

Green Chemistry

Cutting-edge research for a greener sustainable future

rsc.li/greenchem

The Royal Society of Chemistry is the world's leading chemistry community. Through our high impact journals and publications we connect the world with the chemical sciences and invest the profits back into the chemistry community.

IN THIS ISSUE

ISSN 1463-9262 CODEN GRCHFJ 25(20) 7829–8296 (2023)



Cover

See Wei-Min He *et al.*, pp. 7983–7987.

Image reproduced by permission of Wei-Min He from *Green Chem.*, 2023, **25**, 7983.



Inside cover

See Zongjie Dai *et al.*, pp. 7988–7997.

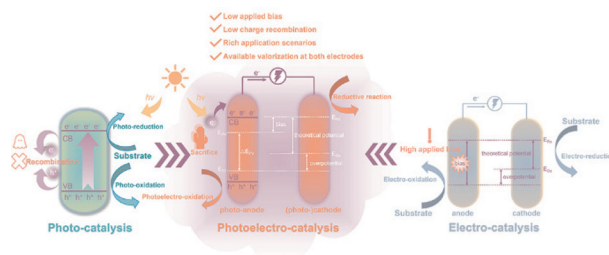
Image reproduced by permission of Zongjie Dai from *Green Chem.*, 2023, **25**, 7988.

TUTORIAL REVIEWS

7843

Sacrifice and valorization of biomass to realize energy exploitation and transformation in a photoelectrochemical way

Daobin Tang, Jianguo Liu,* Xinghua Zhang, Lungang Chen, Longlong Ma and Qi Zhang*



7863

Physico-chemical challenges on the self-assembly of natural and bio-based ingredients on hair surfaces: towards sustainable haircare formulations

Gustavo S. Luengo,* Fabien Leonforte, Andrew Greaves, Ramon G. Rubio and Eduardo Guzman*



Editorial Staff

Executive Editor

Michael A. Rowan

Deputy Editor

Vikki Pritchard

Development Editors

Bee Hockin, Andrea Carolina Ojeda Porras

Editorial Production Manager

Gisela Scott

Publisher

Jeanne Andres

Senior Publishing Editor

Robin Brabham

Publishing Editors

Catherine Au, Isobel Darlington, Konoya Das, Alexandre Dumon, Amy Lucas, Kieran Nicholson, Rini Prakash, Charlotte Pugsley, Hugh Ryan

Editorial Assistant

Daphne Houston

Publishing Assistant

Robert Griffiths

For queries about submitted articles please contact Gisela Scott, Editorial Production Manager, in the first instance. E-mail green@rsc.org

For pre-submission queries please contact Michael A. Rowan, Executive Editor.

E-mail green-rsc@rsc.org

Green Chemistry electronic:

ISSN 1463-9270 is published 24 times

a year by the Royal Society of Chemistry, Thomas Graham House, Science Park, Milton Road, Cambridge, CB4 0WF, UK.

All orders, with cheques made payable to the Royal Society of Chemistry, should be sent to the Royal Society of Chemistry Order Department, Royal Society of Chemistry, Thomas Graham House, Science Park, Milton Road, Cambridge, CB4 0WF, UK

Tel +44 (0)1223 432398; E-mail orders@rsc.org

2023 Annual electronic subscription price: £2578; US\$4544. Customers in Canada will be subject to a surcharge to cover GST. Customers in the EU subscribing to the electronic version only will be charged VAT.

If you take an institutional subscription to any Royal Society of Chemistry journal you are entitled to free, site-wide web access to that journal. You can arrange access via Internet Protocol (IP) address at www.rsc.org/ip

Customers should make payments by cheque in sterling payable on a UK clearing bank or in US dollars payable on a US clearing bank.

Whilst this material has been produced with all due care, the Royal Society of Chemistry cannot be held responsible or liable for its accuracy and completeness, nor for any consequences arising from any errors or the use of the information contained in this publication. The publication of advertisements does not constitute any endorsement by the Royal Society of Chemistry or Authors of any products advertised. The views and opinions advanced by contributors do not necessarily reflect those of the Royal Society of Chemistry which shall not be liable for any resulting loss or damage arising as a result of reliance upon this material. The Royal Society of Chemistry is a charity, registered in England and Wales, Number 207890, and a company incorporated in England by Royal Charter (Registered No. RC000524), registered office: Burlington House, Piccadilly, London W1J 0BA, UK, Telephone: +44 (0) 207 4378 6556.

Advertisement sales:

Tel +44 (0) 1223 432246; Fax +44 (0) 1223 426017;

E-mail advertising@rsc.org

For marketing opportunities relating to this journal, contact marketing@rsc.org

Green Chemistry

Cutting-edge research for a greener sustainable future

rsc.li/greenchem

Green Chemistry focuses on cutting-edge research that attempts to reduce the environmental impact of the chemical enterprise by developing a technology base that is inherently non-toxic to living things and the environment.

