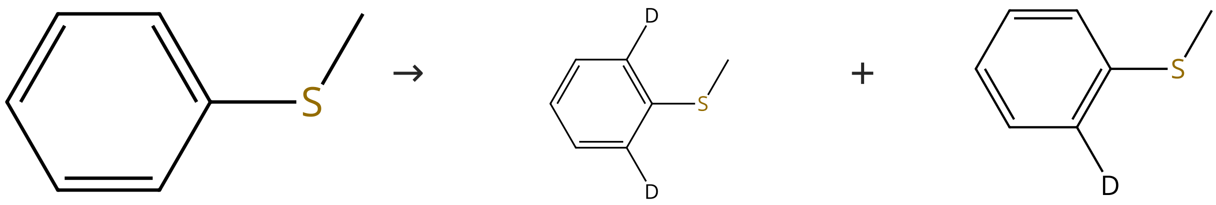
31-116-CAS-16870489 Steps: **1** Yield: **15%**	**Ruthenium-Catalyzed Direct Hydroxymethylation of Aryl C-H Bonds**
1.1 **Reagents:** Water-d_2 **Catalysts:** Monosodium phosphate, Silver hexafluoro phosphate, Bis(dichloro(η^6-*p*-cymene)ruthenium) **Solvents:** Dichloroethane; 0.5 h, 60 °C	By: Wu, Yunxiang; et al ACS Catalysis (2017), 7(3), 2213-2217.
Experimental Protocols	

Scheme 418 (1 Reaction) Steps: **1**



31-614-CAS-35212741 Steps: **1**	**One-Pot Cascade Access to Ru(II)-Catalyzed Regioselective C (sp^2)-H Activation/Alkenylation of Chromeno[4,3-c]pyrazol-4-ones and Their Emission Solvatochromic Studies**
1.1 **Reagents:** Cupric acetate, Water-d_2 **Catalysts:** Bis(dichloro(η^6-*p*-cymene)ruthenium) **Solvents:** 1,2-Dichloroethane; 8 h, 120 °C 1.2 **Reagents:** Dichloromethane	By: Singla, Dinesh; et al Journal of Organic Chemistry (2022), 87(24), 16436-16448.
Experimental Protocols	

Scheme 419 (1 Reaction) Steps: 1



Suppliers (88) Supplier (1)

31-614-CAS-38662072 Steps: 1

1.1 **Reagents:** Silver trifluoroacetate
Catalysts: Bis(dichloro(η^6-*p*-cymene)ruthenium)
Solvents: 2,2,2-Trifluoroethanol, Water-d_2; 16 h, 60 °C

Ruthenium(II)-Catalyzed S(II)-Directed Aromatic C-H Allylation with Vinylaziridines

By: Duan, Yu-Tong; et al

Journal of Organic Chemistry (2023), 88(23), 16076-16090.

Scheme 420 (1 Reaction) Steps: 1

Suppliers (93) Suppliers (410)

Suppliers (6)

31-116-CAS-22950742 Steps: 1

1.1 **Reagents:** *tert*-Butyl peroxide
Catalysts: Tripotassium phosphate, Bis(dichloro(η^6-*p*-cymene) ruthenium)
Solvents: Tetrahydrofuran, Water-d_2; 12 h, 120 °C

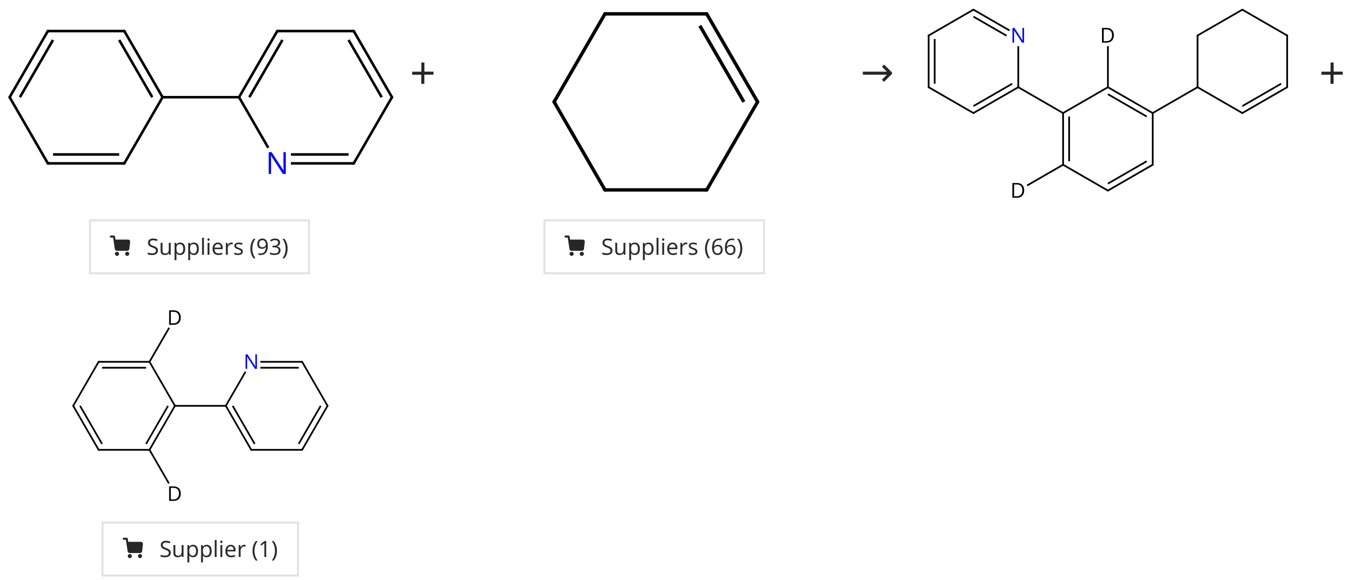
Meta-Dehydrogenative Alkylation of Arenes with Ethers, Ketones, and Esters Catalyzed by Ruthenium

By: Li, Gang; et al

Organic Letters (2020), 22(22), 8758-8763.

Scheme 421 (1 Reaction)

Steps: **1**



31-614-CAS-31940375

Steps: **1**

1.1 **Reagents:** *tert*-Butyl peroxide, Water-d_2
Catalysts: Dichlorotris(triphenylphosphine)ruthenium; 12 h, 120 °C

Experimental Protocols

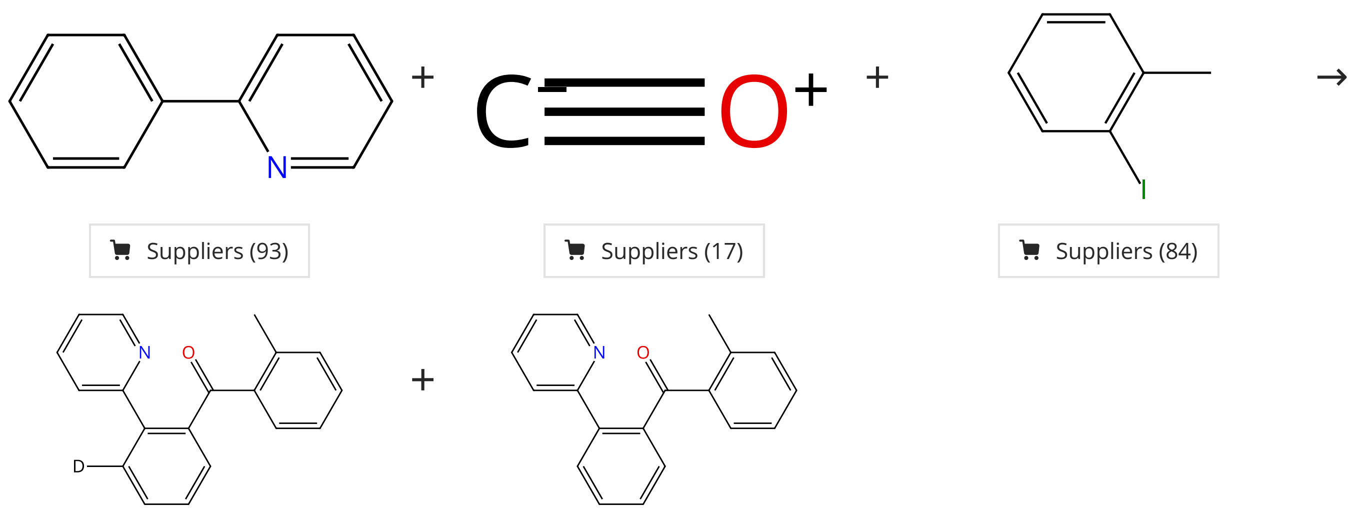
meta-Allylation of Arenes via Ruthenium-Catalyzed Cross-Dehydrogenative Coupling

By: Jia, Chunqi; et al

Journal of Organic Chemistry (2022), 87(10), 6934-6941.

Scheme 422 (1 Reaction)

Steps: **1**



31-116-CAS-15140754

Steps: **1**

1.1 **Reagents:** Sodium bicarbonate, Benzoxazole, Water-d_2
Catalysts: Potassium acetate, Dichloro[(1,2,5,6-η)-1,5-cyclooctadiene]ruthenium
Solvents: Water-d_2; 30 bar, rt; 20 h, 120 °C

Experimental Protocols

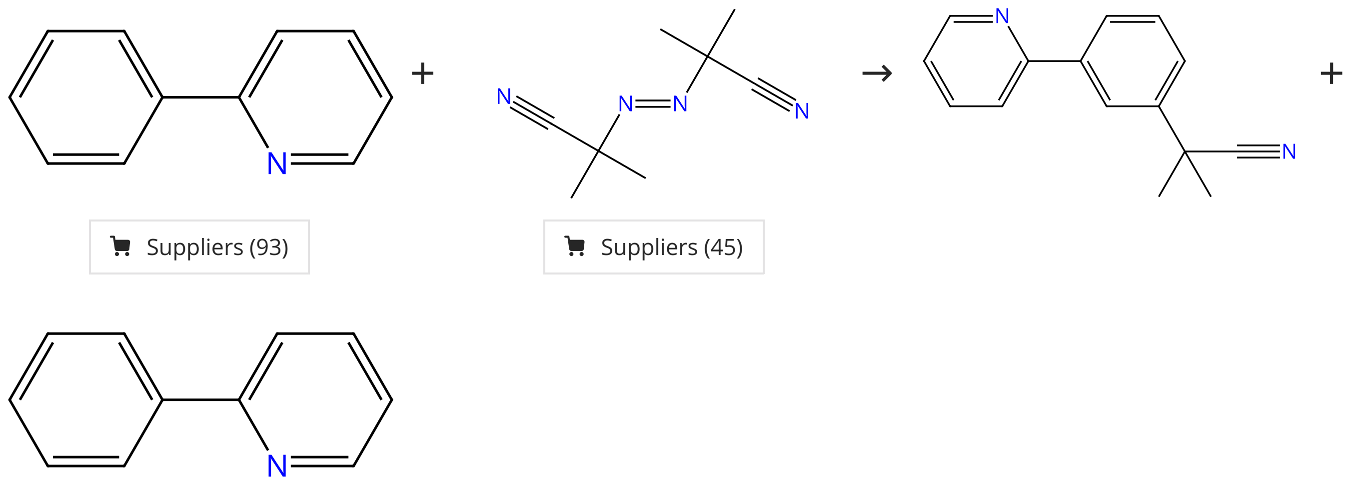
Ruthenium-Catalyzed Carbonylative C-C Coupling in Water by Directed C-H Bond Activation

By: Tlili, Anis; et al

Angewandte Chemie, International Edition (2013), 52(24), 6293-6297.

