

# Catalysis Science & Technology

A multidisciplinary journal focussing on all fundamental science and technological aspects of catalysis  
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## IN THIS ISSUE

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### Cover

See Kröcher *et al.*, pp. 942–951.  
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### Inside cover

See Richards *et al.*, pp. 900–911.  
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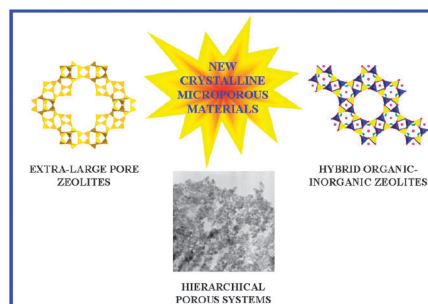
## PERSPECTIVES

833

### New trends in the synthesis of crystalline microporous materials

Giuseppe Bellussi, Angela Carati, Caterina Rizzo and Roberto Millini\*

This *perspective article* focuses on the challenges, recent progress and research directions in the preparation of microporous materials for applications in heterogeneous catalysis.

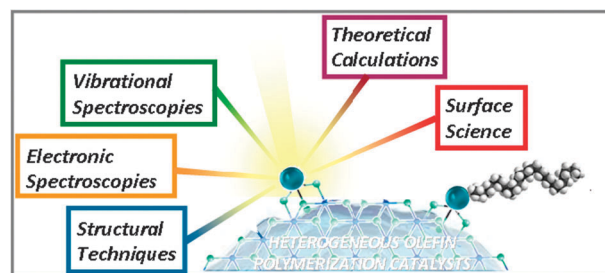


858

### The potential of spectroscopic methods applied to heterogeneous catalysts for olefin polymerization

Elena Groppo,\* Kalaivani Seenivasan and Caterina Barzan

Spectroscopic methods have the potential to reach a detailed understanding of the active sites in heterogeneous catalysts for olefin polymerization; this target has a high industrial and economic impact.



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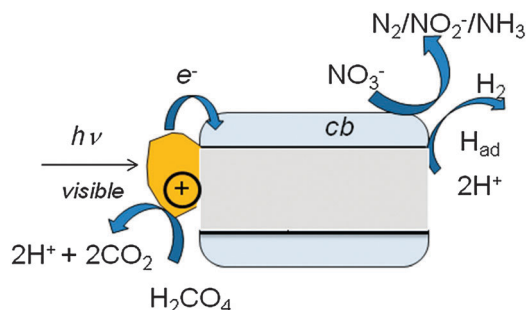
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### Aqueous phase photocatalytic nitrate destruction using titania based materials: routes to enhanced performance and prospects for visible light activation

Mikaela Shand and James A. Anderson\*

Representation of the simultaneous destruction of nitrate and oxalic acid over metal promoted titania activated by visible radiation.



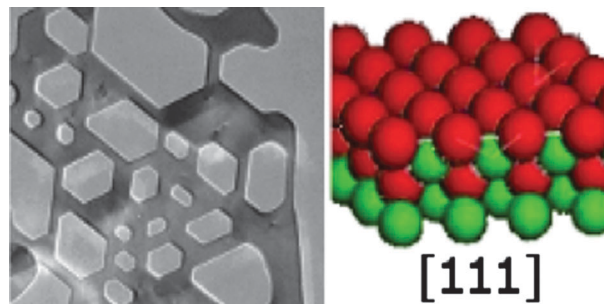
## MINIREVIEWS

900

### Nanoscale (111) faceted rock-salt metal oxides in catalysis

Christopher A. Cadigan, April R. Corpuz, Feng Lin, Christopher M. Caskey, Kenneth B. H. Finch, Xue Wang and Ryan M. Richards\*

Wet chemical syntheses and catalytic properties of (111) faceted rock-salt structure metal oxides MgO and NiO are reviewed.

