

Catalysis Science & Technology

A multidisciplinary journal focussing on all fundamental science and technological aspects of catalysis

rsc.li/catalysis

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 2044-4761 CODEN CSTAGD 13(12) 3459–3726 (2023)



Cover

See Tzu Hsuan Chiang and Yu-Si Chen, pp. 3505–3516. Image reproduced by permission of Tzu Hsuan Chiang from *Catal. Sci. Technol.*, 2023, 13, 3505.



Inside cover

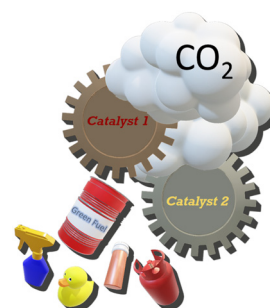
See Zhen-Yu Tian *et al.*, pp. 3517–3526. Image reproduced by permission of Cedric Karel Fonzeu Monguen and Zhen-Yu Tian from *Catal. Sci. Technol.*, 2023, 13, 3517.

MINI REVIEW

3469

Bifunctional catalysts for the conversion of CO₂ into value-added products – distance as a design parameter for new catalysts

Maik Alexander Rudolph, Philipp Isbrücker and Reinhard Schomäcker*

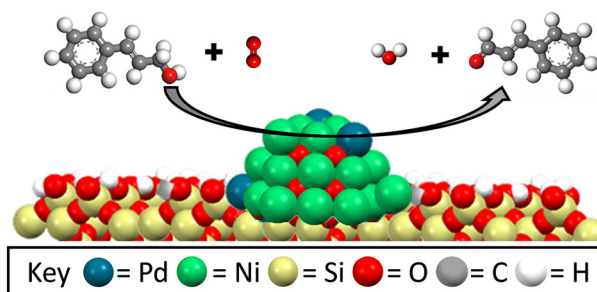


COMMUNICATIONS

3483

Isolated PdO sites on SiO₂-supported NiO nanoparticles as active sites for allylic alcohol selective oxidation

Aleksandra Ziarko, Thomas J. A. Slater, Mark A. Isaacs, Lee J. Durndell and Christopher M. A. Parlett*



Editorial Staff

Executive Editor

Maria Southall

Deputy Editor

Bianca Provost

Editorial Production Manager

Emily Skinner

Assistant Editors

Sean Browner, Molly Colgate, Paul Scott, Alison Winder

Editorial Assistant

Basita Javeed

Publishing Assistant

Allison Holloway

Publisher

Sam Keltie

For queries about submitted articles please contact

Emily Skinner, Editorial Production Manager, in the first instance.

E-mail catalysis@rsc.org

For pre-submission queries please contact

Maria Southall, Executive Editor.

E-mail catalysis-rsc@rsc.org

Catalysis Science & Technology electronic: ISSN 2044-4761

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: £2552; US\$4214.

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

Catalysis Science & Technology

A multidisciplinary journal focusing on all fundamental science and technological aspects of catalysis

rsc.li/catalysis

Editorial Board

Editor-in-Chief

Bert Weckhuysen,
Utrecht University, The Netherlands

Associate Editors

Dirk De Vos, KU Leuven, Belgium
Shaojun Guo, Peking University, China
Mélanie Hall, University of Graz, Austria

Bin Liu, Nanyang Technological University,
Singapore

Núria López, Institut Català d'Investigació
Química, Spain

Will Medlin, University of Colorado Boulder, USA

Regina Palkovits, RWTH Aachen, Germany

Xiulian Pan, Chinese Academy of Sciences, China

Kenichi Shimizu, Hokkaido University, Japan

Andrew Weller, University of York, UK

Chris Williams, University of South Carolina, USA

Yong Zhou, Nanjing University, China

Advisory Board

Isabel Arends, Utrecht University, The Netherlands
Xinhe Bao, Dalian Institute of Chemical Physics,
CAS, China