Scheme 423 (1 Reaction)

Steps: 1



Suppliers (93)

Suppliers (45)

31-614-CAS-24910278	Steps: 1
1.1	**Reagents:** Water-d_2 **Catalysts:** Ruthenium trichloride **Solvents:** Dimethylformamide; 12 h, 120 °C
Experimental Protocols	

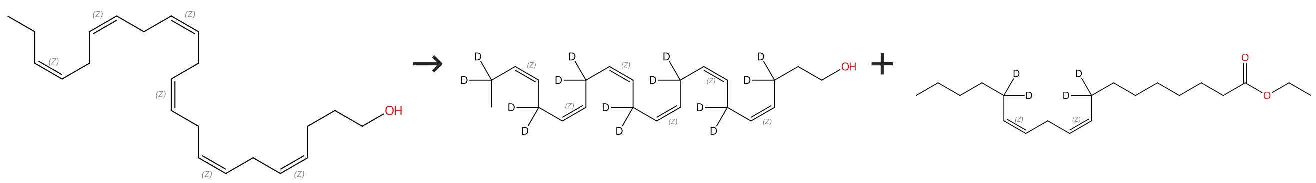
AIBN for Ru-catalyzed meta-C_{Ar}-H alkylation

By: Yang, Suling; et al

Organic Chemistry Frontiers (2020), 7(17), 2474-2479.

Scheme 424 (1 Reaction)

Steps: 1



Double bond geometry shown

Double bond geometry shown

Double bond geometry shown

Suppliers (15)

31-116-CAS-17923442	Steps: 1
1.1	**Reagents:** Water-d_2 **Catalysts:** Ruthenium(1+), tris(acetonitrile)(η^5-2,4-cyclopentadien-1-yl)-, hexafluorophosphate(1-) (1:1) **Solvents:** Acetone; 18 h, rt
1.2	**Reagents:** Hydrochloric acid **Solvents:** Water; 15 min, rt
Experimental Protocols	

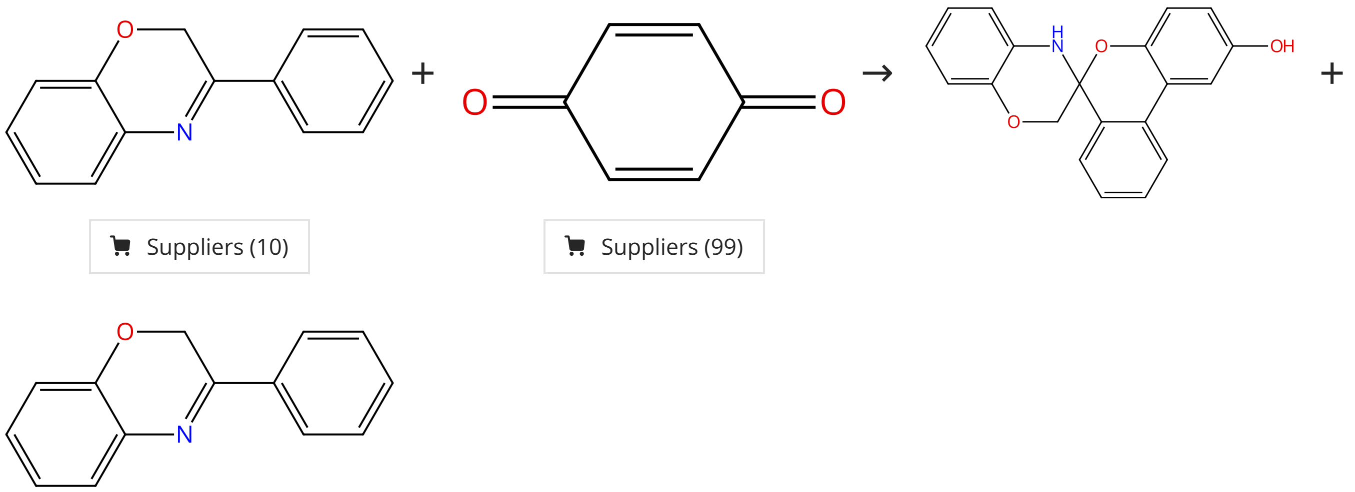
Site-Specific Deuteration of Polyunsaturated Alkenes

By: Smarun, A. V.; et al

Journal of Organic Chemistry (2017), 82(24), 13115-13120.

Scheme 425 (1 Reaction)

Steps: 1



31-614-CAS-39025352	Steps: 1
1.1	**Reagents:** Cupric acetate, Water-d_2 **Catalysts:** Silver hexafluoroantimonate, Bis(dichloro(η^6-*p*-cymene)ruthenium) **Solvents:** 1,2-Dichloroethane; 4 h, rt
Experimental Protocols	

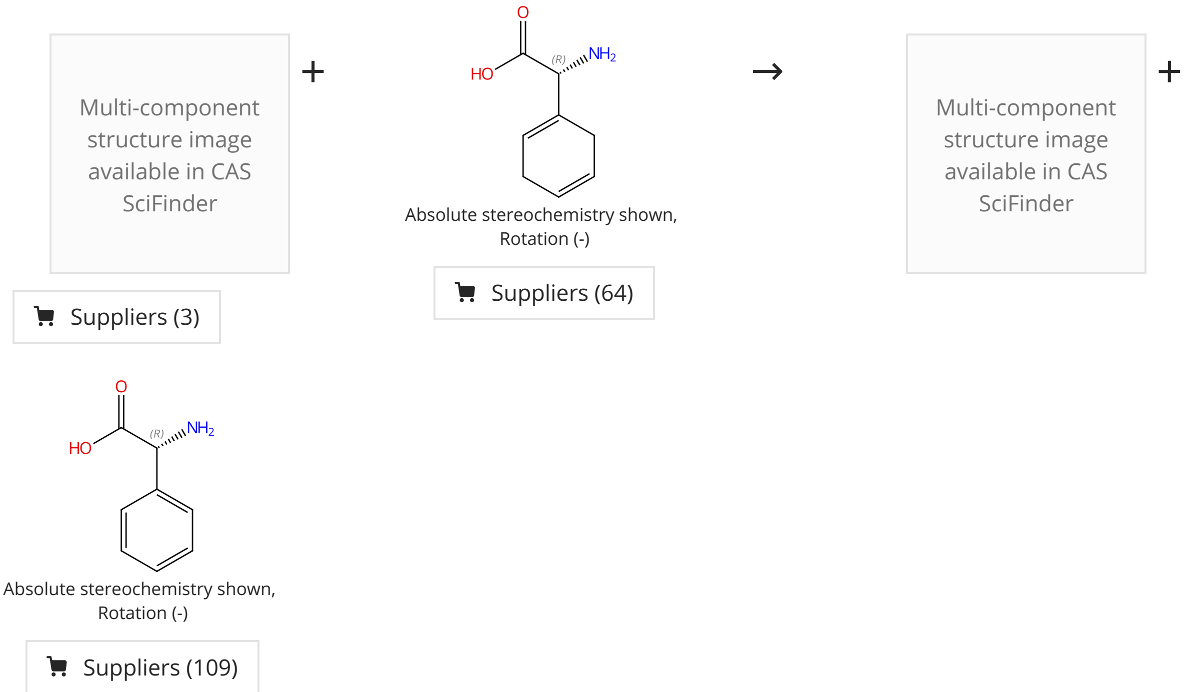
Synthesis of spiropyrans via Ru(II)-catalyzed coupling of 3-aryl-2H-benzo[b][1,4]oxazines with benzoquinones

By: Wen, Mengke; et al

Organic & Biomolecular Chemistry (2024), 22(5), 998-1009.

Scheme 426 (1 Reaction)

Steps: 1



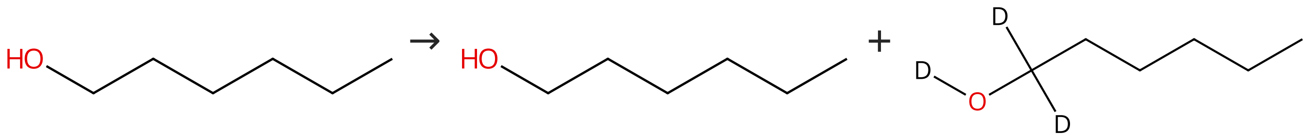
31-478-CAS-12497283	Steps: 1
1.1	**Catalysts:** Ruthenium(2+), [2-amino-7,9-dihydro-9-[4-(4'-methyl[2,2'-bipyridin]-4-yl-κN^1,κ$N^{1'}$)butyl]-1*H*-purine-6,8-dione]bis(2,2'-bipyridine-κN^1,κ$N^{1'}$)-, chloride (1:2), (*OC*-6-33)- **Solvents:** 1,4-Dioxane, Water-d_2; pH 7, 20 °C
Experimental Protocols	

Nucleobase mediated, photocatalytic vesicle formation from an ester precursor

By: DeClue, Michael S.; et al

Journal of the American Chemical Society (2009), 131(3), 931-933.

