

Green Chemistry

Cutting-edge research for a greener sustainable future

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IN THIS ISSUE

ISSN 1463-9262 CODEN GRCHFJ 12(5) 729–924 (2010)



Cover

See Clark *et al.*, pp. 798–803. Switching adhesive properties at the end-of-life enables the bitumen and valuable Nylon to be fully recycled achieving a closed-loop system.

Image reproduced by permission of James H. Clark and Sarah Lumley-Holmes from *Green Chemistry*, 2010, **12**, 798.



Inside cover

See Jérôme *et al.*, pp. 804–808. Combination of cheap and sustainable glycerol with supercritical carbon dioxide offers new tools in the search of greener medium for catalysis.

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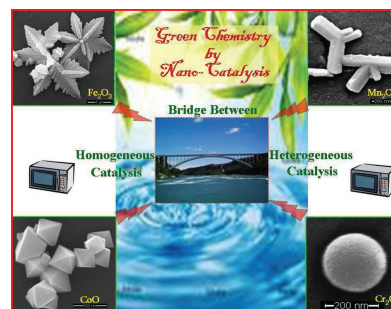
TUTORIAL REVIEW

743

Green chemistry by nano-catalysis

Vivek Polshettiwar* and Rajender S. Varma*

Nano-materials have emerged as sustainable and high surface area heterogeneous catalysts which mimic the homogeneous catalysts. This review focuses on the role of nano-catalysts in green chemistry development including the strategy of using microwave heating with nano-catalysis in benign aqueous media which offers an extraordinary synergistic effect with greater potential than these three components in isolation.



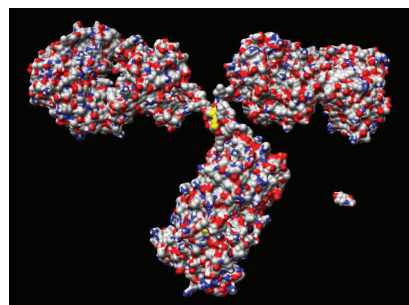
PERSPECTIVE

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Environmental considerations in biologics manufacturing

Sa V. Ho,* Joseph M. McLaughlin, Berkeley W. Cue and Peter J. Dunn

Nearly 20 years ago, Professor Roger Sheldon proposed an E factor for small-molecule medicines and gave typical ranges for those molecules. This perspective extends that idea to large-molecule medicines which are growing rapidly in importance.



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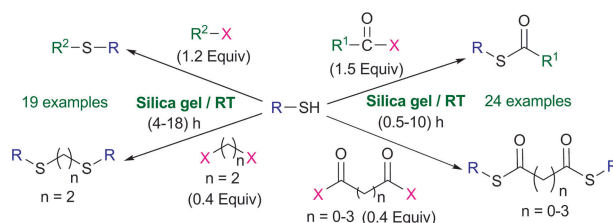
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Silica-promoted facile synthesis of thioesters and thioethers: a highly efficient, reusable and environmentally safe solid support

Basudeb Basu,* Susmita Paul and Ashis K. Nanda

An efficient, mild and rapid procedure for the acylation and alkylation of aromatic and aliphatic thiols mediated on a silica gel surface at room temperature is described.

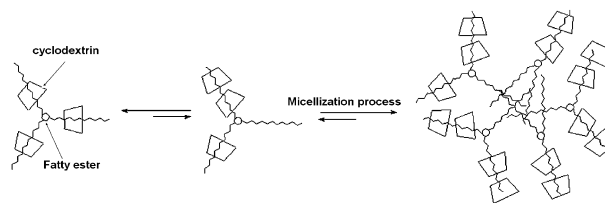


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New supramolecular amphiphiles based on renewable resources

Cécile Machut,* Fouzia Mouri-Belabdelli, Jean-Paul Cavrot, Adlane Sayede and Eric Monflier

β -Cyclodextrin: a tool to create renewable surfactant. The complexation between esters derived from sorbitol and β -cyclodextrin was studied. Isosorbide dioleate and sorbitan trioleate formed well-defined inclusion complexes with β -cyclodextrin and these inclusion complexes exhibited surfactant behaviour.