Editorial Board

Chair

Professor Doctor Javier Pérez-Ramírez, ETH Zurich, Switzerland

Associate Editors

Professor Aiwen Lei, College of Chemistry and Molecular Sciences, The Institute for Advanced Studies, Wuhan University, P. R. China
Dr Elsje A. Quadrelli, CNRS and CPE Lyon, France

Professor Magdalena Titirici, Imperial College London, UK
Dr Keiichi Tomishige, Tohoku University, Japan

Members

Professor André Bardow, ETH Zurich, Switzerland
Dr François Jérôme, University of Poitiers, France
Professor Laurel Shafer, The University of British Columbia, Canada
Dr Helen Sneddon, University of York, UK
Dr Tao Zhang, Dalian Institute of Chemical Physics, Chinese Academy of Sciences, China

Advisory Board

Paul Anastas, Yale University, USA
Isabel Arends, TU Delft, The Netherlands
Gregg Beckham, NREL, USA
Asim Bhaumik, Indian Association for the Cultivation of Science, India
Fabrizio Caverni, University of Bologna, Italy
James Clark, University of York, UK
Avelino Corma, Universidad Politécnica de Valencia, Spain
Robert H Crabtree, Yale University, USA
Paul Dauenhauer, University of Minnesota, USA
James Dumesic, University of Wisconsin-Madison, USA
Martin Eastgate, Bristol Myers Squibb, USA
Karen Goldberg, University of Washington, USA
Buxing Han, Chinese Academy of Sciences, China
Steve Howdle, Nottingham University, UK
Andrew J. Hunt, Khon Kaen University, Thailand

Graham Hutchings, Cardiff University, UK
Philip Jessop, Queen's University, Canada
C. Oliver Kappe, University of Graz, Austria
Shu Kobayashi, University of Tokyo, Japan
Burkhard Koenig, University of Regensburg, Germany
Michael Kopach, Eli Lilly and Company, USA
Walter Leitner, RWTH Aachen University, Germany
Chao-Jun Li, McGill University, Canada
Bruce Lipshutz, University of California, USA
Doug MacFarlane, Monash University, Australia
Tomoo Mizugaki, Osaka University, Japan
Regina Palkovits, RWTH Aachen, Germany
Alvise Perosa, Università Ca Foscari, Italy
Martina Peters, Bayer AG, Germany
Martyn Poliakoff, University of Nottingham, UK
Colin Raston, Flinders University, Australia
Roberto Rinaldi, Imperial College London, UK
Robin D. Rogers, McGill University, Canada

Susannah Scott, University of California, USA
Roger Sheldon, Delft University of Technology, The Netherlands
Christian Stevens, Ghent University, Belgium
Natalia Tarasova, Mendeleev University of Chemical Technology, Russia
Rajender Varma, US Environmental Protection Agency, USA
Tom Welton, Imperial College London, UK
Kevin C. W. Wu, National Taiwan University, Taiwan
Ganapati D. Yadav, Institute of Chemical Technology, India
Hisao Yoshida, Kyoto University, Japan
Suojiang Zhang, Institute of Process Engineering, Chinese Academy of Sciences, China
Julie Zimmerman, Yale University, USA
Vânia Zuin Zeidler, Institute of Sustainable Chemistry Faculty/School of Sustainability, Leuphana University, Germany

Information for Authors

Full details on how to submit material for publication in Green Chemistry are given in the Instructions for Authors (available from <http://www.rsc.org/authors>). Submissions should be made via the journal's homepage: rsc.li/greenchem

Authors may reproduce/republish portions of their published contribution without seeking permission from the Royal Society of Chemistry, provided that any such republication is accompanied by an acknowledgement in the form: (Original Citation)–Reproduced by permission of the Royal Society of Chemistry.

This journal is © The Royal Society of Chemistry 2023.

Apart from fair dealing for the purposes of research or private study for non-commercial purposes, or criticism or review, as permitted under the Copyright, Designs and Patents Act 1988 and the Copyright and Related Rights Regulation 2003, this publication may only be reproduced, stored or transmitted, in any form or by any means, with the prior permission in writing of the Publishers or in the case of reprographic reproduction in accordance with the terms of licences issued by the Copyright Licensing Agency in the UK. US copyright law is applicable to users in the USA.

