

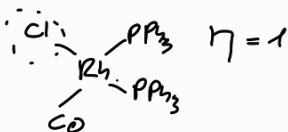
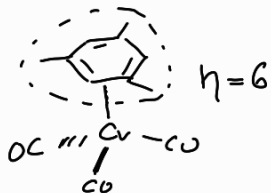
Organometallic

Terminology: . Complex mostly has Metal in case

. Ligand = bond to the Complex

. Coordination number = number of ligand

\Rightarrow Hapticity η of a ligand $\hat{=}$ how many atoms are involved in the binding to the Metal



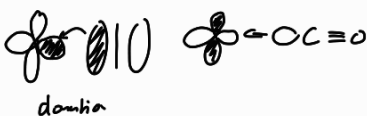
$\text{Cr}(0) d6 \Rightarrow +6e^- \text{ from CO's}$
 $+6e^- \text{ from Benzene}$
 $\Rightarrow 18e^-$

$\text{Rh}(I) d8 + 8e^- \text{ from bonds}$
 $\Rightarrow 16e^-$
 $\rightarrow \text{more reactive}$

$18e^-$ in complex analogous to $8e^-$ in CH_4
 \rightarrow stable

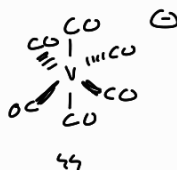
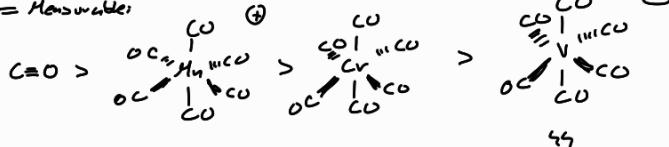
Ligand field theory

M || M-C≡O



\Rightarrow The higher the e^- density on the Metal, the more back donation the weaker is the $\text{C}\equiv\text{O}$!

= Measurable:



as strong as $\text{C}\equiv\text{O}$
 So basically breaks triple bond into dB

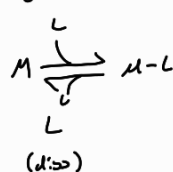
\Rightarrow Interplay between donation and back donation

\rightarrow back donation to the metal is in between a metal bond and de stabilizes the DB in this example

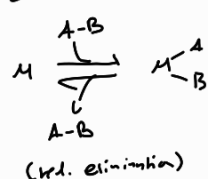
\Rightarrow Interplay between Metal orbital and Ligand lead to a weakening of the Ligand's bond depending on the e^- density of the Metal.

Ligand behaviour!

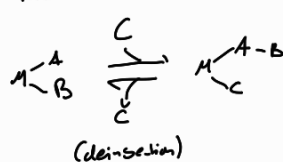
Ligand association



oxidative addition



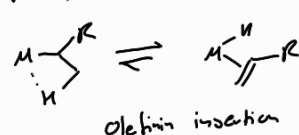
insertion reaction



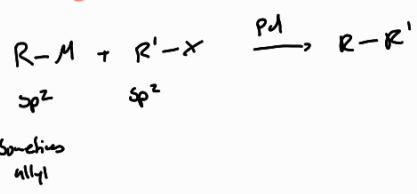
Transmetalation



β -Hydride elimination

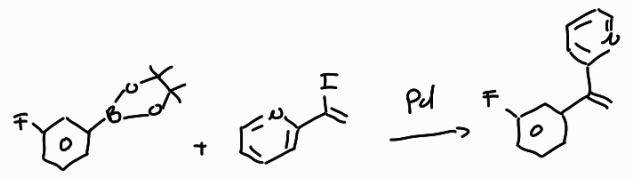


Organometallics - Palladium

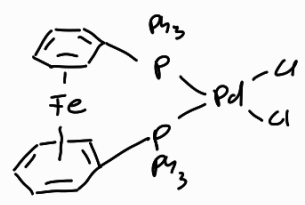


Suzuki: $R-B$ boron Most common
 Negishi: $R-ZnY$ Zinc
 $Y = halide or R$
 Stille: $R-Sn(Allyl)_3$ tin
 Kumada: $R-MgX$ Magnesium