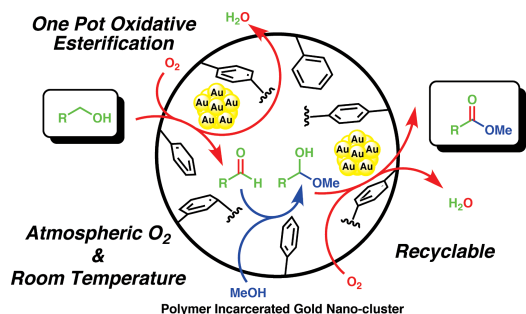


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Aerobic oxidative esterification of alcohols catalyzed by polymer-incarcerated gold nanoclusters under ambient conditions

Hiroyuki Miyamura, Tomohiro Yasukawa and Shū Kobayashi*

One-pot oxidative methyl esterification reactions of alcohols were catalyzed by polymer-incarcerated gold nanocluster catalyst using molecular oxygen as an oxidant under ambient conditions.

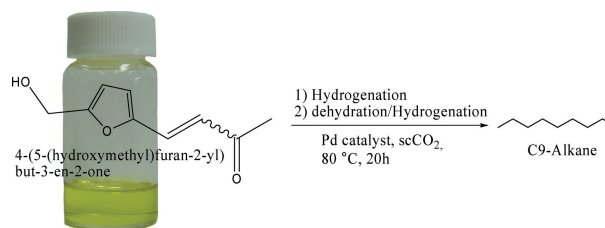


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Production of linear alkane *via* hydrogenative ring opening of a furfural-derived compound in supercritical carbon dioxide

Maya Chatterjee,* Keichiro Matsushima, Yutaka Ikushima, Masahiro Sato, Toshirou Yokoyama, Hajime Kawanami* and Toshishige Suzuki

The formation of linear alkane with >99% selectivity was achieved in supercritical carbon dioxide under very mild conditions using Pd/Al-MCM-41 catalyst through the hydrogenation and dehydration/hydrogenation of a furfural-derived compound.





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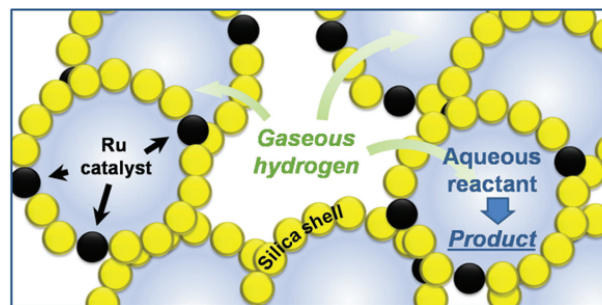
COMMUNICATIONS

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Pausing a stir: heterogeneous catalysis in “dry water”

Benjamin O. Carter, Dave J. Adams and Andrew I. Cooper*

The highly distributed gas–liquid interface in “dry water” powder can be used to greatly increase the kinetics of a gas–liquid heterogeneous catalytic hydrogenation, in the absence of any applied mixing.

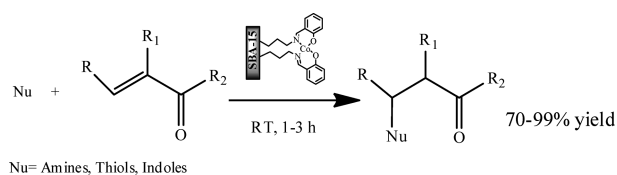


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Supported cobalt complex-catalysed conjugate addition of indoles, amines and thiols to α,β -unsaturated compounds

Fatemeh Rajabi,* Sepideh Razavi and Rafael Luque*

A versatile cobalt-heterogenised complex on SBA-15 shows excellent activities in solventless aza- and thia-Michael conjugative additions of indoles amines and thiols to α,β -unsaturated compounds at room temperature.