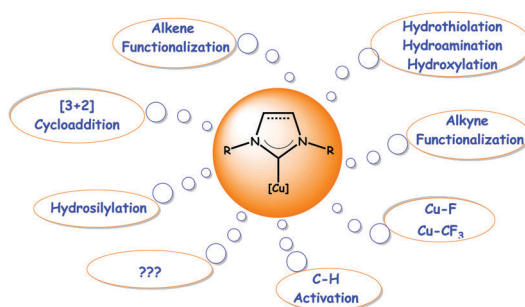


912

### Copper *N*-heterocyclic carbene complexes in catalysis

Jonathan D. Egbert, Catherine S. J. Cazin\* and Steven P. Nolan\*

*N*-Heterocyclic carbene ligated copper complexes act as catalysts in a variety of reactions.



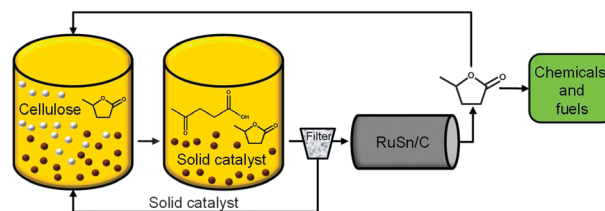
## COMMUNICATIONS

927

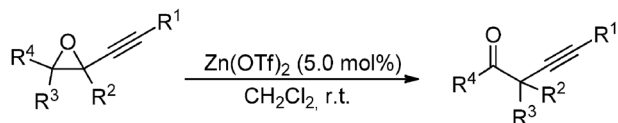
### Direct conversion of cellulose to levulinic acid and gamma-valerolactone using solid acid catalysts

David Martin Alonso, Jean Marcel R. Gallo, Max A. Mellmer, Stephanie G. Wettstein and James A. Dumesic\*

Cellulose can be converted to levulinic acid at high yields (>65%) over solid acid catalysts using gamma-valerolactone (GVL) as the solvent. This levulinic acid can be hydrogenated to produce GVL, thereby eliminating separation steps.



932

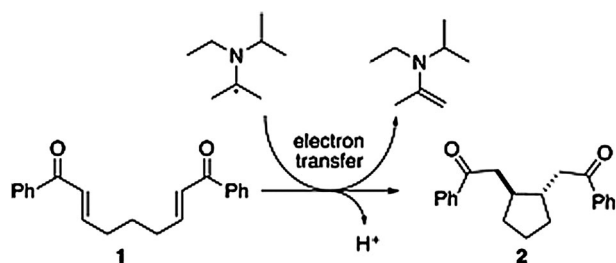


### Zinc-catalyzed Meinwald rearrangement of tetrasubstituted 1-alkynylloxiranes to tertiary $\alpha$ -alkynylketones

María J. González, Jesús González, Carmela Pérez-Calleja, Luis A. López\* and Rubén Vicente\*

Efficient access to tertiary  $\alpha$ -alkynylketones via a zinc-catalyzed Meinwald-type rearrangement of 1-alkynylloxiranes is reported.

935

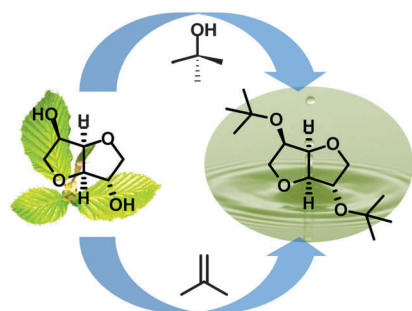


### Active participation of amine-derived radicals in photoredox catalysis as exemplified by a reductive cyclization

Hossein Ismaili, Spencer P. Pitre and Juan C. Scaiano\*

Amine-derived radicals can act as electron donors inducing the same cyclizations usually performed under photoredox catalysis conditions.