Scheme 427 (1 Reaction) Steps: **1**



Suppliers (106)

31-614-CAS-24998724 Steps: **1**

1.1 **Reagents:** Sodium hydroxide, Water-d_2
Catalysts: Ruthenium, [6-[[bis(1,1-dimethylethyl)phosphino-κ*P*]methyl]-2,2'-bipyridine-κN^1,κ$N^{1'}$]carbonylchlorohydro-, (*OC*-6-64)-; 24 h, 120 °C

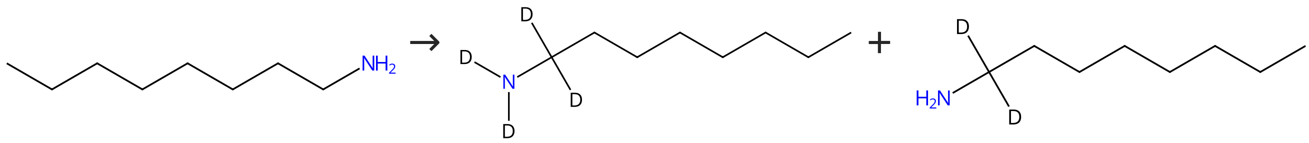
Experimental Protocols

Simple and Efficient Catalytic Reaction for the Selective Deuteration of Alcohols

By: Khaskin, Eugene; et al

ACS Catalysis (2013), 3(3), 448-452.

Scheme 428 (1 Reaction) Steps: **1**



Suppliers (82)

31-116-CAS-14285116 Steps: **1**

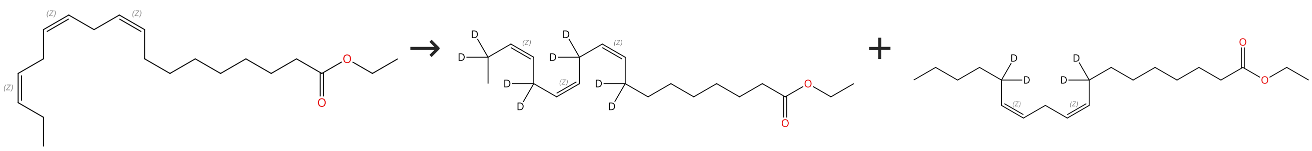
1.1 **Reagents:** Water-d_2
Catalysts: Dichlorobis(triphenylphosphine)ruthenium; 30 min, 10 atm, 150 °C

Ruthenium catalyzed deuterium labeling of α-carbon in primary alcohol and primary/secondary amine in D_2O

By: Takahashi, Masaaki; et al

Chemistry Letters (2005), 34(2), 192-193.

Scheme 429 (1 Reaction) Steps: **1**



Double bond geometry shown Double bond geometry shown Double bond geometry shown

Suppliers (67)

31-116-CAS-17923432 Steps: **1**

1.1 **Reagents:** Water-d_2
Catalysts: Ruthenium(1+), tris(acetonitrile)(η^5-2,4-cyclopentadien-1-yl)-, hexafluorophosphate(1-) (1:1)
Solvents: Acetone; 1 h, rt

1.2 **Reagents:** Hydrochloric acid
Solvents: Water; 15 min, rt

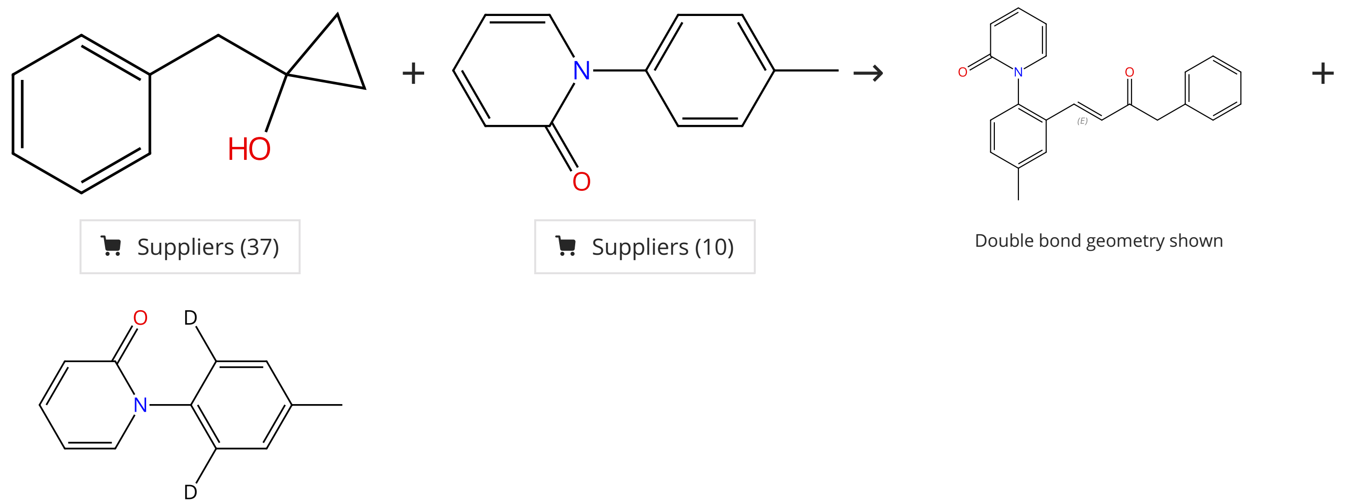
Experimental Protocols

Site-Specific Deuteration of Polyunsaturated Alkenes

By: Smarun, A. V.; et al

Journal of Organic Chemistry (2017), 82(24), 13115-13120.

Scheme 430 (1 Reaction) Steps: **1**



31-614-CAS-38942618	Steps: **1**
1.1	**Reagents:** Copper diacetate monohydrate, Water-d_2 **Catalysts:** Bis(dichloro(η^6-*p*-cymene)ruthenium), [1,1,1-Trifluoro-*N*-[(trifluoromethyl)sulfonyl-κ*O*]methanesulfonamidato-κ*O*]silver **Solvents:** 1,4-Dioxane; 16 h, 110 °C

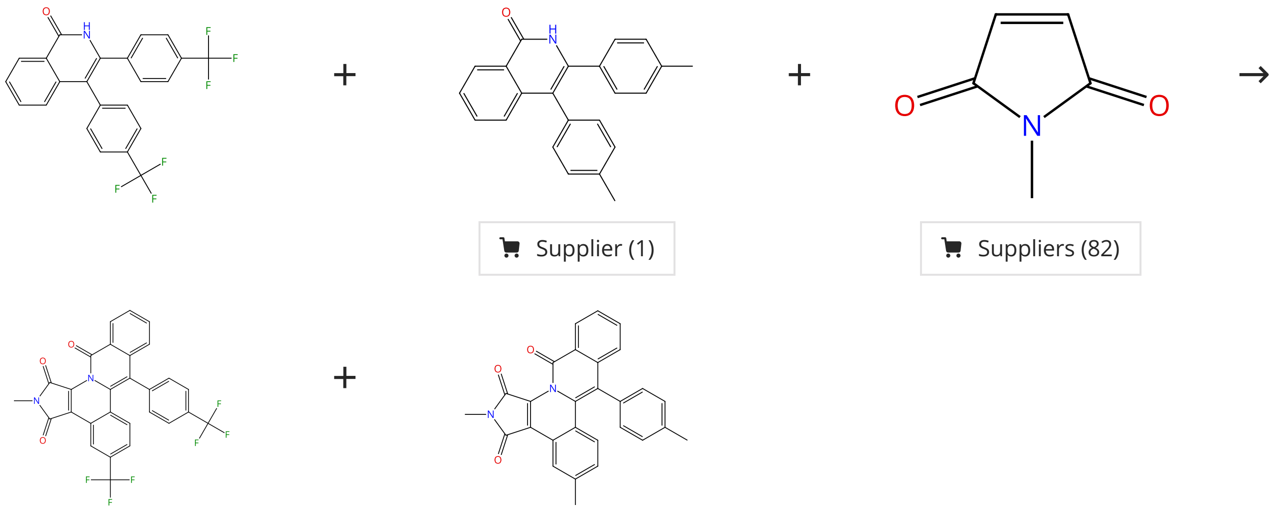
Experimental Protocols

Biorelevant Weakly Coordinating Directing Group Assisted C-H Alkenylation with Cyclopropanols via Sequential C-H/C-C Activation

By: Paul, Tripti; et al

Organic Letters (2023), 25(50), 8975-8980.

Scheme 431 (1 Reaction) Steps: **1**



31-614-CAS-39267429	Steps: **1**
1.1	**Reagents:** Potassium persulfate, Water-d_2 **Catalysts:** Bis(dichloro(η^6-*p*-cymene)ruthenium) **Solvents:** *o*-Xylene; 12 h, 130 °C

Experimental Protocols

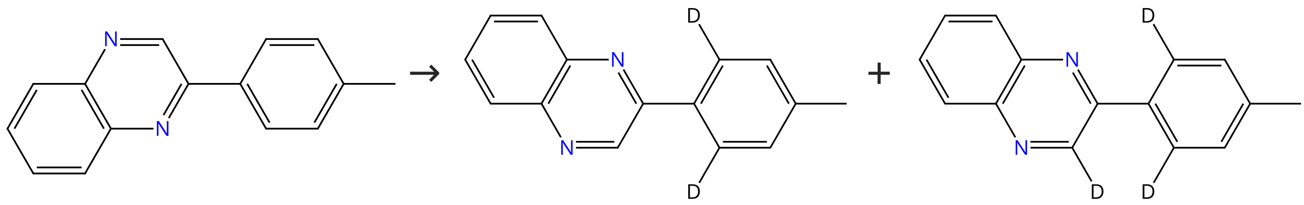
Ru(II) Catalyzed Oxidative Dehydrogenative Annulation and Spirocyclization of Isoquinolones with N-Substituted Maleimides

By: Seal, Kaushik; et al

Advanced Synthesis & Catalysis (2024), 366(8), 1788-1808.