Bhachandra Bhanage, Institute of Chemical
Technology, Mumbai, India

George Britovsek, Imperial College London, UK

Christian Bruneau, Institut des Sciences Chimiques
de Rennes, France

Yong Cao, Fudan University, China

Matt Clarke, University of St Andrews, UK

Christophe Coperet, ETH Zürich, Switzerland

Avelino Corma, Valencia University, Spain

Johannes de Vries, Leibniz-Institut für Katalyse,
Germany

Chris Hardacre, University of Manchester, UK

Graham Hutchings, University of Cardiff, UK

David Jackson, University of Glasgow, UK

Axel Knop-Gericke, Fritz-Haber Institute of the
Max Planck Society, Germany

Can Li, Dalian Institute of Chemical Physics,
Chinese Academy of Sciences, China

Wei-Xue Li, University of Science and Technology
of China, China

Antonio Llobet, Institut Català d'Investigació
Química, Spain

Jennifer Love, University of Calgary, Canada

Ding Ma, Peking University, China

Debabrata Maiti, IIT Bombay, India

Noritaka Mizuno, University of Tokyo, Japan

Francesca Paradisi, University of Bern, Switzerland

Evgeny Pidko, Delft University of Technology, The
Netherlands

Robert M. Rioux, The Pennsylvania State
University, USA

Tito Scaiano, University of Ottawa, Canada

Tetsuya Shishido, Tokyo Metropolitan University,
Japan

Tsunehiro Tanaka, Kyoto University, Japan

Nick Turner, University of Manchester, UK

Piet van Leeuwen, University of Toulouse, France

Ning Yan, National University of Singapore,
Singapore

Jinhua Ye, National Institute for Materials Science,
Japan

Information for Authors

Full details on how to submit material for publication in Catalysis Science & Technology 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/catalysis

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

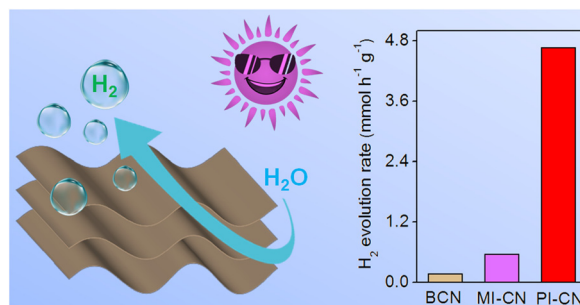


COMMUNICATIONS

3489

Facile implantation of imidazole-ring into graphitic carbon nitride for efficient photocatalytic hydrogen production

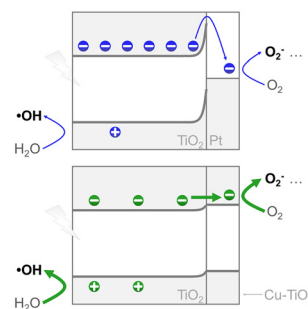
Siyuan He, Guanchao Wang and Zhongkui Zhao*



3495

Homogeneous interfacial electron transfer promotes photoinduced hole extraction for phenol mineralization

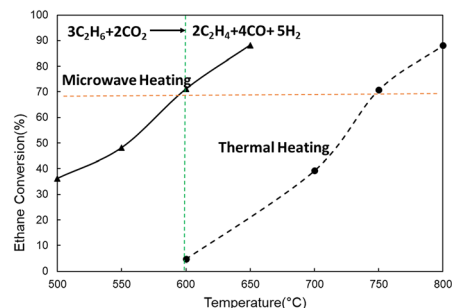
Yao Fang, Xuhui Wei, Haifeng Liu, Shugong Gao, Kun Jia, Junwei Wang* and Jiazang Chen*



3499

Selectivity modulated oxidative dehydrogenation of ethane with CO₂ under microwave catalytic processing

Xiaoyan Wang, Yuxin Wang, Brandon Robinson, Ashley Caiola and Jianli Hu*

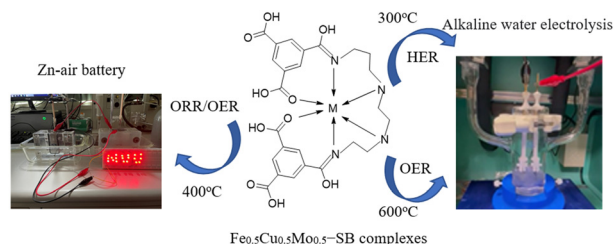


PAPERS

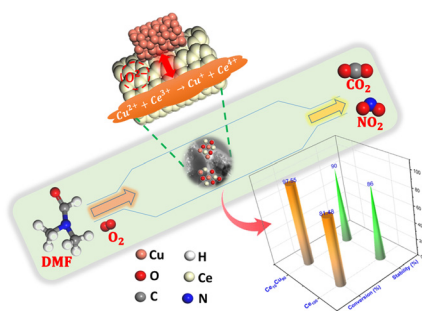
3505

Trifunctional electrocatalysts of ternary iron-copper-molybdenum Schiff base complexes applied to Zn-air battery and alkaline water splitting