938

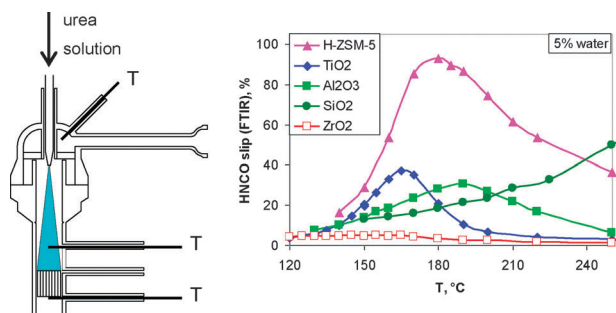


### Heterogeneously catalysed production of isosorbide *tert*-butyl ethers

Marcus Rose,\* Katharina Thenert, Rebecca Pfützenreuter and Regina Palkovits\*

Biogenic isosorbide has been converted to high boiling liquids by heterogeneously catalysed etherification with *tert*-butanol as well as with isobutene.

942



### Catalytic urea hydrolysis in the selective catalytic reduction of $\text{NO}_x$ : catalyst screening and kinetics on anatase $\text{TiO}_2$ and $\text{ZrO}_2$

Andreas M. Bernhard, Daniel Peitz, Martin Elsener, Tilman Schildhauer and Oliver Kröcher\*

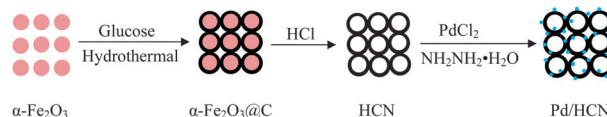
Catalytic urea thermolysis into  $\text{NH}_3$  and  $\text{HNCO}$  was found to be the rate-determining step in urea hydrolysis on  $\text{TiO}_2$ .

952

### Hematite nanoparticle-templated hollow carbon nanonets supported palladium nanoparticles: preparation and application as efficient recyclable catalysts

Maiyong Zhu, Ying Wang, Chengjiao Wang, Wei Li and Guowang Diao\*

Hollow carbon nanonets (HCN), which are attractive materials for catalyst support, were fabricated using the pre-synthesized hematite nanoparticles as the hard template.

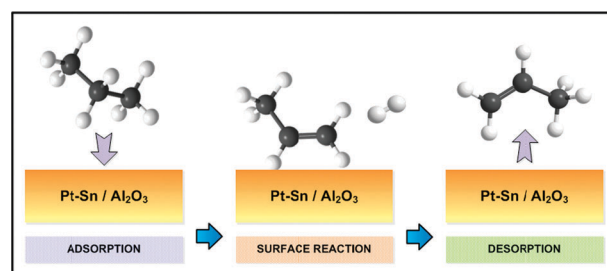


962

### Kinetics of propane dehydrogenation over Pt-Sn/Al<sub>2</sub>O<sub>3</sub>

Santiago Gómez-Quero, Theodoros Tsoufis, Petra Rudolf, Michiel Makkee, Freek Kapteijn and Gadi Rothenberg\*

A comprehensive kinetic study shows that propane dehydrogenates following a Langmuir mechanism, releasing hydrogen with surface reaction as the rate-limiting step.

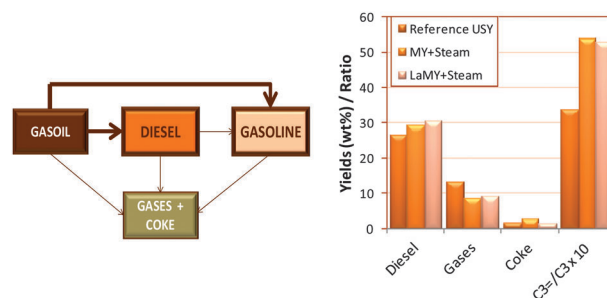


972

### Stabilized hierarchical USY zeolite catalysts for simultaneous increase in diesel and LPG olefinicity during catalytic cracking

Cristina Martínez, Danny Verboekend, Javier Pérez-Ramírez and Avelino Corma\*

A strategic combination of post-synthetic modifications results in mesoporous hydrothermally stable FCC catalysts giving enhanced propylene, diesel and bottoms conversion.