Scheme 432 (1 Reaction)

Steps: 1



Suppliers (17)

31-116-CAS-23154110

Steps: 1

1.1 **Reagents:** Cupric acetate
Catalysts: Silver hexafluoroantimonate, Bis(dichloro(η[6]-*p*-cymene)ruthenium)
Solvents: 1,2-Dichloroethane; 5 min, rt

1.2 **Reagents:** Water-d_2; 12 h, 90 °C

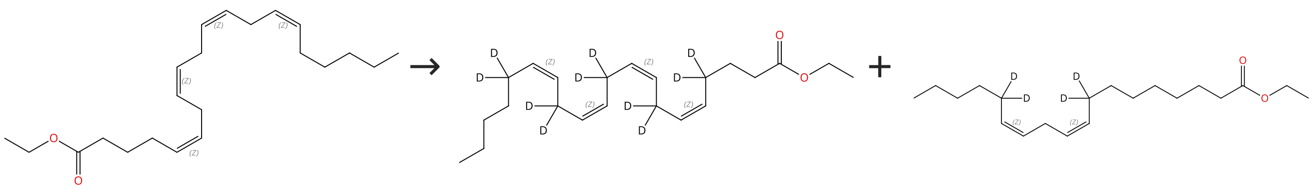
Ru(II)-Catalyzed Switchable C-H Alkylation and Spirocyclization of 2-Arylquinoxalines with Maleimides via ortho- C-H Activation

By: Laru, Sudip; et al

Journal of Organic Chemistry (2021), 86(3), 2784-2795.

Scheme 433 (1 Reaction)

Steps: 1



Double bond geometry shown

Double bond geometry shown

Double bond geometry shown

Suppliers (53)

31-116-CAS-17923433

Steps: 1

1.1 **Reagents:** Water-d_2
Catalysts: Ruthenium(1+), tris(acetonitrile)(η[5]-2,4-cyclopentadien-1-yl)-, hexafluorophosphate(1-) (1:1)
Solvents: Acetone; 24 h, rt

1.2 **Reagents:** Hydrochloric acid
Solvents: Water; 15 min, rt

Experimental Protocols

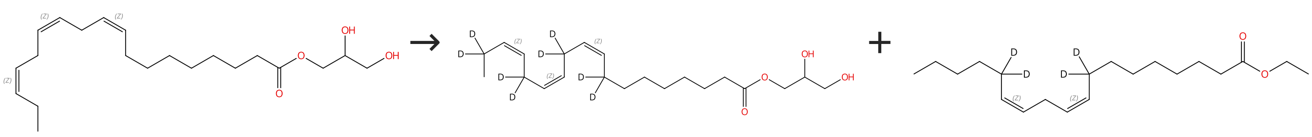
Site-Specific Deuteration of Polyunsaturated Alkenes

By: Smarun, A. V.; et al

Journal of Organic Chemistry (2017), 82(24), 13115-13120.

Scheme 434 (1 Reaction)

Steps: 1



Double bond geometry shown

Double bond geometry shown

Double bond geometry shown

Suppliers (21)

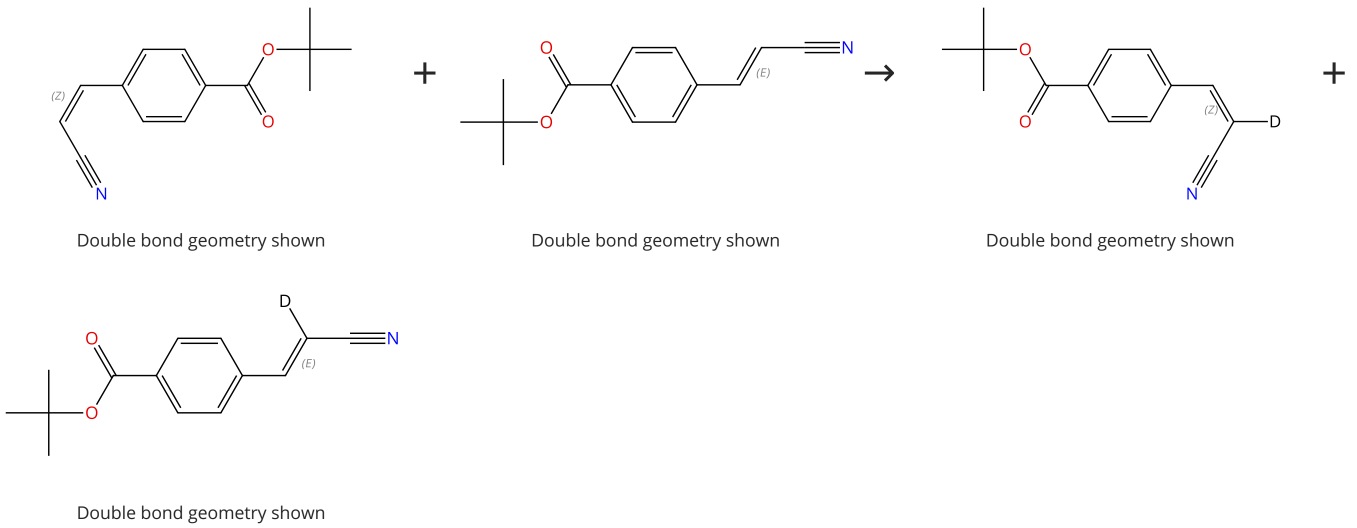
31-116-CAS-17923435	Steps: **1**
1.1	**Reagents:** Water-d_2 **Catalysts:** Ruthenium(1+), tris(acetonitrile)(η^5-2,4-cyclopentadien-1-yl)-, hexafluorophosphate(1-) (1:1) **Solvents:** Acetone; 1 h, rt
1.2	**Reagents:** Hydrochloric acid **Solvents:** Water; 15 min, rt
Experimental Protocols	

Site-Specific Deuteration of Polyunsaturated Alkenes

By: Smarun, A. V.; et al

Journal of Organic Chemistry (2017), 82(24), 13115-13120.

Scheme 435 (1 Reaction) Steps: **1**



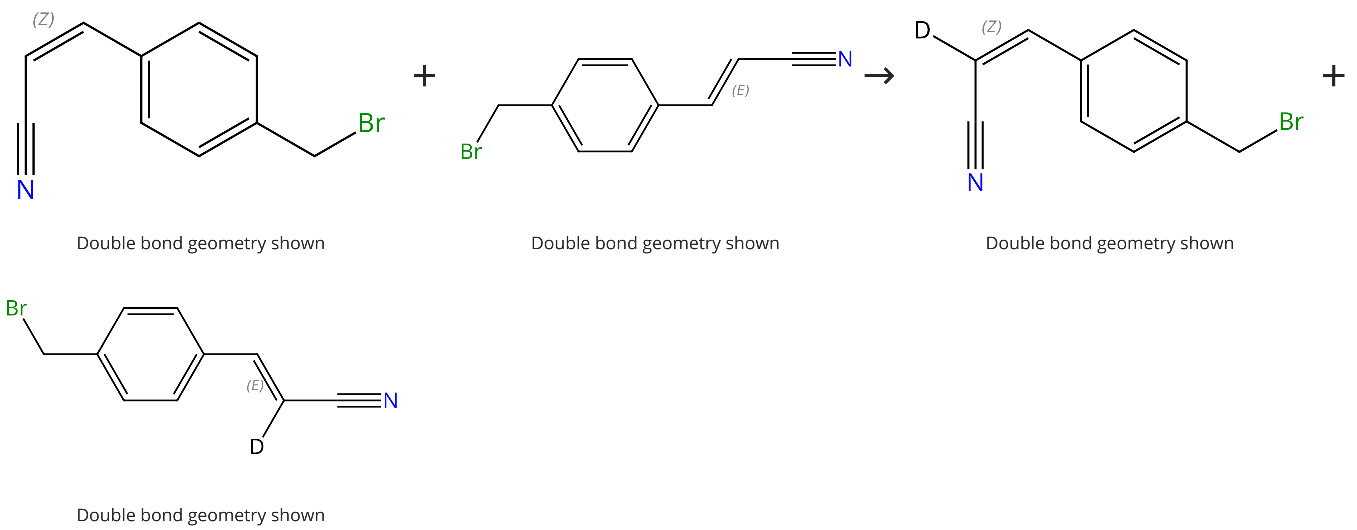
31-614-CAS-24401859	Steps: **1**
1.1	**Reagents:** Water-d_2 **Catalysts:** (*SP*-5-52)-[6-[[Bis(1,1-dimethylethyl)phosphino-κ*P*]methylene]-*N*,*N*-diethyl-1,6-dihydro-2-pyridinemethanaminato-κN^1,κN^2]carbonylhydroruthenium **Solvents:** 1,2-Dimethoxyethane; 1.5 h, rt

Selective α-Deuteration of Cinnamonitriles using D_2O as Deuterium Source

By: Guo, Beibei; et al

Advanced Synthesis & Catalysis (2022), 364(1), 179-186.

Scheme 436 (1 Reaction) Steps: **1**



31-614-CAS-24401861	Steps: **1**
1.1	**Reagents:** Water-d_2 **Catalysts:** (*SP*-5-52)-[6-[[Bis(1,1-dimethylethyl)phosphino-κ*P*]methylene]-*N*,*N*-diethyl-1,6-dihydro-2-pyridinemethanaminato-κN^1,κN^2]carbonylhydroruthenium **Solvents:** 1,2-Dimethoxyethane; 2 h, rt

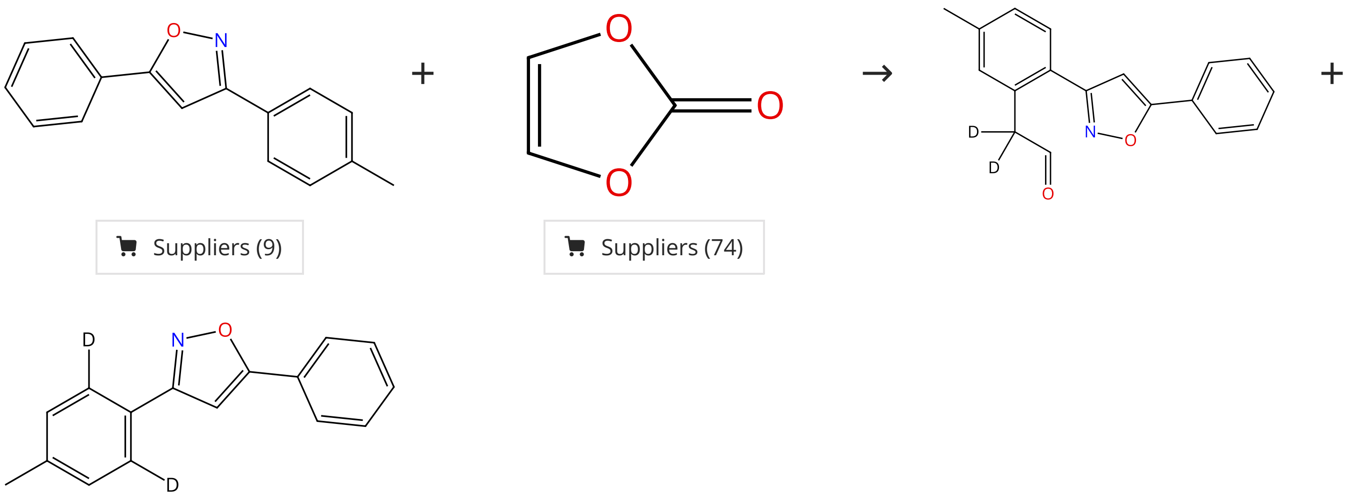
Selective α-Deuteration of Cinnamonitriles using D_2O as Deuterium Source

By: Guo, Beibei; et al

Advanced Synthesis & Catalysis (2022), 364(1), 179-186.