Registered charity number: 207890

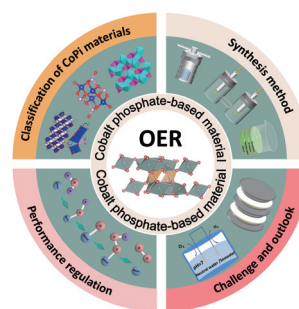


TUTORIAL REVIEWS

7883

Research status, opportunities, and challenges of cobalt phosphate based materials as OER electrocatalysts

Xingheng Zhang, Qi Hou, Shoufu Cao, Xiaojing Lin, Xiaodong Chen, Zhaojie Wang,* Shuxian Wei, Siyuan Liu, Fangna Dai and Xiaoqing Lu*

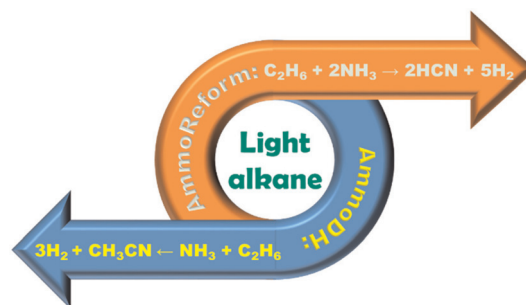


PERSPECTIVE

7904

Ammonia-assisted reforming and dehydrogenation toward efficient light alkane conversion

Yizhi Xiang

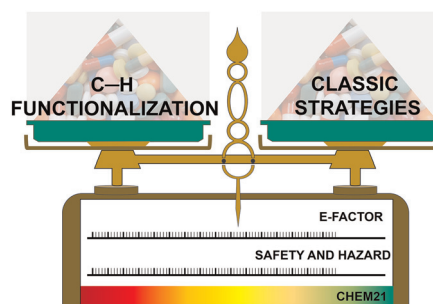


CRITICAL REVIEWS

7916

Classic vs. C–H functionalization strategies in the synthesis of APIs: a sustainability comparison

Francesco Ferlin, Giulia Brufani, Gabriele Rossini and Luigi Vaccaro*



7934

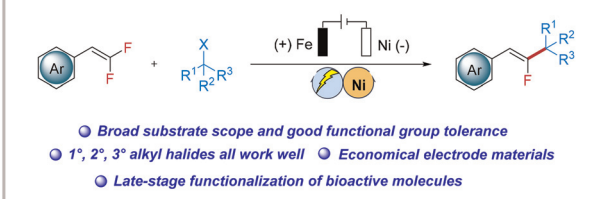
Potential of using microalgae to sequester carbon dioxide and processing to bioproducts

Venkatesh Balan,* James Pierson, Hasan Husain, Sandeep Kumar, Christopher Saffron and Vinod Kumar



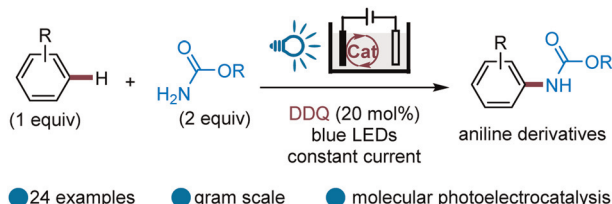
COMMUNICATIONS

7952

Electrochemical nickel-catalysed defluoroalkylation of *gem*-difluoroalkenesElectrochemical nickel-catalysed defluoroalkylation of *gem*-difluoroalkenes with alkyl halides

Yin Liu, Pengfei Li, Jun Tan, Guangsheng Kou, Dengke Ma* and Youai Qiu*

7959

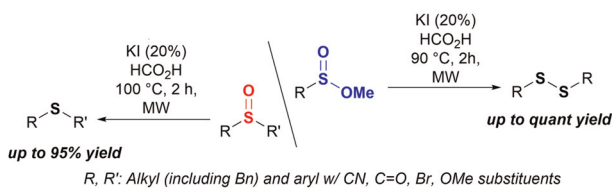


Photoelectrocatalytic C–H amination of arenes

Zhong-Wei Hou, Hong Yan, Jinshuai Song* and Hai-Chao Xu*

7963

TM-free reduction featuring iodide as the reducing catalyst
and FA as the stoichiometric reductant, media and Brønsted activator



Hydrogen-Bonding Formic Networks Enhance Brønsted Acid Activity

Introducing I[−]/formic acid as a green reagent for the reduction of sulfinates and sulfoxides

J. Armando Luján-Montelongo,* Luis Javier García de la Cuesta, Alicia E. Cruz-Jiménez, Perla Hernández and Alberto Vela

7971

Alkyl radicals from diacyl peroxides: metal-/base-/additive-free photocatalytic alkylation of *N*-heteroaromatics