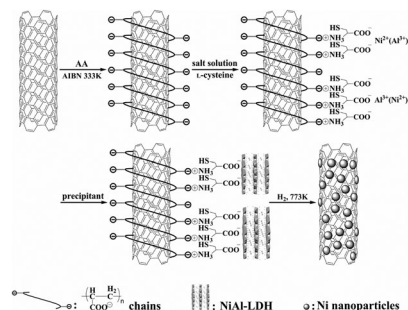


982

### A hybrid nanocomposite precursor route to synthesize dispersion-enhanced Ni catalysts for the selective hydrogenation of *o*-chloronitrobenzene

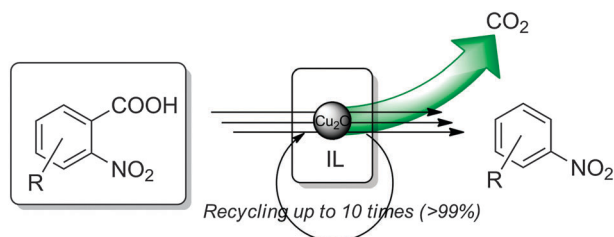
Jia Wang, Guoli Fan and Feng Li\*

Highly dispersed supported Ni catalysts for selective hydrogenation of *o*-chloronitrobenzene to *o*-chloroaniline were achieved from a hybrid nanocomposite precursor route.





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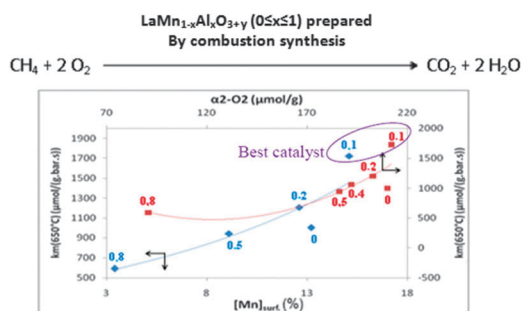


### Recyclable nanoscale copper(I) catalysts in ionic liquid media for selective decarboxylative C–C bond cleavage

Michael T. Keßler, Christian Gedig, Sebastian Sahler, Patricia Wand, Silas Robke and Martin H. G. Prechtl\*

Cu<sub>2</sub>O nanoparticles in phosphonium ionic liquids as a recyclable and effective catalytic system for protodecarboxylation of 2-nitrobenzoic acid derivatives.

1002

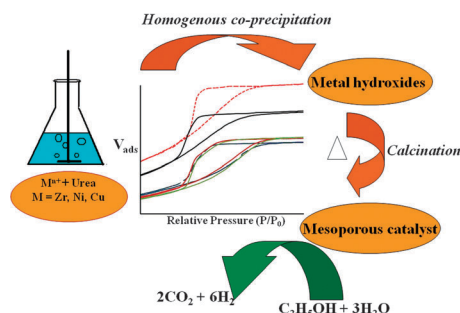


### Combustion synthesis of LaMn<sub>1-x</sub>Al<sub>x</sub>O<sub>3+δ</sub> (0 ≤ x ≤ 1): tuning catalytic properties for methane deep oxidation

Hend Najjar, Jean-François Lamonier, Olivier Mentré, Jean-Marc Giraudon\* and Habib Batis

LaMn<sub>1-x</sub>Al<sub>x</sub>O<sub>3+y</sub> (0 ≤ x ≤ 1) synthesized by a combustion method. The specific area varies from 6 to 22 m<sup>2</sup> g<sup>-1</sup>. Best catalytic activity for x = 0.1. Correlation of this activity with amounts of non-stoichiometric oxygen and Mn superficial concentration.