Scheme 437 (1 Reaction)

Steps: **1**



Suppliers (9)

Suppliers (74)

31-614-CAS-31691962	Steps: **1**
1.1	**Reagents:** Water-*d*$_2$ **Catalysts:** Silver hexafluoroantimonate, Bis(dichloro(η^6-*p*-cymene)ruthenium) **Solvents:** 1,1,1,3,3,3-Hexafluoro-2-propanol; 12 h, 90 °C

Experimental Protocols

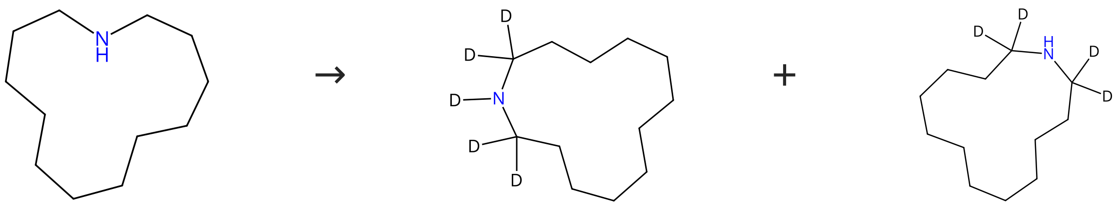
Ruthenium-catalyzed oxidative coupling of vinylene carbonate with isoxazoles: access to fused anthranils

By: Kumar, Pravin; et al

Chemical Communications (Cambridge, United Kingdom) (2022), 58(28), 4476-4479.

Scheme 438 (1 Reaction)

Steps: **1**



Suppliers (37)

31-116-CAS-5138718	Steps: **1**
1.1	**Reagents:** Water-*d*$_2$ **Catalysts:** Dichlorobis(triphenylphosphine)ruthenium; 30 min, 10 atm, 150 °C

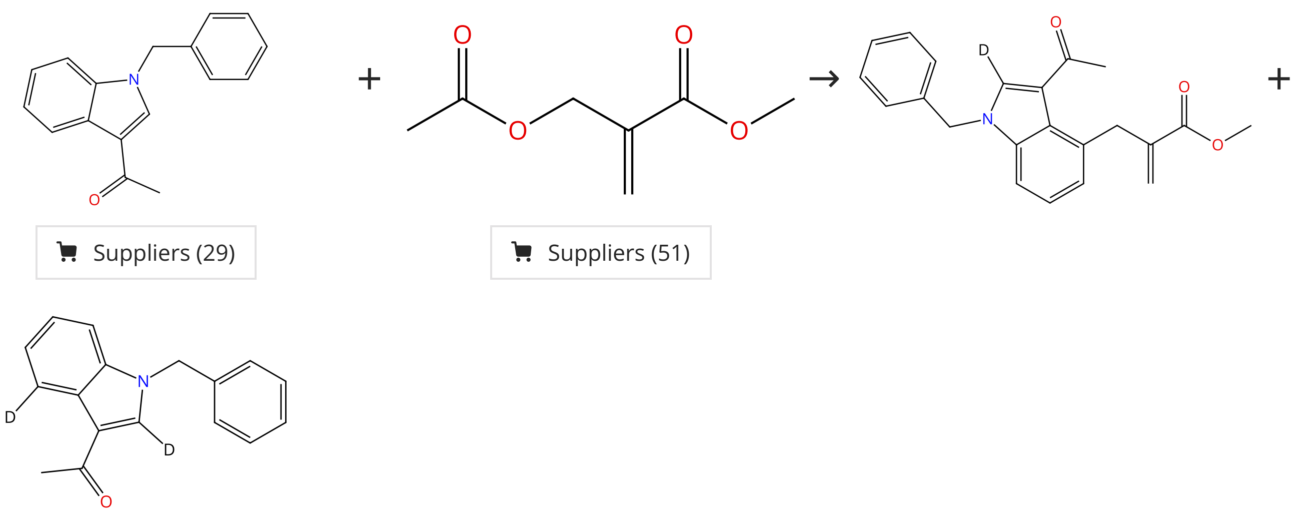
Ruthenium catalyzed deuterium labeling of α-carbon in primary alcohol and primary/secondary amine in D_2O

By: Takahashi, Masaaki; et al

Chemistry Letters (2005), 34(2), 192-193.

Scheme 439 (1 Reaction)

Steps: **1**



Suppliers (29)

Suppliers (51)

31-085-CAS-20859186 Steps: **1**

1.1 **Reagents:** Water-d_2
Catalysts: Ruthenium(1+), tris(acetonitrile)[(1,2,3,4,5-η)-1,2,3,4,5-pentamethyl-2,4-cyclopentadien-1-yl]-, hexafluoro phosphate(1-) (1:1)
Solvents: 1,2-Dichloroethane; 10 h, 120 °C

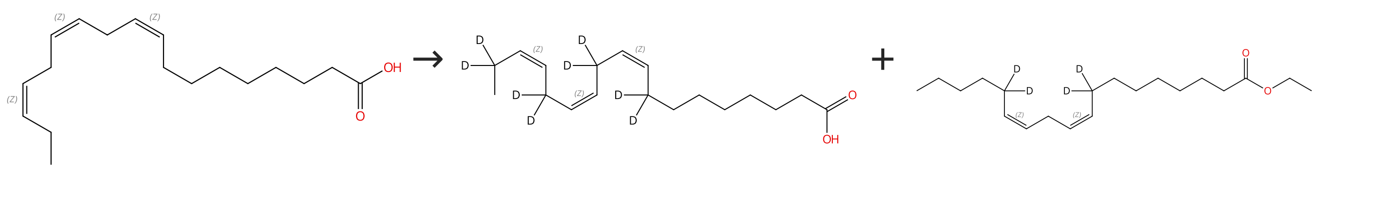
Experimental Protocols

Weak Coordination-Guided Regioselective Direct Redox-Neutral C4 Allylation of Indoles with Morita- Baylis-Hillman Adducts

By: Pradhan, Sourav; et al

Organic Letters (2019), 21(24), 9898-9903.

Scheme 440 (1 Reaction) Steps: **1**



Double bond geometry shown

Suppliers (124)

Double bond geometry shown

Double bond geometry shown

31-614-CAS-30789926 Steps: **1**

1.1 **Reagents:** Water-d_2
Catalysts: Ruthenium(1+), tris(acetonitrile)(η^5-2,4-cyclopentadien-1-yl)-, hexafluorophosphate(1-) (1:1)
Solvents: Acetone; 24 h, rt

1.2 **Reagents:** Hydrochloric acid
Solvents: Water; 15 min, rt

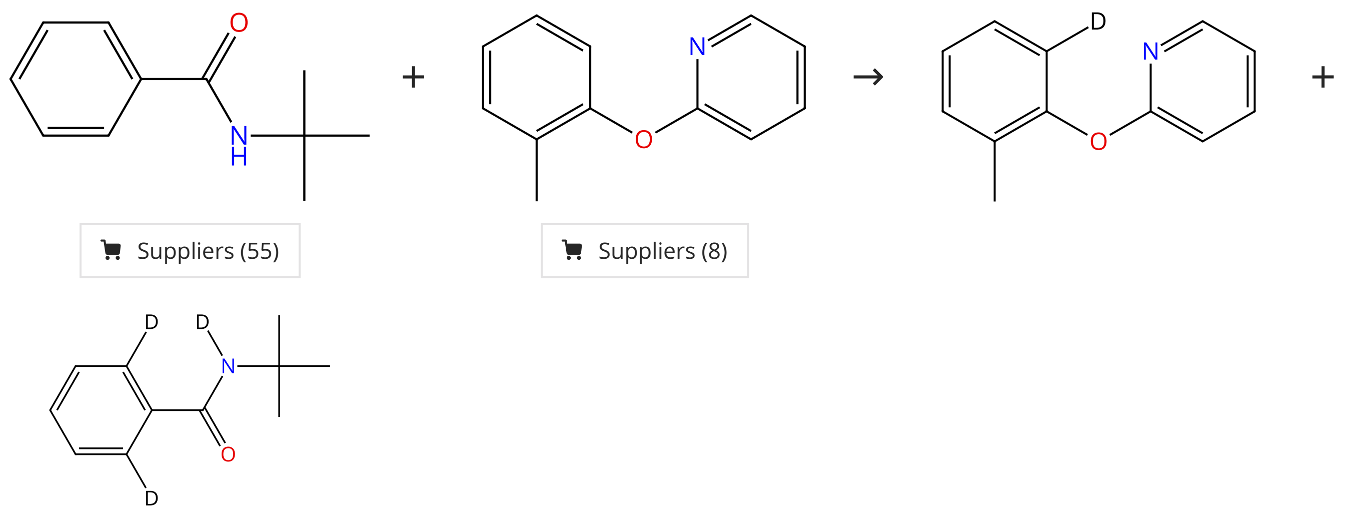
Experimental Protocols

Site-Specific Deuteration of Polyunsaturated Alkenes

By: Smarun, A. V.; et al

Journal of Organic Chemistry (2017), 82(24), 13115-13120.