Fukun Cheng, Lulu Fan,* Qiyang Lv, Xiaolan Chen* and Bing Yu*

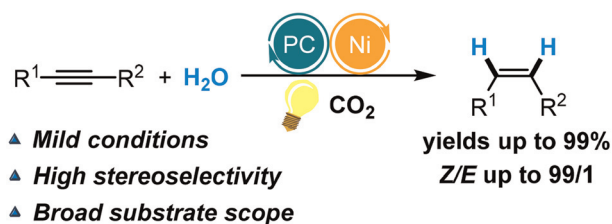


COMMUNICATIONS

7978

CO₂ promoted photoredox/Ni-catalyzed semi-reduction of alkynes with H₂O

Shenhao Chen and Chanjuan Xi*

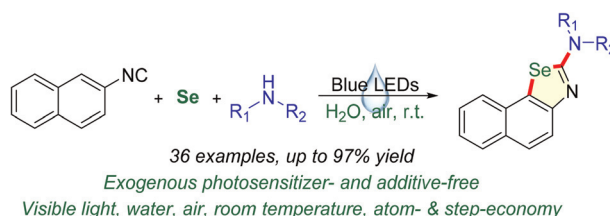


PAPERS

7983

Photoinduced, additive- and photosensitizer-free multi-component synthesis of naphthoselenazol-2-amines with air in water

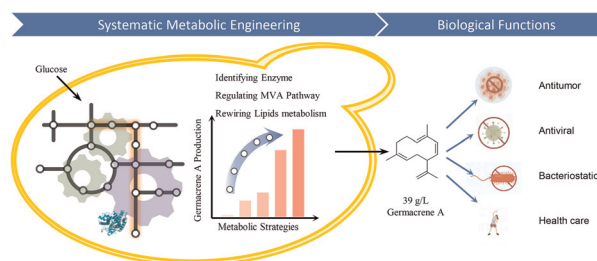
Hong-Tao Ji, Ke-Li Wang, Wen-Tao Ouyang, Qing-Xia Luo, Hong-Xia Li and Wei-Min He*



7988

Reprogramming the metabolism of oleaginous yeast for sustainably biosynthesizing the anticarcinogen precursor germacrene A

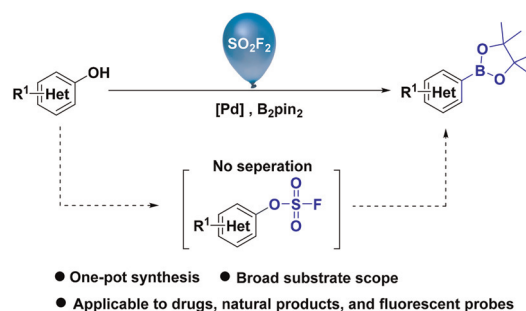
Qi Liu, Ge Zhang, Liqiu Su, Pi Liu, Shiru Jia, Qinhong Wang and Zongjie Dai*



7998

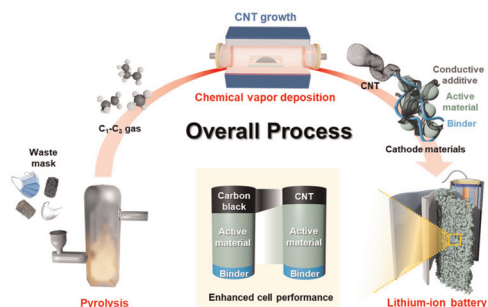
Borylation of phenols using sulfuryl fluoride activation

Zhengjun Chen, Yan Liu, Chunhua Zeng, Changyue Ren, Hongyu Li, Rajenahally V. Jagadeesh,* Zeli Yuan* and Xinmin Li*



PAPERS

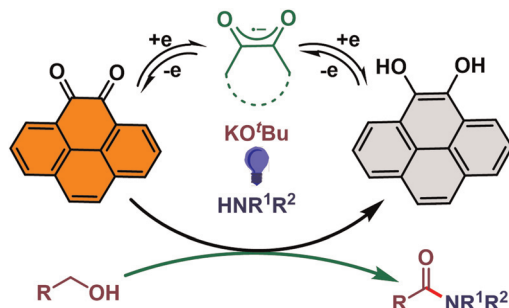
8007



Upcycling of plastic waste into carbon nanotubes as efficient battery additives

Eonu Nam, Gyori Park, Ji Young Nam, Sooryun Park, Yoonjeong Jo, Jihun Kim, Byung Gwan Park, Kyungeun Baek, Seok Ju Kang, Ho Won Ra, Youngsoo Park, Myung Won Seo,* Kyung Jin Lee* and Kwangjin An*

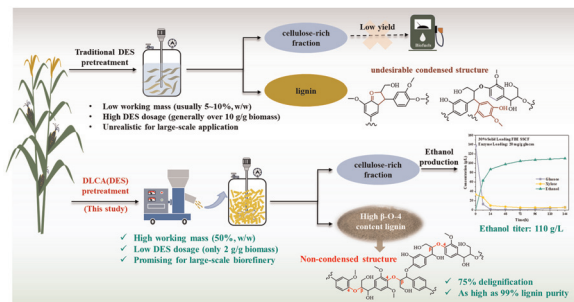
8019



Organophotocatalytic dehydrogenative preparation of amides directly from alcohols