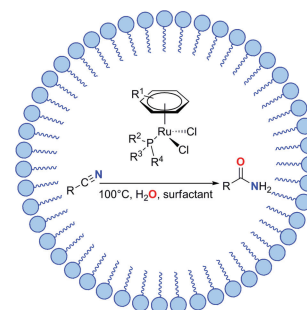


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Efficient nitrile hydration mediated by Ru^{II} catalysts in micellar media

Alessandra Cavarzan, Alessandro Scarso* and Giorgio Strukul*

Efficient hydration of a variety of nitriles to amides can be catalyzed by intrinsically non-water-soluble Ru complexes in water containing surfactants. The micellar medium ensures catalyst solubilization, favoring rapid ligand screening and moderate experimental conditions.

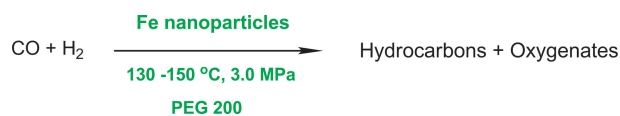


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Liquid-phase Fischer–Tropsch synthesis over Fe nanoparticles dispersed in polyethylene glycol (PEG)

Xiao-Bing Fan, Zhi-Yuan Tao, Chao-Xian Xiao, Fang Liu and Yuan Kou*

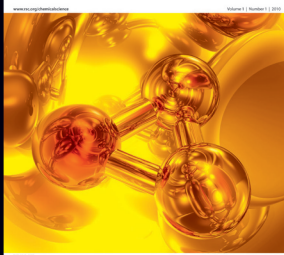
The Fe nanoparticles dispersed in polyethylene glycol (PEG) can catalyze Fischer–Tropsch (F-T) synthesis at mild conditions (150 °C, 2.0 MPa H₂, 1.0 MPa CO) with an activity as high as 1.5 mol_{CO} mol_{Fe}⁻¹ h⁻¹.



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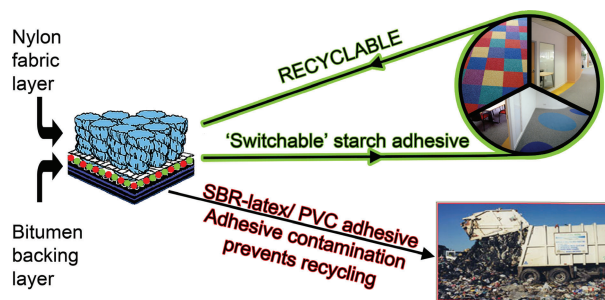
PAPERS

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Switchable adhesives for carpet tiles: a major breakthrough in sustainable flooring

Peter S. Shuttleworth, James H. Clark,* Robert Mantle and Nigel Stansfield

A 'switchable' adhesive, based on a modified starch was utilised for binding carpet tiles. Switching adhesive properties at the end-of-life enables the bitumen and valuable Nylon to be fully recycled achieving a closed-loop system. Currently used adhesives such as SBR-latex and PVC contaminate the nylon and prevent recycling.

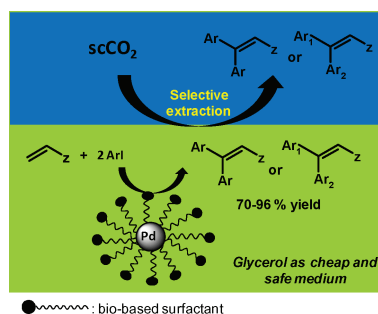


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Glycerol as a cheap, safe and sustainable solvent for the catalytic and regioselective β,β -diarylation of acrylates over palladium nanoparticles

Mathieu Delample, Nicolas Villandier, Jean-Paul Douliez, Séverine Camy, Jean-Stéphane Condoret, Yannick Pouilloux, Joël Barrault and François Jérôme*

β,β -Diarylation of acrylates can be conveniently achieved in glycerol using palladium nanoparticles as an air-stable catalyst and supercritical carbon dioxide as a clean and selective extraction solvent.

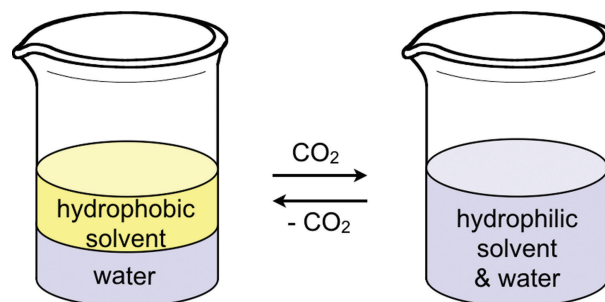


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A solvent having switchable hydrophilicity

Philip G. Jessop,* Lam Phan, Andrew Carrier, Shona Robinson, Christoph J. Dürr and Jitendra R. Harjani

A switchable-hydrophilicity solvent is a liquid solvent that normally has very poor miscibility with water, but when exposed to 1 bar of CO_2 becomes miscible with water.