Scheme 441 (1 Reaction) Steps: **1**



Suppliers (55)

Suppliers (8)

31-116-CAS-19519643 Steps: **1**

1.1 **Reagents:** Cupric acetate, Oxygen, Water-d_2
Catalysts: Acetic acid, Zinc triflate, Ruthenium(2+), tris(acetonitrile)[(1,2,3,4,5,6-η)-1-methyl-4-(1-methylethyl)benzene]-, (*OC*-6-11)-hexafluoroantimonate(1-) (1:2)
Solvents: Toluene; 1 h, 130 °C

Experimental Protocols

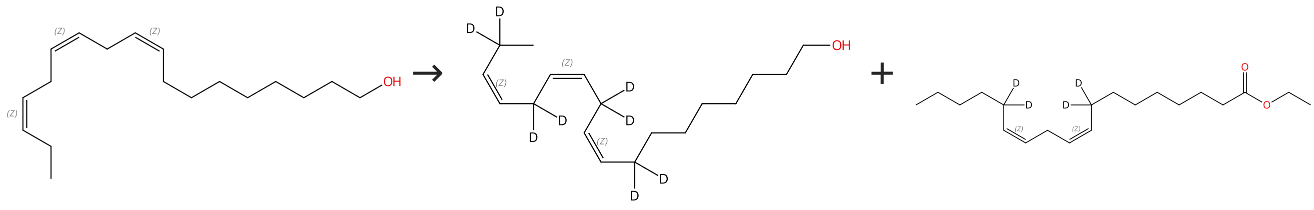
Experimental and Theoretical Studies on Ru(II)-Catalyzed Oxidative C-H/C-H Coupling of Phenols with Aromatic Amides Using Air as Oxidant: Scope, Synthetic Applications, and Mechanistic Insights

By: Zhang, Luoqiang; et al

ACS Catalysis (2018), 8(9), 8324-8335.

Scheme 442 (1 Reaction)

Steps: **1**



Suppliers (35)

31-116-CAS-17923440

Steps: **1**

1.1 **Reagents:** Water-d_2
Catalysts: Ruthenium(1+), tris(acetonitrile)(η^5-2,4-cyclopentadien-1-yl)-, hexafluorophosphate(1-) (1:1)
Solvents: Acetone; 18 h, rt

1.2 **Reagents:** Hydrochloric acid
Solvents: Water; 15 min, rt

Experimental Protocols

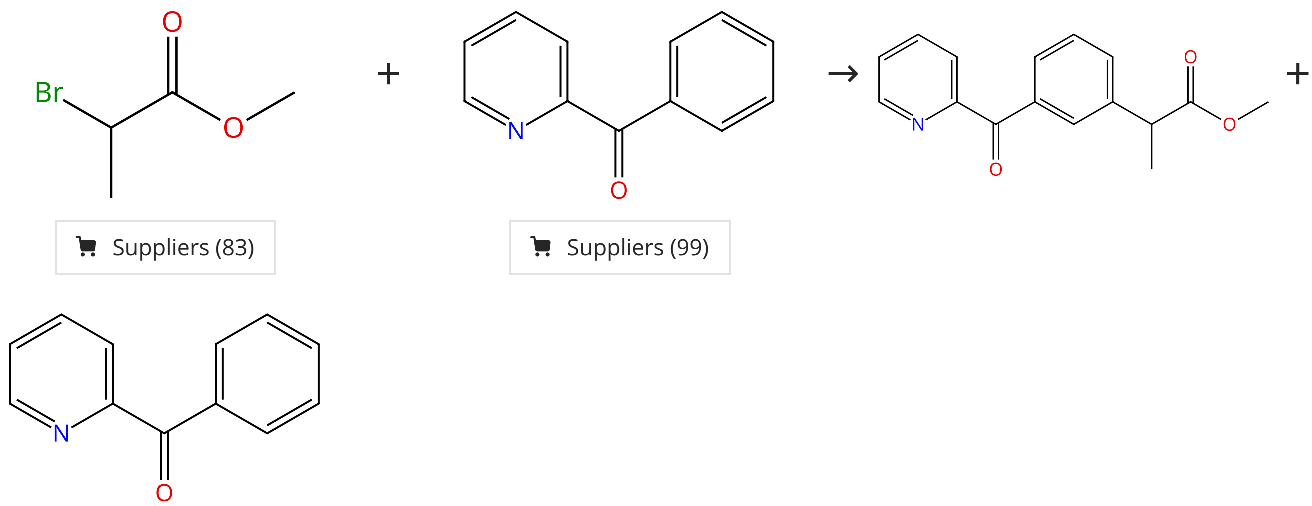
Site-Specific Deuteration of Polyunsaturated Alkenes

By: Smarun, A. V.; et al

Journal of Organic Chemistry (2017), 82(24), 13115-13120.

Scheme 443 (1 Reaction)

Steps: **1**



Suppliers (83)

Suppliers (99)

31-614-CAS-30482413

Steps: **1**

1.1 **Reagents:** Potassium acetate, 1-Adamantanecarboxylic acid, Water-d_2
Catalysts: Bis(dichloro(η^6-*p*-cymene)ruthenium)
Solvents: Toluene; 24 h, 110 °C

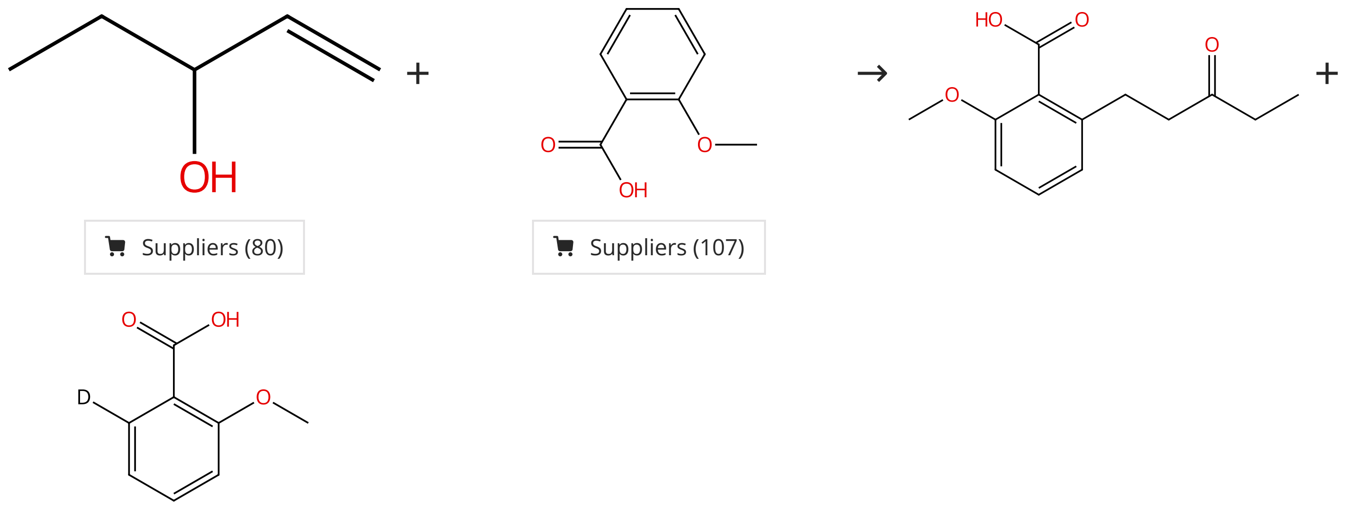
Experimental Protocols

Ruthenium-catalyzed meta-C-H bond alkylation of aryl 2-pyridyl ketones

By: Li, Gang; et al

Chemical Communications (Cambridge, United Kingdom) (2020), 56(2), 293-296.

Scheme 444 (1 Reaction)   Steps: 1



31-614-CAS-27476461   Steps: 1

1.1 **Solvents:** Dichloroethane; 5 - 10 min, rt

1.2 **Reagents:** Potassium acetate, Water-d_2
Catalysts: Cupric acetate, Bis(dichloro(η[6]-*p*-cymene) ruthenium); rt → 85 °C; 24 h, 85 °C; 85 °C → rt

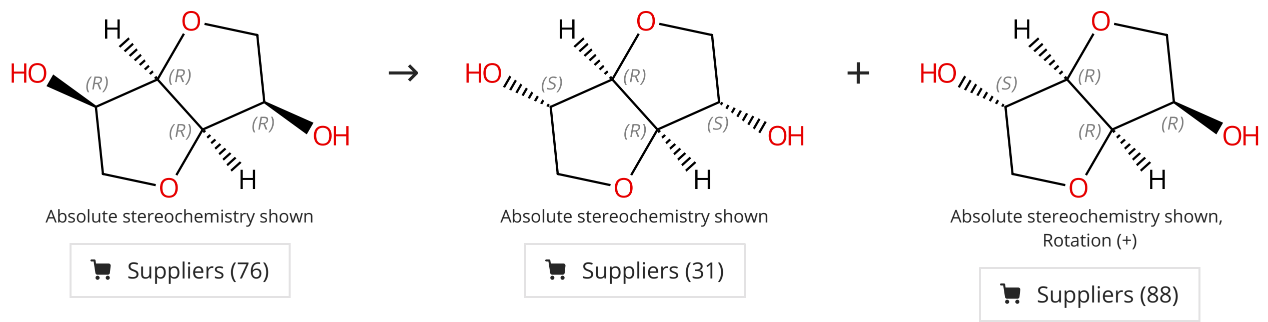
Experimental Protocols

Ruthenium-Catalyzed C-H Functionalization of Benzoic Acids with Allyl Alcohols: A Controlled Reactivity Switch between C-H Alkenylation and C-H Alkylation Pathways

By: Kumar, Gangam Srikanth; et al

Organic Letters (2018), 20(16), 4934-4937.