Shyamali Maji, Monojit Roy, Kanchan Shaikh and Debashis Adhikari*

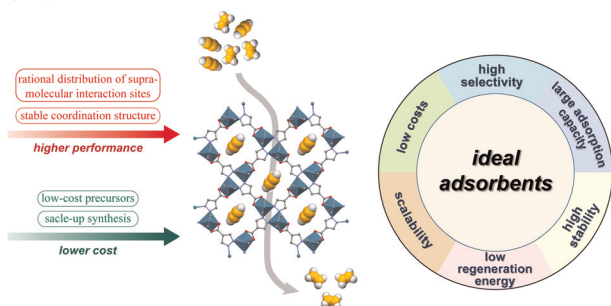
8026



Densification pretreatment with a limited deep eutectic solvent triggers high-efficiency fractionation and valorization of lignocellulose

Guannan Shen, Xinchuan Yuan, Yin Cheng, Sitong Chen, Zhaoxian Xu and Mingjie Jin*

8040



A scalable stable porous coordination polymer synthesized from low-cost precursors for efficient C₂H₂/C₂H₄ separation

Hengcong Huang, Yifan Gu, Luyao Wang, Tao Jia, Susumu Kitagawa and Fengting Li*

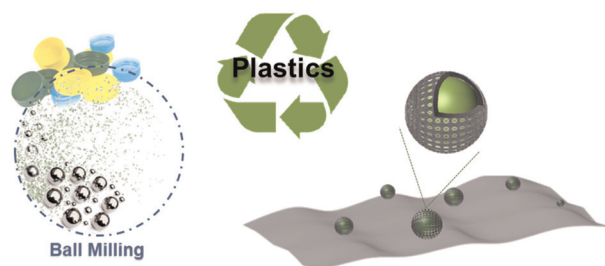


PAPERS

8047

Core-shell construction of metal@carbon by mechanochemically recycling plastic wastes: towards an efficient oxygen evolution reaction

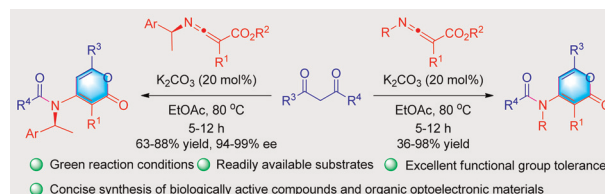
Jiahua Zhao, Qiang Niu, Junjun Zhang* and Pengfei Zhang*



8057

Green and effective synthesis of multisubstituted α -pyrones via K_2CO_3 catalyzed formal insertion of ketenimines into C(CO)–C bonds of 1,3-diketones

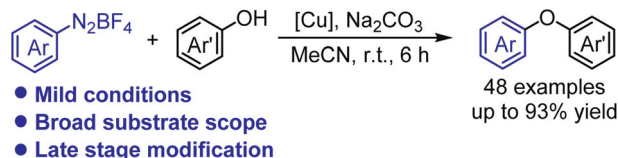
Jian Luo, Ai-Qing Zhong, Jia-Hao Qiu, Xiong-Wei Liu,* You-Ping Tian, Bao-Hua Zhang,* Guo-Shu Chen, Wei Shu and Yun-Lin Liu*



8068

Copper-catalyzed O-arylation of phenols with diazonium salts

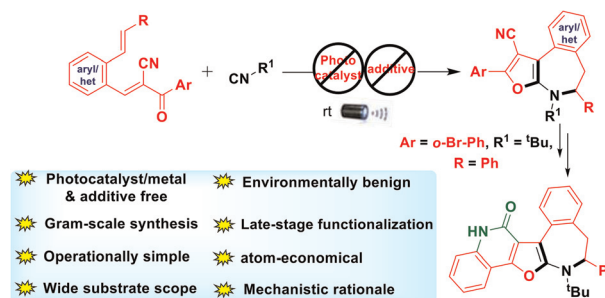
Xin Fang, Chengning Qi, Xiangqian Cao, Zhi-Gang Ren, David James Young and Hong-Xi Li*



8074

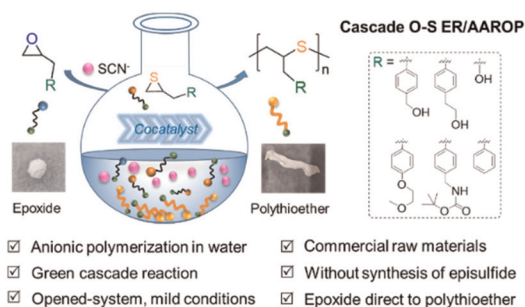
Photocatalyst- and transition-metal-free syntheses of furan-fused dihydroazepines by visible light