1017

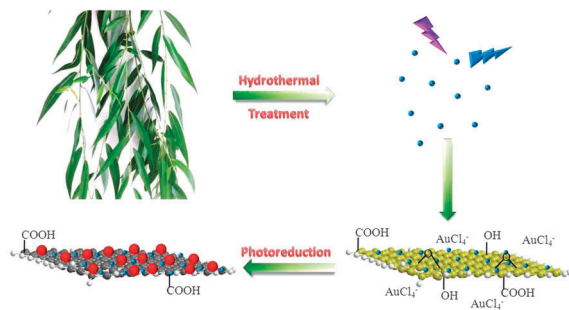


### Synthesis of mesoporous bimetallic Ni–Cu catalysts supported over ZrO<sub>2</sub> by a homogenous urea coprecipitation method for catalytic steam reforming of ethanol

Pankaj Kumar Sharma, Navin Saxena, Arti Bhatt, Chitra Rajagopal and Prasun Kumar Roy\*

Synthesis of mesoporous Ni–Cu bimetallic oxides supported over ZrO<sub>2</sub> by homogenous urea co-precipitation technique and its catalytic efficacy towards steam reforming of ethanol has been explored.

1027



### Green, low-cost synthesis of photoluminescent carbon dots by hydrothermal treatment of willow bark and their application as an effective photocatalyst for fabricating Au nanoparticles–reduced graphene oxide nanocomposites for glucose detection

Xiaoyun Qin, Wenbo Lu, Abdullah M. Asiri, Abdulrahman O. Al-Youbi and Xuping Sun\*

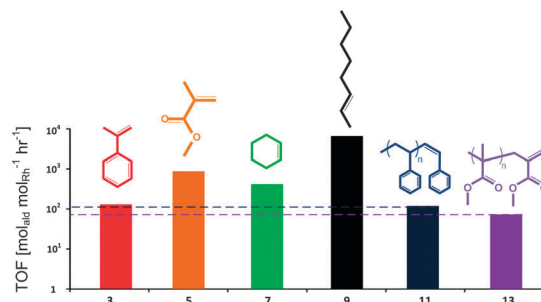
AuNPs–rGO nanocomposites were prepared via photoreduction using CNDs as a photocatalyst.

1036

### A bulky phosphite modified rhodium catalyst for efficient hydroformylation of disubstituted alkenes and macromonomers in supercritical carbon dioxide

Ard C. J. Koeken\* and Niels M. B. Smeets

The application of Rh as catalyst in combination with a bulky phosphite ligand in the presence of supercritical CO<sub>2</sub> yields high conversions in the hydroformylation of disubstituted alkenes and related macromonomers with high selectivity to the product aldehydes.

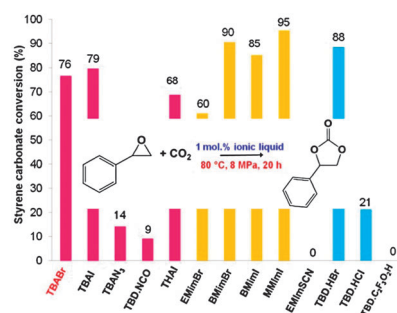


1046

### On the chemical fixation of supercritical carbon dioxide with epoxides catalyzed by ionic salts: an *in situ* FTIR and Raman study

Stéphanie Foltran, Jérôme Alsarraf, Frédéric Robert, Yannick Landais, Eric Cloutet, Henri Cramail and Thierry Tassaing\*

A kinetic analysis of the cycloaddition of CO<sub>2</sub> onto styrene oxide has been performed for a range of ionic liquids at 80 °C and 8 MPa. TBD·HBr and MMImI have shown better efficiency than the standard TBABr.

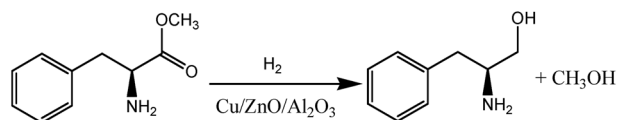


1056

### Preparation of L-phenylalaninol with high ee selectivity by catalytic hydrogenation of L-phenylalaninate over Cu/ZnO/Al<sub>2</sub>O<sub>3</sub> catalyst

Chunyou Gao, Xiuzheng Xiao, Dongsan Mao and Guanzhong Lu\*

Cu/ZnO/Al<sub>2</sub>O<sub>3</sub> (Cu/Zn/Al = 1.0:0.3:1.0) catalyzed hydrogenation of L-phenylalaninate by H<sub>2</sub> at 110 °C and 4 MPa for 5 h gave 69.2% yield of L-phenylalaninol with 99.84% ee.