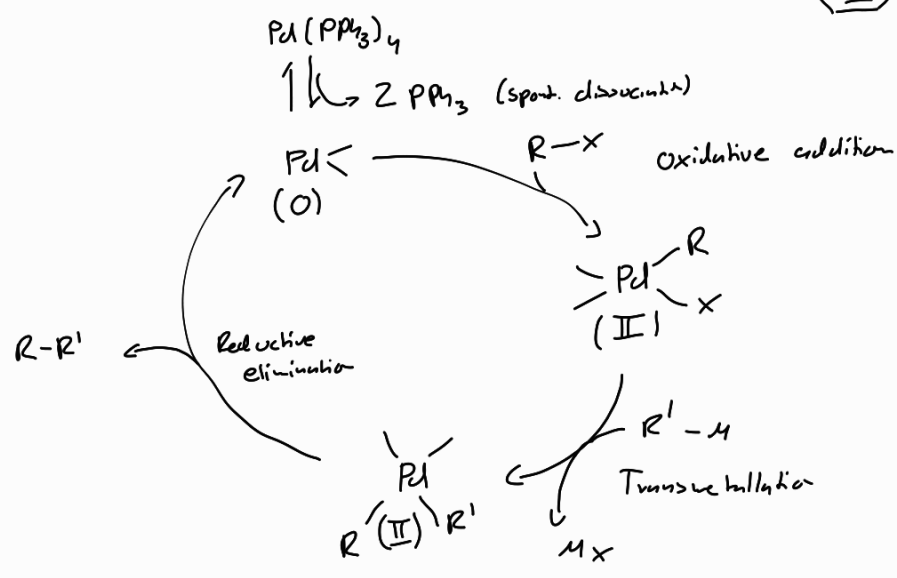
ex



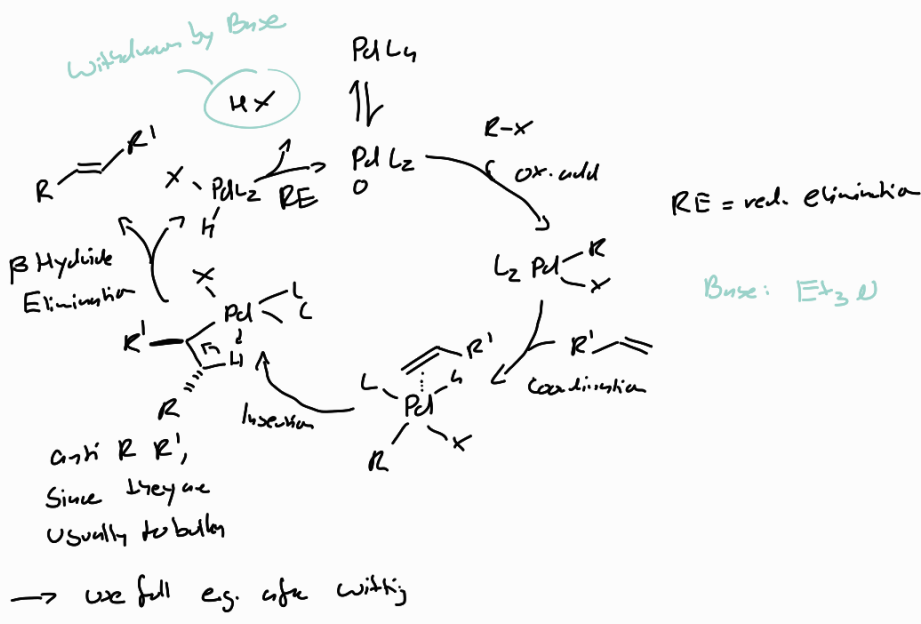
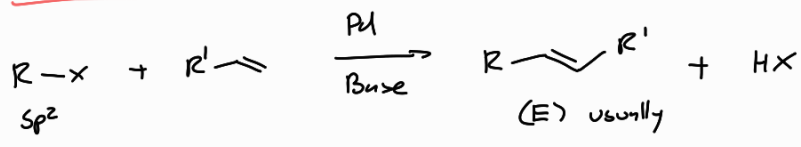
Catalysts: $Pd(PPh_3)_4$, $Pd(PPh_3)_2Cl_2$, $Pd(dppf)Cl_2$
 L