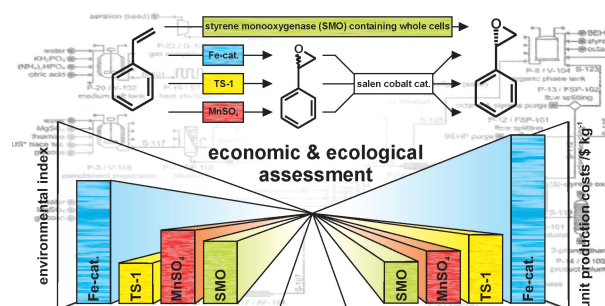


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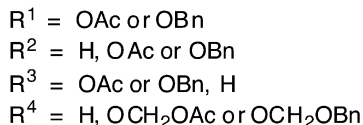
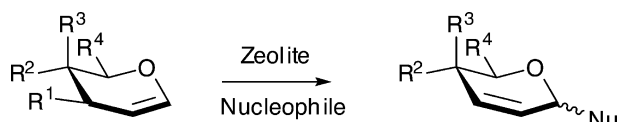
Intensification and economic and ecological assessment of a biocatalytic oxyfunctionalization process

Daniel Kuhn, Muhammad Abdul Khaliq, Elmar Heinzle, Bruno Bühler* and Andreas Schmid

Intensified biocatalytic (*S*)-styrene oxide production compared well in an ecological and economic assessment including chemical alternatives based on epoxidation by means of ferric phenanthroline (Fe-cat.), titanium silicate (TS-1), or manganese sulfate (MnSO_4) catalysts and hydrolytic kinetic resolution using a salen cobalt catalyst.



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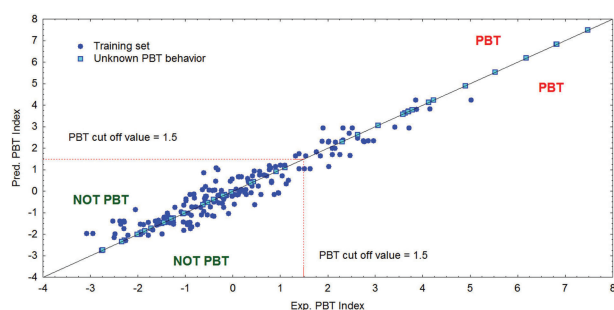


The use of ultrastable Y zeolites in the Ferrier rearrangement of acetylated and benzylated glycols

Pieter Levecque, David W. Gammon,* Pierre Jacobs, Dirk De Vos and Bert Sels

The commercially available H-USY zeolite, CBV-720, is an efficient, recyclable catalyst for the Ferrier rearrangement of acetylated and benzylated glycols, providing a general route to 2,3-unsaturated *O*-, *S*-, *N*- and *C*-glycosides.

836

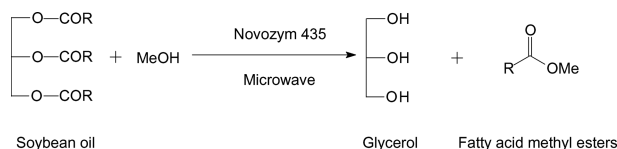


QSPR as a support for the EU REACH regulation and rational design of environmentally safer chemicals: PBT identification from molecular structure

Ester Papa and Paola Gramatica*

A QSAR model was developed to predict the potential PBT behaviour of existing and not yet synthesised organic compounds; this model is particularly useful for the identification of unsafe chemicals and of possible alternatives only on the basis of their chemical structures.