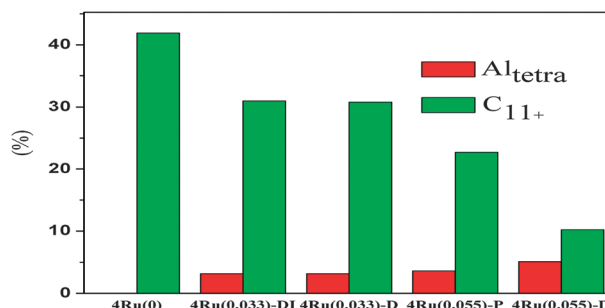


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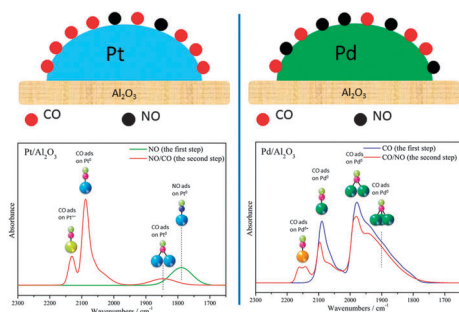
### Effect of tetrahedral aluminum on the catalytic performance of Al-SBA-15 supported Ru catalysts in Fischer-Tropsch synthesis

Sufang Chen, Jinlin Li,\* Yuhua Zhang, Yanxi Zhao and Jinping Hong

The product selectivity is mainly determined by the Al<sub>tetra</sub> content, a higher Al<sub>tetra</sub> content results in lower C<sub>11+</sub> selectivity in FTS.



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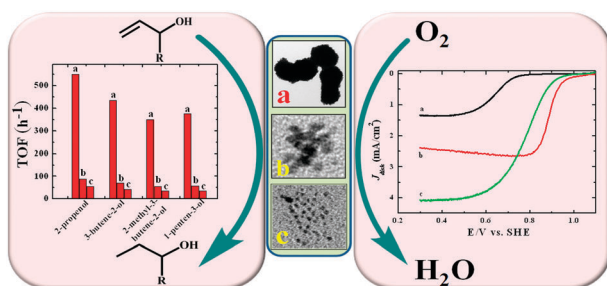


### The effect of CO on NO reduction over Pt/Pd-based NSR catalysts at low temperature

Qingqing Zhang, Liangfang Lv, Jinxin Zhu, Xinquan Wang, Jun Wang and Meiqing Shen\*

The present work investigates the effect of CO on NO reduction during the rich period over Pt/Pd-based NSR catalysts at low temperature.

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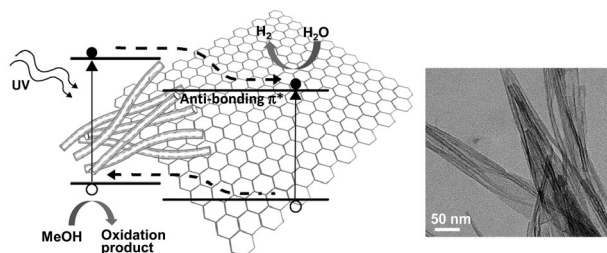


### Shape-controlled synthesis of Pt nanostructures and evaluation of catalytic and electrocatalytic performance

Sourov Ghosh and C. Retna Raj\*

It is demonstrated that the interconnected peanut-like Pt nanoparticles have significantly high catalytic and electrocatalytic activity with respect to the dendritic and quasispherical nanoparticles.