Babasaheb Sopan Gore,* Chiao-Ying Kuo and Jeh-Jeng Wang*



PAPERS

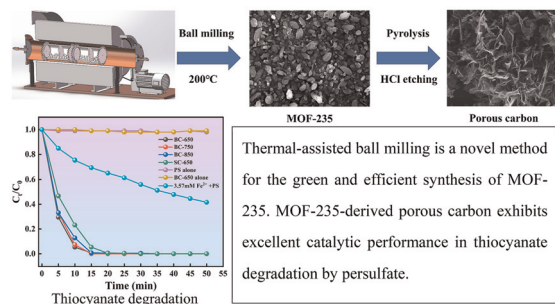
8082



Green synthesis of well-defined linear poly(hydroxyl thioether) direct from epoxide in water

Ying Quan, Cuihong Ma, Qiancai Liu, Zhiying Han, Huijing Han, Xiaojuan Liao,* Ruyi Sun* and Meiran Xie*

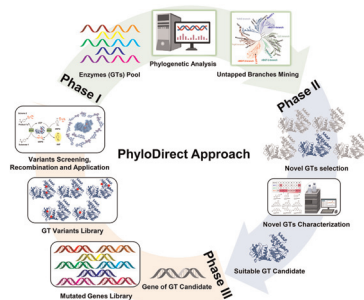
8093



Green and efficient synthesis of hierarchical porous carbon derived from MOF-235 for catalytic degradation of thiocyanate

Yang Yang, Binchuan Li, Daxue Fu, Jianshe Chen, Shuang Cui, Xiaocai He, Kuiren Liu, Shicheng Wei, Da Li and Qing Han*

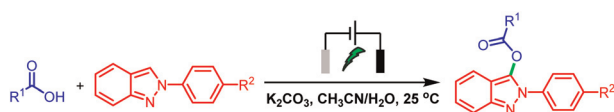
8108



A phylogeny-based directed evolution approach to boost the synthetic applications of glycosyltransferases

Peng Zhang, Yu Ji,* Shuaiqi Meng, Zhongyu Li, Dennis Hirtz, Lothar Elling and Ulrich Schwaneberg*

8117



Electrochemical C3 acyloxylation reactions of 2H-indazoles with carboxylic acids via C(sp²)-O coupling

Xin Liu, Yibin Hu, Yuanbin She, Meichao Li* and Zhenlu Shen*

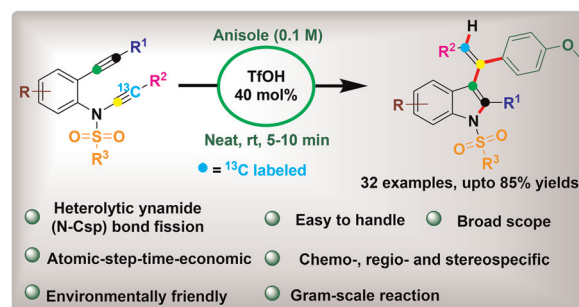


PAPERS

8124

Green and rapid acid-catalyzed ynamide skeletal rearrangement and stereospecific functionalization with anisole derivatives

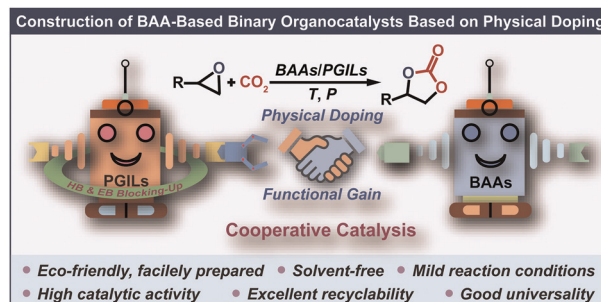
Mohana Reddy Mutra,* T. L. Chandana, Yun-Jou Wang and Jeh-Jeng Wang*



8134

Functionally enhanced basic amino acid-based binary organocatalysts based on physical doping for efficient coupling of CO₂ with epoxides

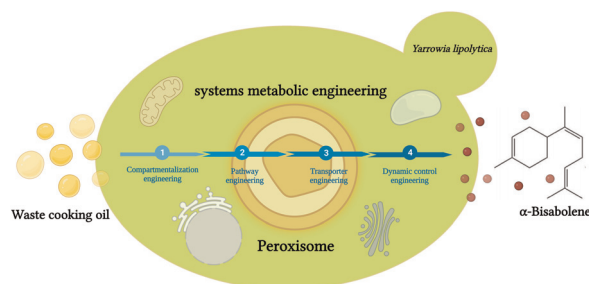
Fan Wang, Congxia Xie, Hongbing Song and Xin Jin*



8145

Biosynthesis of α -bisabolene from low-cost renewable feedstocks by peroxisome engineering and systems metabolic engineering of the yeast *Yarrowia lipolytica*