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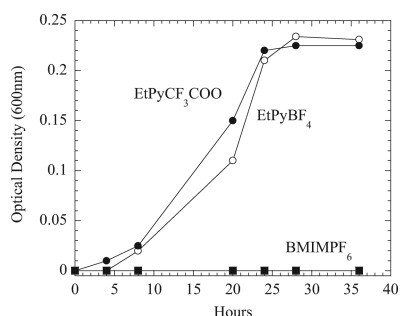


Microwave-assisted fatty acid methyl ester production from soybean oil by Novozym 435

Dahai Yu,* Li Tian, Dongxiao Ma, Hao Wu, Zhi Wang, Lei Wang and Xuexun Fang*

Microwave-assisted enzymatic transesterification of soybean oil with methanol is presented as a green and fast approach to producing fatty acid methyl ester.

851



Biodegradation of pyridinium-based ionic liquids by an axenic culture of soil *Corynebacteria*

C. Zhang, H. Wang, S. V. Malhotra, C. J. Dodge and A. J. Francis*

Corynebacterium sp. isolated from soil degraded [EtPy]⁺[BF₄]⁻ and [EtPy]⁺[CF₃COO]⁻ but not [BMIM]⁺[PF₆]⁻ when present as the sole carbon and nitrogen source.

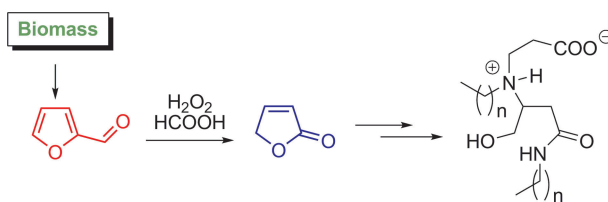
PAPERS

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Synthesis of surfactants from furfural derived 2[5H]-furanone and fatty amines

Abdoulaye Gassama, Cédric Ernenwein and Norbert Hoffmann*

Furfural obtained from biomass has been transformed into surfactants belonging to a new betain family with two hydrophobic moieties. First studies on biodegradation and typical surfactant parameters have been carried out.

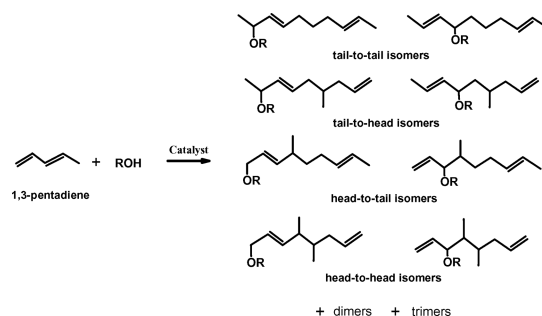


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Telomerisation of long-chain dienes with alcohols using Pd(IMES)(dvds) catalyst

Laura Torrente-Murciano, Alexei Lapkin,* David J. Nielsen, Ian Fallis and Kingsley J. Cavell*

The telomerisation of long diene molecules such as 1,3-pentadiene and 1,3-hexadiene with long-chain alcohols was probed by using palladium catalysts with nucleophilic carbene (NHC) ligands. These results open up new opportunities for building high molecular weight and value-added functionalised molecules.

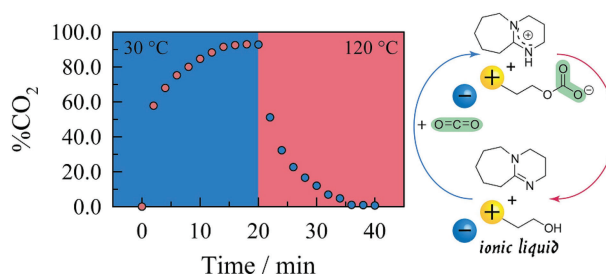


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Reversible and robust CO₂ capture by equimolar task-specific ionic liquid–superbase mixtures

Congmin Wang, Shannon M. Mahurin, Huimin Luo, Gary A. Baker, Haoran Li and Sheng Dai*

Task-specific ionic liquid–superbase systems are highly efficient for the capture of CO₂, eliminating the use of volatile alcohol or water. The captured CO₂ is easily released by slight heating.