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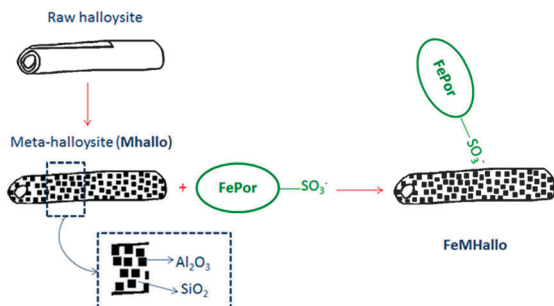


### Photocatalytic H<sub>2</sub> production of composite one-dimensional TiO<sub>2</sub> nanostructures of different morphological structures and crystal phases with graphene

Tse Jian Wong, Fang Jeng Lim, Minmin Gao, Gah Hung Lee and Ghim Wei Ho\*

One-dimensional TiO<sub>2</sub> nanostructures of different structural phases with graphene composites were employed as photocatalysts for photocatalytic H<sub>2</sub> production.

1094



### Iron(III) porphyrin supported on metahalloysite: an efficient and reusable catalyst for oxidation reactions

Guilherme Sippel Machado, Omar José de Lima, Kátia Jorge Ciuffi, Fernando Wypych and Shirley Nakagaki\*

Preparation of highly effective catalyst for oxidation reactions based on iron(III) porphyrin immobilized on metahalloysite.

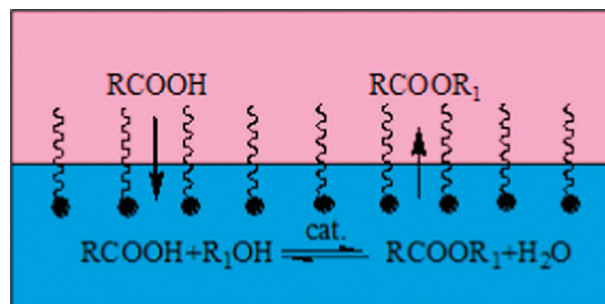


1102

### Biodiesel synthesis from the esterification of free fatty acids and alcohol catalyzed by long-chain Brønsted acid ionic liquid

Leqin He, Shenjun Qin,\* Tao Chang, Yuzhuang Sun and Xiaorui Gao

A long-chain Brønsted acid IL based on alkylammonium salts was synthesized. The IL as catalyst was applied to the catalytic synthesis of biodiesel from free fatty acids (FFAs). Hammett acidity of the IL was measured using UV–visible spectroscopy.

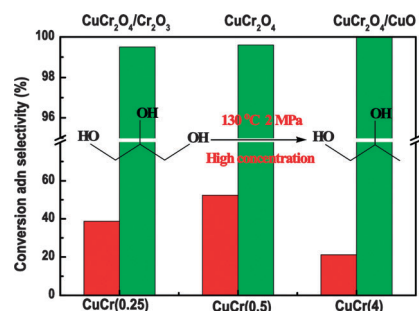


1108

### Controlled preparation and characterization of supported $\text{CuCr}_2\text{O}_4$ catalysts for hydrogenolysis of highly concentrated glycerol

Zihui Xiao, Jinghai Xiu, Xinkui Wang, Bingsen Zhang, Christopher T. Williams, Dangsheng Su and Changhai Liang\*

Hydrogenolysis performance of highly concentrated glycerol over the Cu–Cr catalysts was tuned by the Cu–Cr molar ratio.

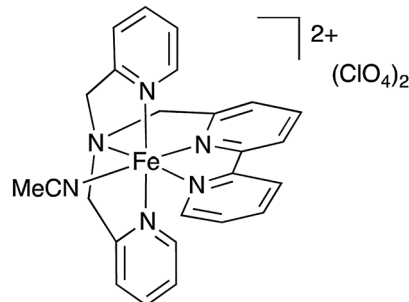


1116

### A strong-field pentadentate ligand in iron-based alkane oxidation catalysis and implications for iron(IV) oxo intermediates

Emma Wong, Jonathan Jeck, Michaela Grau, Andrew J. P. White and George J. P. Britovsek\*

A novel iron(II) complex containing a strong field pentadentate ligand has been investigated as a catalyst for alkane oxidation.