Baixiang Zhao, Yahui Zhang, Yaping Wang, Zhihui Lu, Lin Miao, Shuhui Wang, Zhuo Li, Xu Sun, Yuqing Han, Sicheng He, Ziyuan Zhang, Dongguang Xiao, Cuiying Zhang,* Jee Loon Foo,* Adison Wong* and Aiqun Yu*



8160

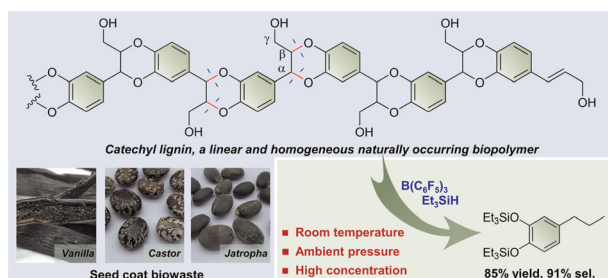
Efficient Fe₃O₄ nanoparticle catalysts for depolymerization of polyethylene terephthalate

Yoonjeong Jo, Eun Jeong Kim, Jueun Kim and Kwangjin An*



PAPERS

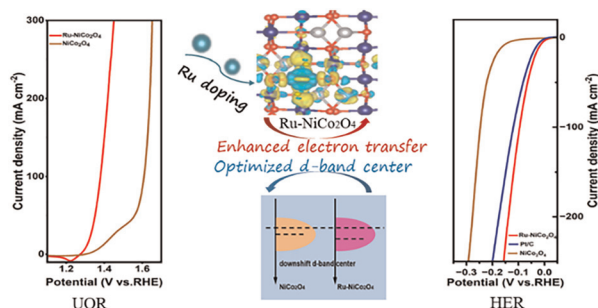
8172



Organoborane-catalysed reductive depolymerisation of catechyl lignin under ambient conditions

Shihao Su, Fan-shu Cao, Shuizhong Wang,*
Qingru Shen, Gen Luo,* Qiang Lu and Guoyong Song*

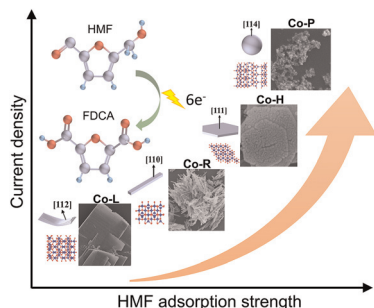
8181



Elaborately tailored NiCo₂O₄ for highly efficient overall water splitting and urea electrolysis

Yamei Wang, Lanli Chen, Huaming Zhang,*
Muhammad Humayun, Junhong Duan, Xuefei Xu,
Yanjuan Fu, Mohamed Bououdina and Chundong Wang*

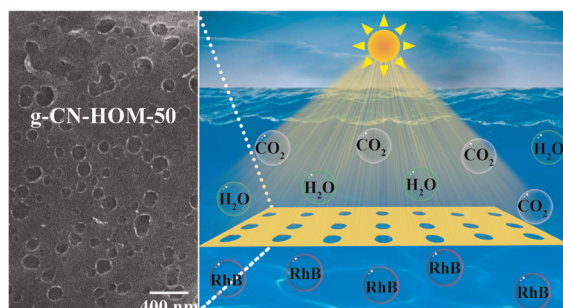
8196



Facet-dependent electrocatalytic oxidation activity of Co₃O₄ nanocrystals for 5-hydroxymethylfurfural

Zhenchuan Zhang, Zhaohui Yang, Chenyang Wei,
Zhenghui Liu and Tiancheng Mu*

8207



Controllable construction of graphitic carbon nitride with highly-ordered macropores for boosting photodegradation

Ruxia Li, Xiaoxiang Fan, Jianqi Meng, Jie Wu,
Jinjuan Zhao, Ruifa Jin, Honglei Yang* and Shuwen Li*

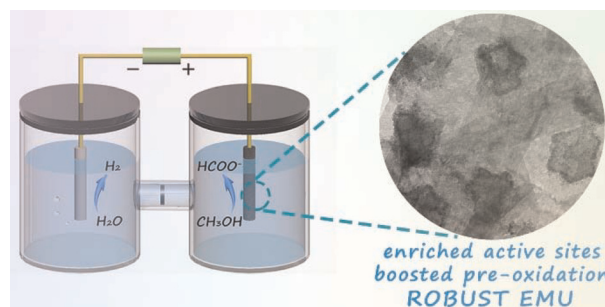


PAPERS

8216

Tailoring the catalytically active sites in Co-based catalysts for electrochemical methanol upgrading to produce formate