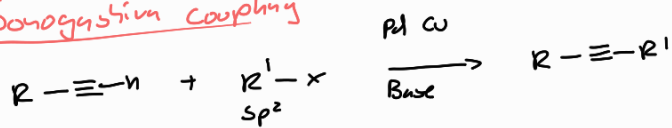
Catalytic Cycle



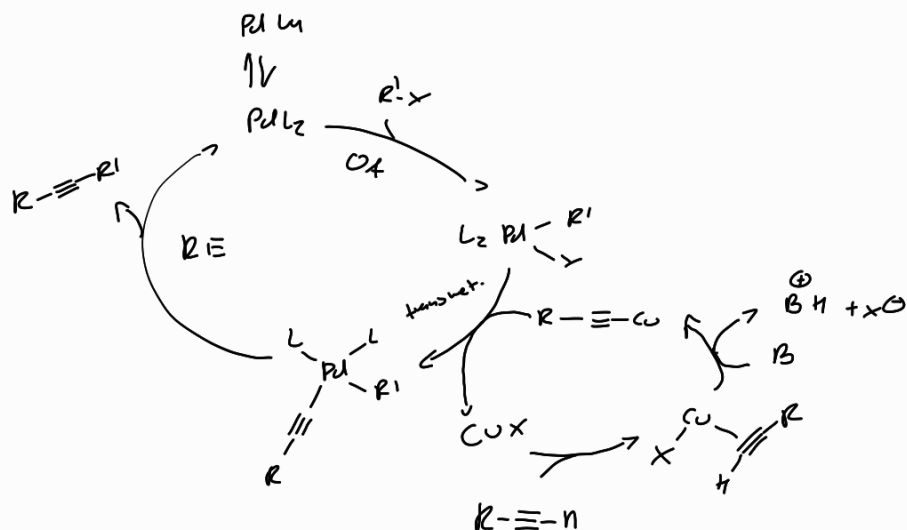
Heck reaction



Sonogashira coupling

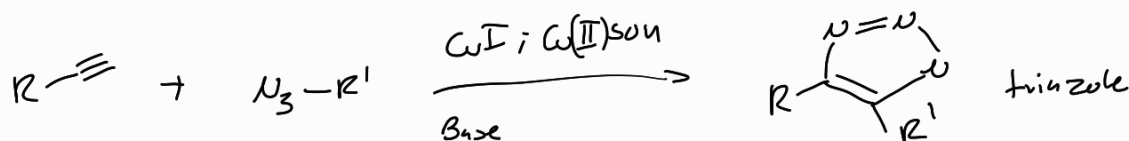


CuI, CuOTf

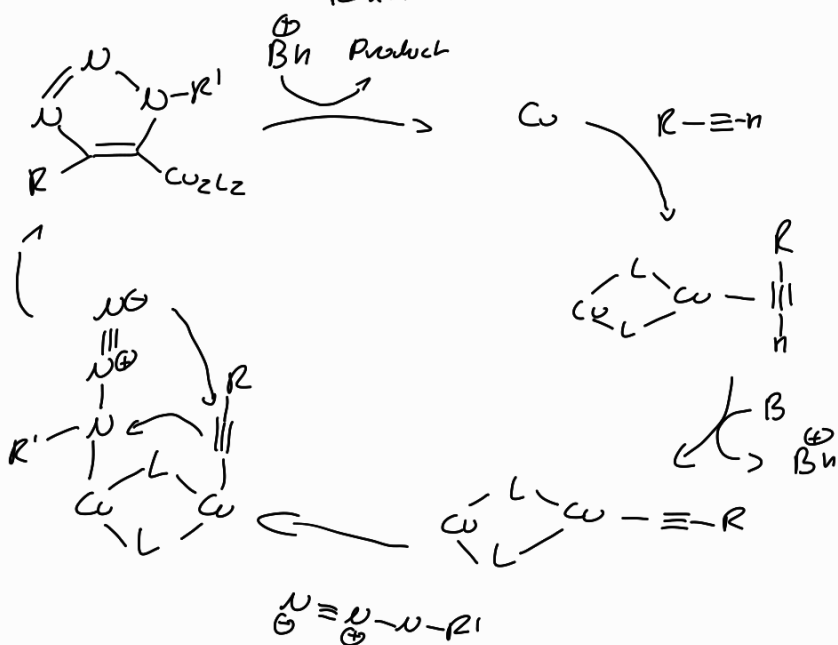


Copper

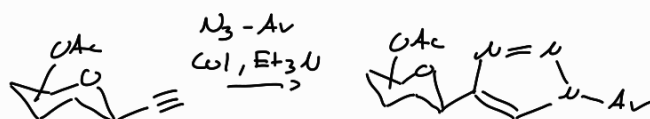
Azide alkyne Huisgen cycloaddition (click rxn)



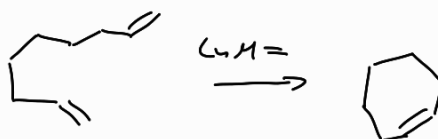
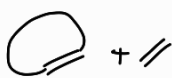
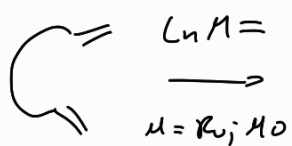
R and R' can be almost everything



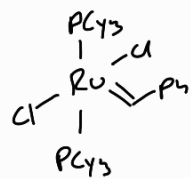
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Ring closing metathesis (RCM)



Catalysts



Grubbs I