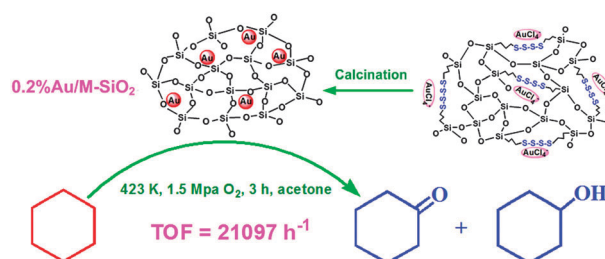


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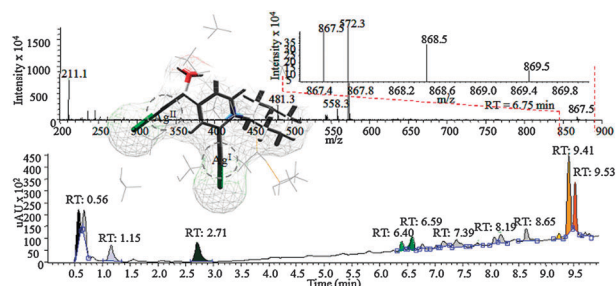
### One-pot synthesis of gold nanoparticles embedded in silica for cyclohexane oxidation

Cuihua Wang, Lifang Chen\* and Zhiwen Qi\*

Highly-dispersed gold nanoparticles embedded in amorphous silica were prepared by a facile one-pot process utilizing thioether functional groups to anchor  $\text{AuCl}_4^-$ . The 0.2% Au/M-SiO<sub>2</sub> catalyst exhibited a high TOF of  $21\,097\text{ h}^{-1}$  under the dipolar non hydrogen bond donor (HBD) acetone solvent at 423 K and 1.5 MPa O<sub>2</sub> for 3 h.



1129

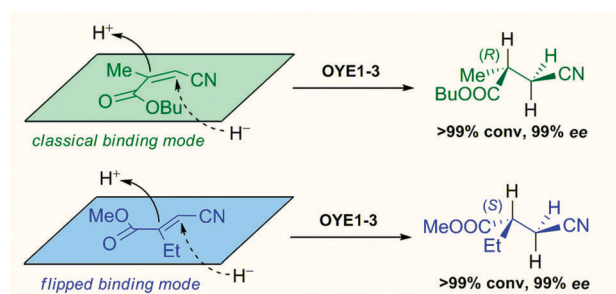


### Organosilver(I/II) catalyzed C–N coupling reactions – phenazines

Bojidarka Ivanova\* and Michael Spiteller

Organosilver catalyzed C–N coupling reactions producing a substantially different phenazine based molecular architecture, involving dinuclear Ag<sup>I</sup>/Ag<sup>II</sup> organometallic precursors.

1136

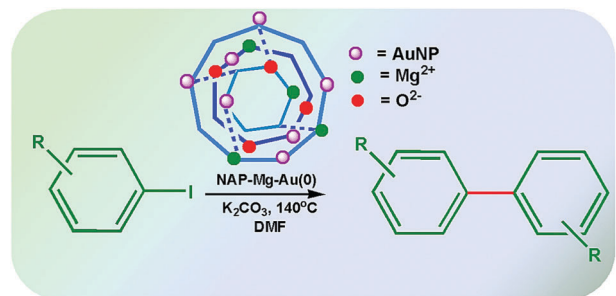


### Old Yellow Enzyme-mediated reduction of $\beta$ -cyano- $\alpha,\beta$ -unsaturated esters for the synthesis of chiral building blocks: stereochemical analysis of the reaction

Elisabetta Brenna,\* Francesco G. Gatti, Alessia Manfredi, Daniela Monti and Fabio Parmeggiani

The Old Yellow Enzyme-mediated reduction of  $\beta$ -cyano- $\alpha,\beta$ -unsaturated esters afforded useful chiral building blocks and showed an interesting stereochemical outcome.

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### Ullmann coupling of aryl iodides catalyzed by gold nanoparticles stabilized on nanocrystalline magnesium oxide

Keya Layek, H. Maheswaran\* and M. Lakshmi Kantam

Gold nanoparticles stabilized on nanocrystalline magnesium oxide is demonstrated to be an efficient heterogeneous catalytic system for the Ullmann coupling of aryl iodides.