Scheme 445 (1 Reaction)   Steps: 1



31-614-CAS-26643219   Steps: 1

1.1 **Reagents:** Hydrogen, Water-d_2
Catalysts: Ruthenium; 3 h, 25 bar, 80 - 160 °C

Experimental Protocols

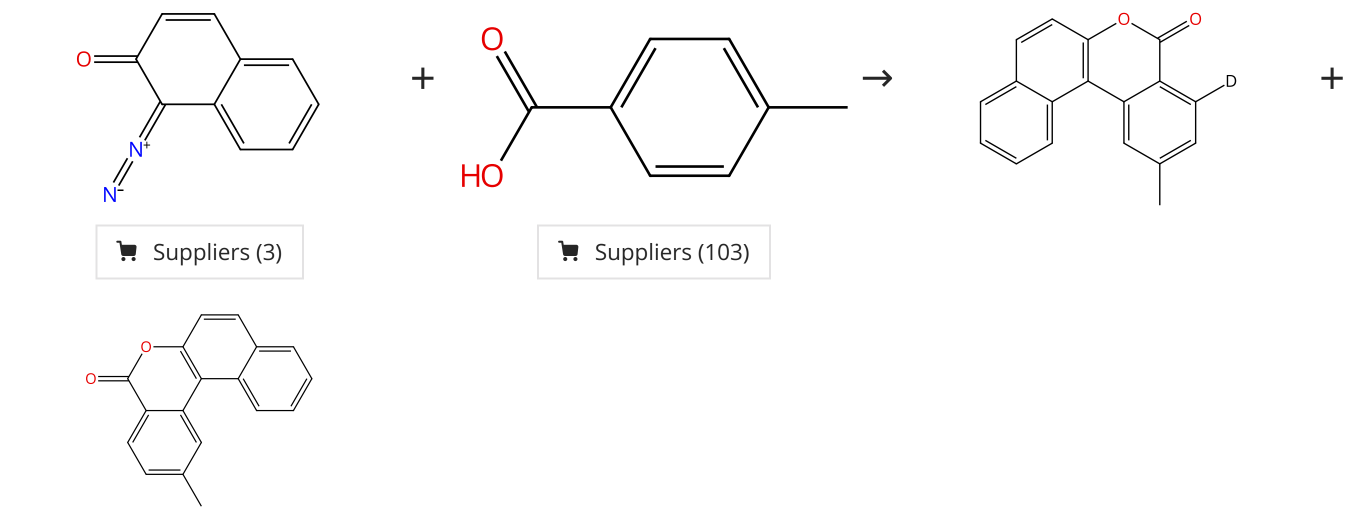
Unravelling the Mechanism of the Ru/C-Catalysed Isohexide and Ether Isomerization by Hydrogen Isotope Exchange

By: Engel, Rebecca V.; et al

Advanced Synthesis & Catalysis (2018), 360(12), 2358-2363.

Scheme 446 (1 Reaction)

Steps: **1**



31-614-CAS-38098670	Steps: **1**
1.1	**Reagents:** Cupric acetate, Potassium carbonate, Water- d_2 **Catalysts:** 1-Adamantanecarboxylic acid, Bis(dichloro(η^6-*p*-cymene)ruthenium) **Solvents:** 2,2,2-Trifluoroethanol; 2 h, 100 °C

Experimental Protocols

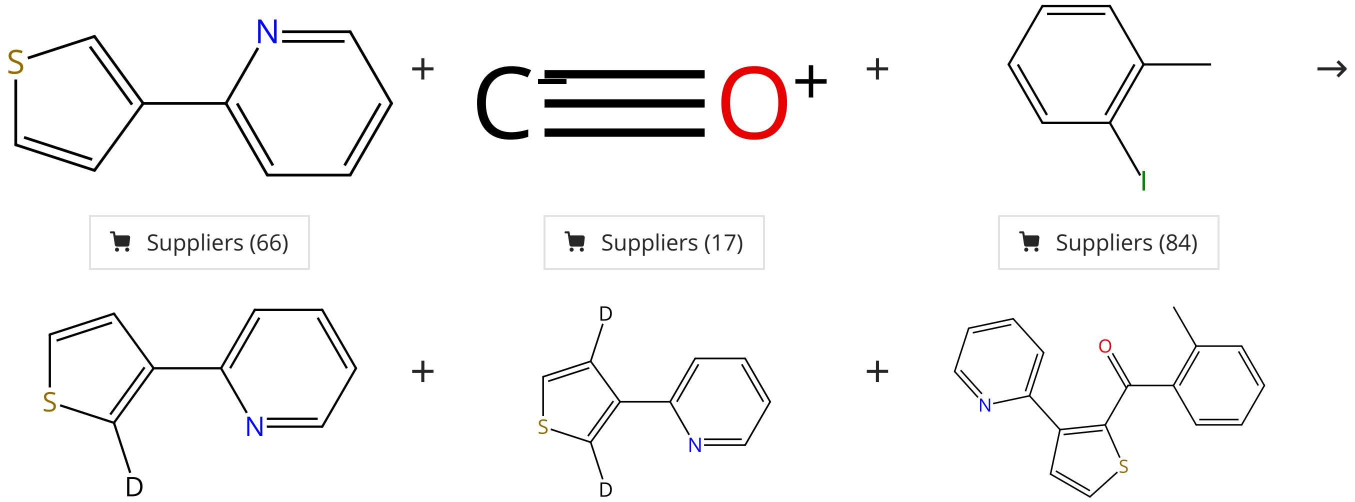
Ruthenium(II)-catalyzed C-H activation/lactonization of aromatic acids with diazonaphthoquinones: regioselective synthesis of polycyclic coumarin frameworks

By: Giri, Chandan Kumar; et al

Organic Chemistry Frontiers (2023), 10(23), 5856-5862.

Scheme 447 (1 Reaction)

Steps: **1** Yield: **95%**



31-116-CAS-14338299	Steps: **1** Yield: **95%**
1.1	**Reagents:** Sodium bicarbonate, Water-d_2 **Catalysts:** Potassium acetate, Dichloro[(1,2,5,6-η)-1,5-cyclooctadiene]ruthenium **Solvents:** Water-d_2; 20 h, 30 bar, rt → 120 °C

Experimental Protocols

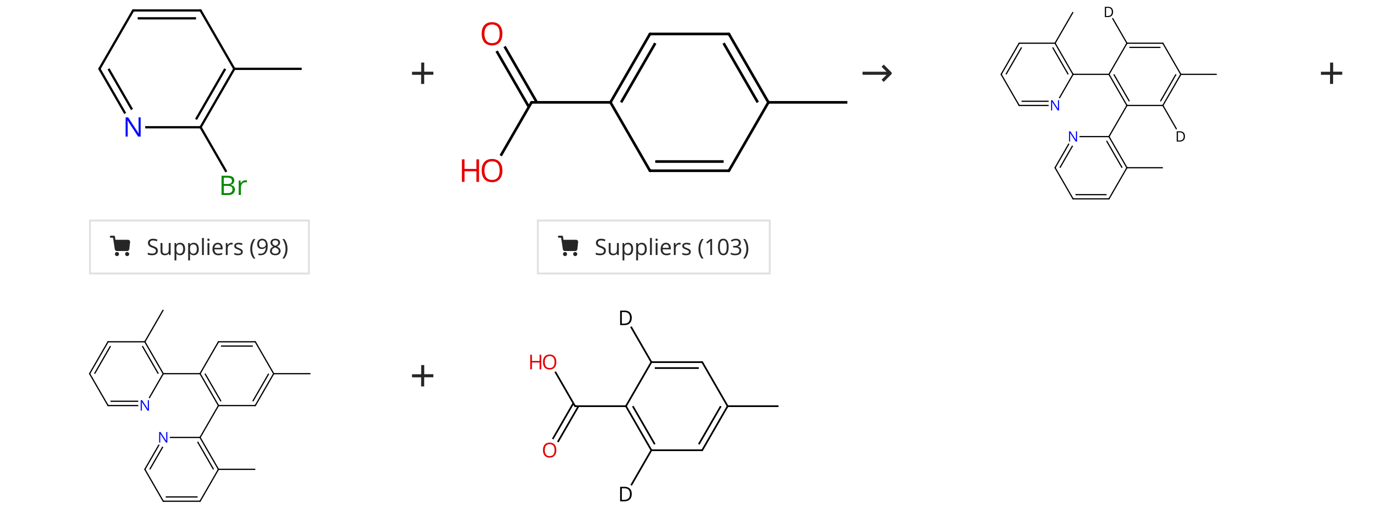
Regioselective Ruthenium-Catalyzed Carbonylative Direct Arylation of Five-Membered and Condensed Heterocycles

By: Pospech, Jola; et al

Chemistry - A European Journal (2014), 20(11), 3135-3141.

Scheme 448 (1 Reaction)

Steps: **1** Yield: **31%**



31-614-CAS-38297951

Steps: **1** Yield: **31%**

1.1 **Reagents:** Potassium carbonate, Water-d_2
Catalysts: 1,10-Phenanthroline, Bis(dichloro(η^6-*p*-cymene) ruthenium)
Solvents: 1,4-Dioxane; 50 min, 120 °C

Experimental Protocols

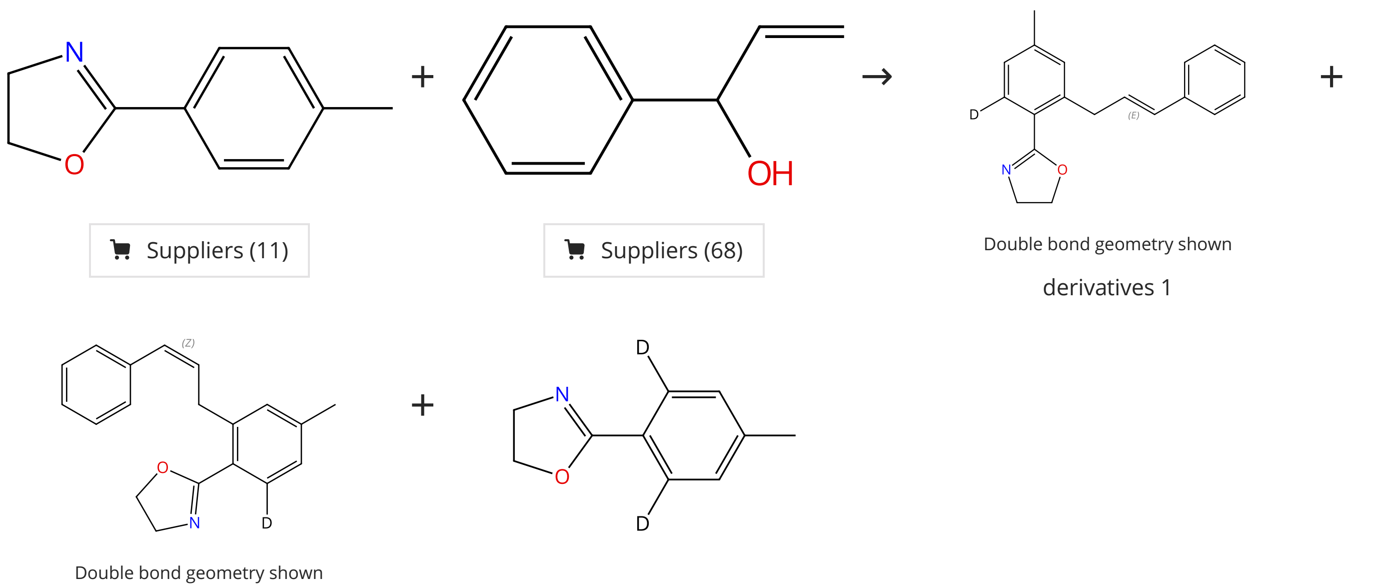
Ruthenium-Catalyzed Decarboxylative ortho-Di-2-pyridination of Aryl Carboxylic Acids

By: Chen, Mengnan; et al

ACS Catalysis (2023), 13(22), 14907-14913.