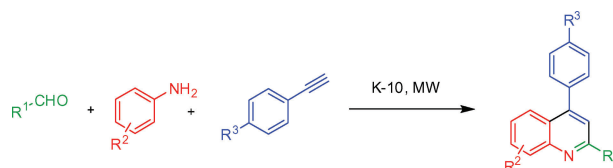


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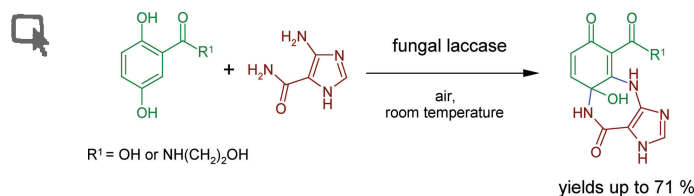
Microwave-assisted multicomponent domino cyclization–aromatization: an efficient approach for the synthesis of substituted quinolines

Aditya Kulkarni and Béla Török*

A solid, acid-catalyzed, microwave-assisted multicomponent domino reaction of anilines, aldehydes and terminal aryl alkynes yields quinolines with nearly 90% atom economy in excellent yields in a matter of minutes.



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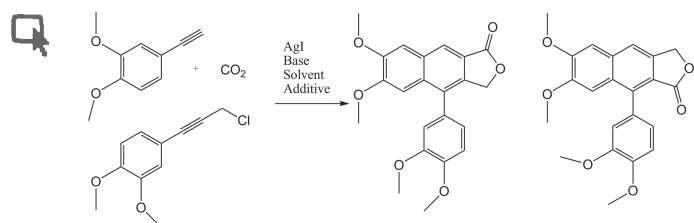


Enzymatic cyclizations using laccases: Multiple bond formation between dihydroxybenzoic acid derivatives and aromatic amines

Veronika Hahn,* Timo Davids, Michael Lalk, Frieder Schauer and Annett Mikolasch

The laccase-catalyzed formation of cycloheptenes, cyclooctenes, diazaspiro cyclohexenes, and phenazines was investigated for the first time. The mild and environmentally friendly reaction conditions, which do not require high temperatures or pressures, are crucial factors for the choice of laccases as biocatalyst.

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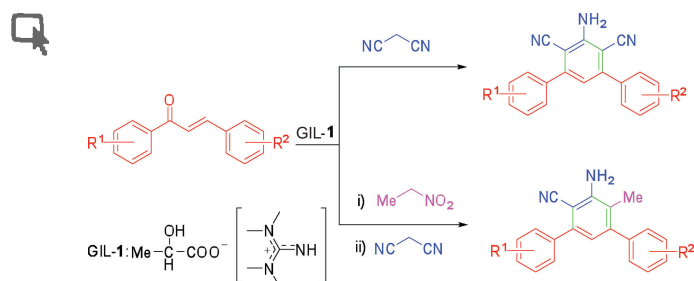


Advances in the methodology of a multicomponent synthesis of aryl-naphthalene lactones

Patrick Foley, Nicolas Eghbali and Paul T. Anastas*

Multicomponent syntheses are of immense interest to the field of Green Chemistry. Described here is a multicomponent synthesis of aryl-naphthalene lignan lactones, which are valuable natural products with promising anticancer and antiviral properties.

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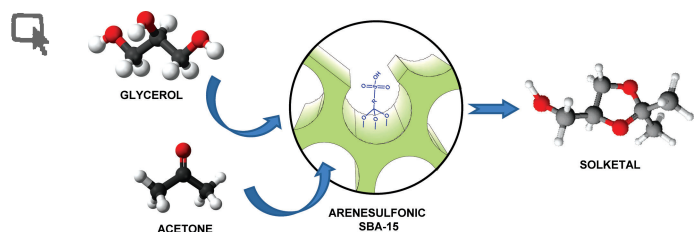


A facile and efficient one-pot synthesis of polysubstituted benzenes in guanidinium ionic liquids

Xin Xin, Yan Wang, Wu Xu, Yingjie Lin,* Haifeng Duan and Dewen Dong*

A facile and efficient synthesis of polysubstituted benzenes has been developed *via* sequential Michael addition, Knoevenagel condensation and nucleophilic cyclization reactions of readily available chalcones with active methylene compounds in guanidinium ionic liquids.