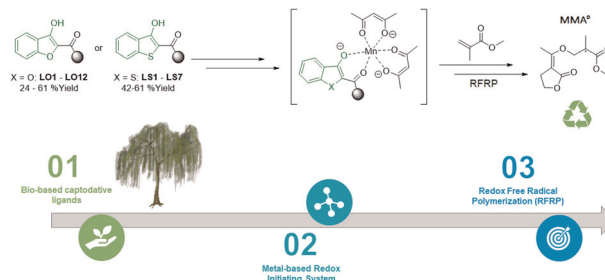
Yameng Wang, Xue Yang, Kexin Wang, Zimeng Liu, Xiaoning Sun, Jinyue Chen, Shanshan Liu, Xu Sun, Junfeng Xie* and Bo Tang*



8226

Bio-based captodative ligands for redox polymerization of Elium® thermoplastic composites under mild conditions

Nicolas Giacoletto, Marie Le Dot, Hizia Cherif, Fabrice Morlet-Savary, Bernadette Graff, Valérie Monnier, Didier Gigmes, Frédéric Dumur, Hamza Olleik, Marc Maresca, Pierre Gerard, Malek Nechab* and Jacques Lalevée*



8241

Feedstock agnostic upcycling of industrial mixed plastic from shredder residue pragmatically through a composite approach

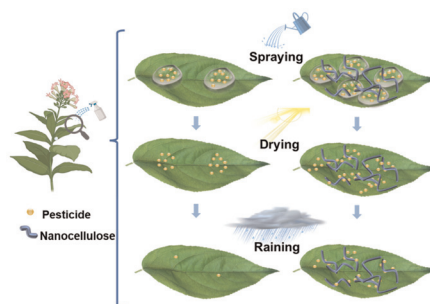
Kanjanawadee Singkronart, Andre Gaduan, Siti Rosminah Shamsuddin, Keeran Ward and Koon-Yang Lee*



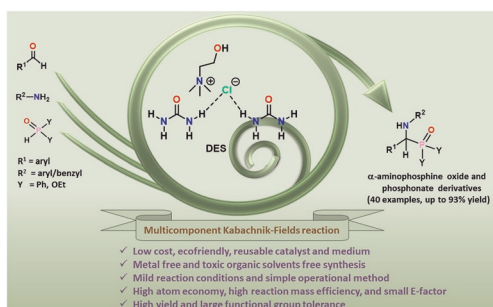
8253

Effectively enhancing topical delivery of agrochemicals onto plant leaves with nanocelluloses

Shangxu Jiang, Peng Li,* Li Li, Nasim Amiralian, Divya Rajah and Zhi Ping Xu*



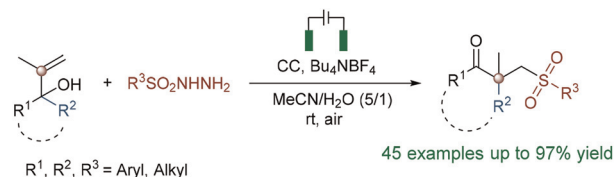
8266



Synthesis of α -aminophosphorous derivatives using a deep eutectic solvent (DES) in a dual role

Susmita Mandal, Rajrani Narvariya, Shiva Lall Sunar, Ishita Paul, Archana Jain* and Tarun K. Panda*

8273

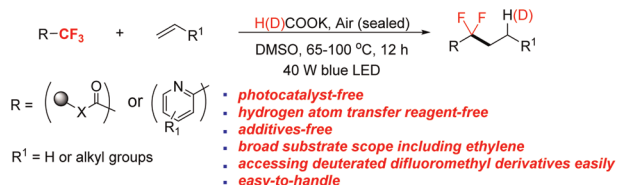


- metal- and oxidant-free
- mild and eco-friendly
- high atom economy
- broad substrate scope
- construction of quaternary C

Electrochemical synthesis of γ -keto sulfones containing a β -quaternary carbon center via 1,2-migration

Wen Xia, Yawen Yang, Xiaohui Zhang, Liangzhen Hu* and Yan Xiong*

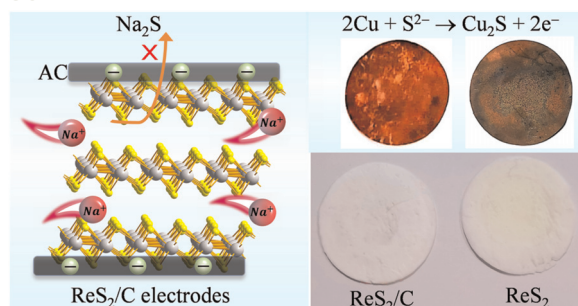
8280



Catalyst-free defluorinative alkylation of trifluoromethyls

Yan Huang, Yuan-Cui Wan, Yu Shao, Le-Wu Zhan, Bin-Dong Li* and Jing Hou*

8286



Carbon-coated ReS₂ hierarchical nanospheres to inhibit polysulfide dissolution in ether-based electrolytes for high-performance Na-ion batteries

Jun Xu,* Xuhui Zhang, Fang Cao, Zilin Mao, Junbao Jiang, Junwei Chen, Yan Zhang* and Kun Xing*