Scheme 449 (1 Reaction)

Steps: **1**



31-116-CAS-20662440

Steps: **1**

1.1 **Reagents:** Water-d_2
Catalysts: Cupric acetate, Silver hexafluoroantimonate, Bis (dichloro(η^6-*p*-cymene)ruthenium)
Solvents: 2,2,2-Trifluoroethanol; 6 h, 60 °C

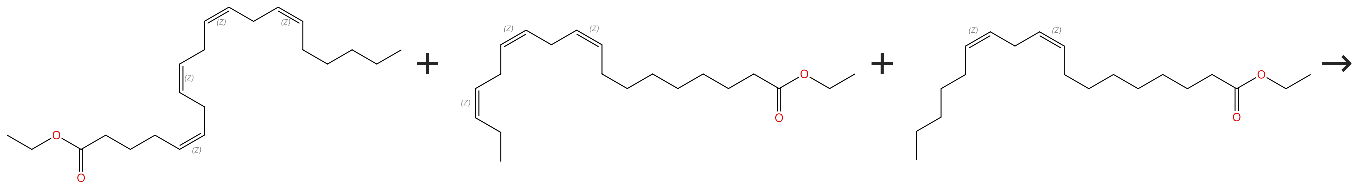
Experimental Protocols

Oxazolinyl-Assisted Ru(II)-Catalyzed C-H Allylation with Allyl Alcohols and Synthesis of 4-Methyleneisochroman-1-ones

By: Singh, Diksha; et al

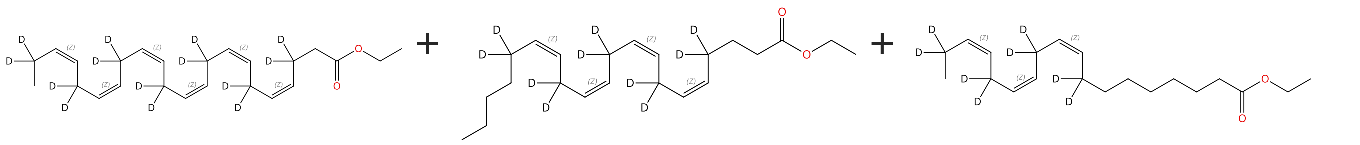
Journal of Organic Chemistry (2019), 84(20), 12881-12892.

Scheme 450 (1 Reaction) Steps: **1**



Double bond geometry shown | Double bond geometry shown | Double bond geometry shown

Suppliers (53) | Suppliers (67) | Suppliers (85)



Double bond geometry shown | Double bond geometry shown | Double bond geometry shown

31-116-CAS-17923458 Steps: **1**

1.1 **Reagents:** Water-d_2
Catalysts: Ruthenium(1+), tris(acetonitrile)(η^5-2,4-cyclopentadien-1-yl)-, hexafluorophosphate(1-) (1:1)
Solvents: Acetone-d_6; 1 h, rt

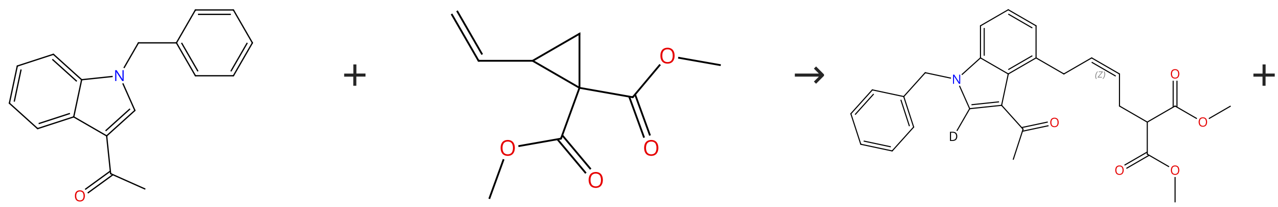
Experimental Protocols

Site-Specific Deuteration of Polyunsaturated Alkenes

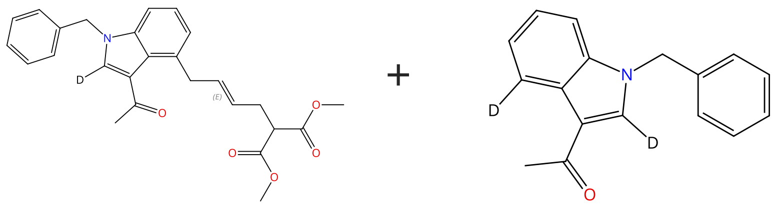
By: Smarun, A. V.; et al

Journal of Organic Chemistry (2017), 82(24), 13115-13120.

Scheme 451 (1 Reaction) Steps: **1**



Suppliers (29) | Suppliers (48) | Double bond geometry shown



Double bond geometry shown

31-614-CAS-37740140 Steps: **1**

1.1 **Reagents:** Potassium carbonate, Water-d_2
Catalysts: 2,4,6-Trimethylbenzoic acid, Bis(dichloro(η^6-*p*-cymene)ruthenium)
Solvents: 1,1,1,3,3,3-Hexafluoro-2-propanol; 12 h, 90 °C

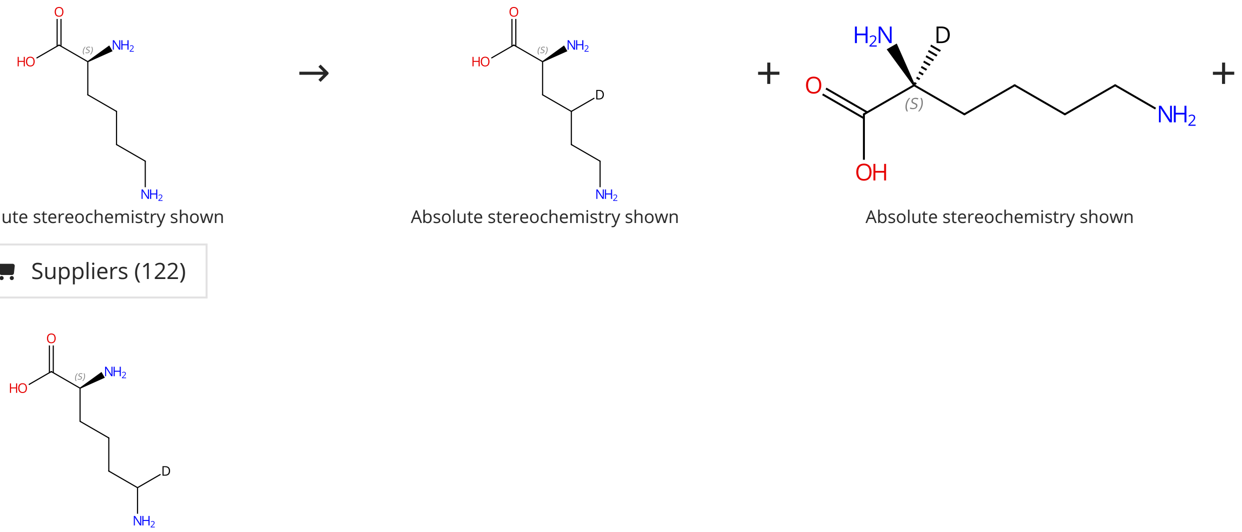
Experimental Protocols

A redox-neutral weak carbonyl chelation assisted C4-H allylation of indoles with vinylcyclopropanes

By: Basak, Shubhajit; et al

Chemical Communications (Cambridge, United Kingdom) (2023), 59(77), 11568-11571.

Scheme 452 (3 Reactions) Steps: 1



Absolute stereochemistry shown

Absolute stereochemistry shown

Absolute stereochemistry shown

Suppliers (122)

Absolute stereochemistry shown

31-614-CAS-34988549	Steps: 1
1.1	**Reagents:** Deuterium **Catalysts:** 1*H*-Imidazolium, 1-(3-sulfopropyl)-3-(2,4,6-trimethylphenyl)-, inner salt (Iridium and ruthenium supported), Iridium, compd. with ruthenium (2:1) **Solvents:** Water-d_2; 48 h, 2 bar, 55 °C
Experimental Protocols	

N-Heterocyclic Carbene-Based Iridium and Ruthenium /Iridium Nanoparticles for the Hydrogen Isotope Exchange Reaction through C-H Bond Activations

By: Zuluaga-Villamil, Alejandra; et al

Organometallics (2022), 41(22), 3313-3319.

31-614-CAS-34988551	Steps: 1
1.1	**Reagents:** Deuterium **Catalysts:** 1*H*-Imidazolium, 1-(3-sulfopropyl)-3-(2,4,6-trimethylphenyl)-, inner salt (Iridium and ruthenium supported), Iridium, compd. with ruthenium (1:2) **Solvents:** Water-d_2; 48 h, 2 bar, 55 °C
Experimental Protocols	

N-Heterocyclic Carbene-Based Iridium and Ruthenium /Iridium Nanoparticles for the Hydrogen Isotope Exchange Reaction through C-H Bond Activations

By: Zuluaga-Villamil, Alejandra; et al

Organometallics (2022), 41(22), 3313-3319.

31-614-CAS-34988547	Steps: 1
1.1	**Reagents:** Deuterium **Catalysts:** Ruthenium (bound to polyvinylpyrrolidone or IMes N-heterocyclic carbene), 1*H*-Imidazolium, 1-(3-sulfopropyl)-3-(2,4,6-trimethylphenyl)-, inner salt (Iridium and ruthenium supported) **Solvents:** Water-d_2; 48 h, 2 bar, 55 °C
Experimental Protocols	

N-Heterocyclic Carbene-Based Iridium and Ruthenium /Iridium Nanoparticles for the Hydrogen Isotope Exchange Reaction through C-H Bond Activations

By: Zuluaga-Villamil, Alejandra; et al

Organometallics (2022), 41(22), 3313-3319.