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Acetalisation of bio-glycerol with acetone to produce solketal over sulfonic mesostructured silicas

Gemma Vicente,* Juan A. Melero, Gabriel Morales, Marta Paniagua and Eric Martín

Sulfonic acid-modified mesostructured silicas have shown an outstanding catalytic behaviour in the acetalisation of glycerol with acetone to produce solketal, an oxygenated glycerol derivative that can be used as fuel component.

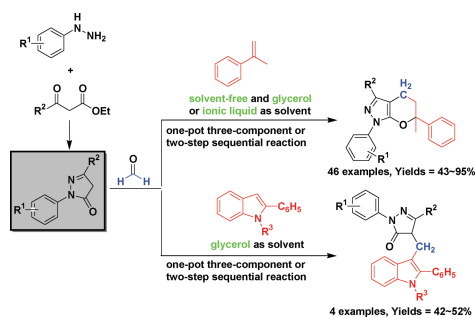
PAPERS

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Multicomponent reactions of 1,3-disubstituted 5-pyrazolones and formaldehyde in environmentally benign solvent systems and their variations with more fundamental substrates

Jia-Neng Tan, Minghao Li and Yanlong Gu*

MCRs of styrenes, vinylferrocene and indoles with 1,3-disubstituted 5-pyrazolones and paraformaldehyde were developed. Synthesis of 1,3-disubstituted 5-pyrazolones from phenylhydrazines and β -ketone esters was proved to be compatible with these MCRs, thus allowing construction of some new two-step sequential reactions.

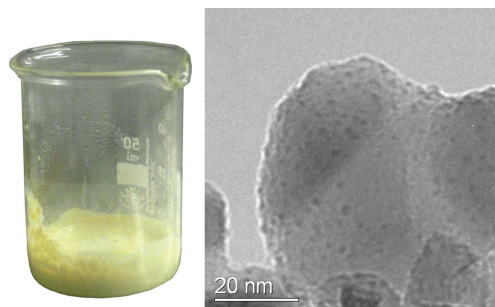


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The effect of catalyst preparation method on the performance of supported Au–Pd catalysts for the direct synthesis of hydrogen peroxide


James C. Pritchard, Qian He, Edwin N. Ntainjua, Marco Piccinini, Jennifer K. Edwards, Andrew A. Herzing, Albert F. Carley, Jacob A. Moulijn, Christopher J. Kiely and Graham J. Hutchings*

Careful control of the preparation parameters for supported AuPd catalysts, particularly the impregnation and drying steps, results in high activity stable catalysts for the direct synthesis of H_2O_2 .



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Plenary Speakers(confirmed):

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Leslie Dutton	(USA)
Graham Fleming	(USA)
Dario Giordano	(ITA)
Michael Graetzel	(CHE)
Julian Hibberd	(U K)
Debbie Lindell	(ISR)
Barry Pogson	(A U)
Jean-David Rochaix	(CHE)
Toshiharu Shikanai	(JPN)
Jürgen Soll	(D E)
John Walker	(U K)
Klaas Jan Van Wijk	(USA)
Guoxiong Wu	(CHN)

Symposia Topics:

- Assembly of photosynthetic protein complex
- Bioenergetics of photosynthetic electron flow
- Biogenesis of photosynthetic apparatus
- C3, C4 and CAM and genetic engineering
- CO₂ concentrating mechanisms
- Computational systems biology
- Control of the Calvin-Benson cycle
- Crop yield improvement
- Global photosynthesis
- Light harvesting in anoxygenic systems
- Light harvesting in oxygenic systems
- Marine photosynthesis and global impact
- Mechanism of water oxidation
- Further perspective in basic and applied photosynthesis research
- Teaching and history of photosynthesis
- Microbial derived biofuels
- Mimicking photosynthetic catalysis
- Mimicking photosynthetic light harvesting
- Organelle communication
- Perception of environmental stress and acclimation
- Photoprotection, photoinhibition, and dynamics
- Photosynthesis and new environmental challenges
- Plant derived biofuels
- Regulation of electron transfer
- Regulation of photosynthetic gene expression
- Type I reaction centres
- Type II reaction centres

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