Tzu Hsuan Chiang* and Yu-Si Chen



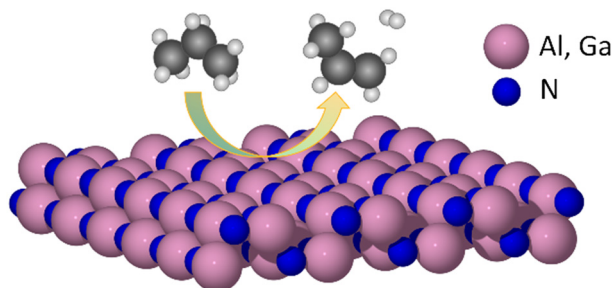
3517



Low-temperature deep oxidation of *N,N*-dimethylformamide (DMF) over CeCu binary oxides

Cedric Karel Fonzeu Monguen, Samuel Daniel and Zhen-Yu Tian*

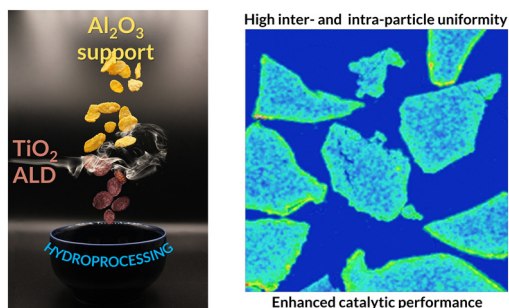
3527



Multiscale modeling reveals aluminum nitride as an efficient propane dehydrogenation catalyst

Mona Abdelgaid, Evan V. Miu, Hyunguk Kwon, Minttu M. Kauppinen, Henrik Grönbeck and Giannis Mpourmpakis*

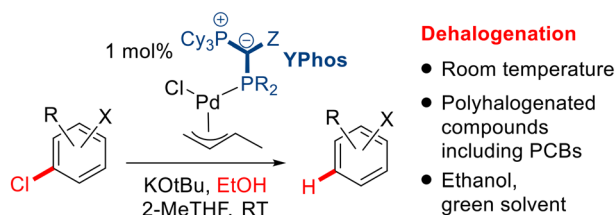
3537



Synthesis of highly-uniform titania overcoats on a mesoporous alumina catalyst support by atomic layer deposition and their application in hydroprocessing

Jacob A. Moulijn,* J. Ruud van Ommen, Aristeidis Goulas, David Valdesueiro, Jana Juan-Alcañiz, Kar-Ming Au-Yeung, Leo Woning and Jaap A. Bergwerff

3545



Pd-catalysed hydrodehalogenation of aryl chlorides: a mild method for deuteration and detoxification

Angela Burhenn, Roberta Bavaro and Viktoria H. Gessner*

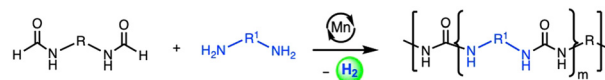


PAPERS

3551

Manganese catalysed dehydrogenative synthesis of polyureas from diformamide and diamines

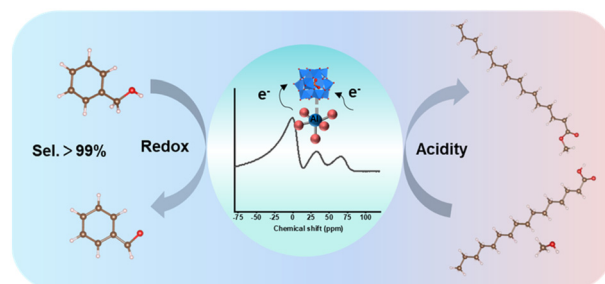
Angus McLuskie, Claire N. Brodie, Michele Tricarico, Chang Gao, Gavin Peters, Aaron B. Naden, C. Logan Mackay, Jin-Chong Tan* and Amit Kumar*



3558

Pentacoordinated Al³⁺ stabilized polyoxometalates for the efficient catalytic valorization of biomass-derived feedstocks

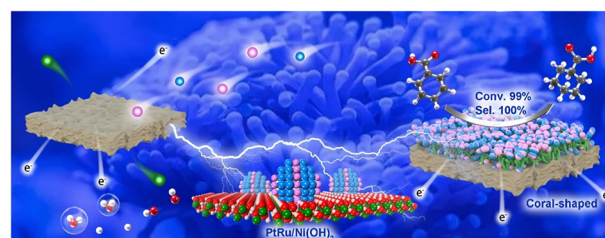
Lihua Wang, Shuangxiu Ma, Chunhong Chen, Bing Lu, Zhe Wang, Yong Wang and Shanjun Mao*



3568

Coral-shaped PtRu/Ni(OH)₂ electrocatalyst promotes selective hydrogenation of benzoic acid

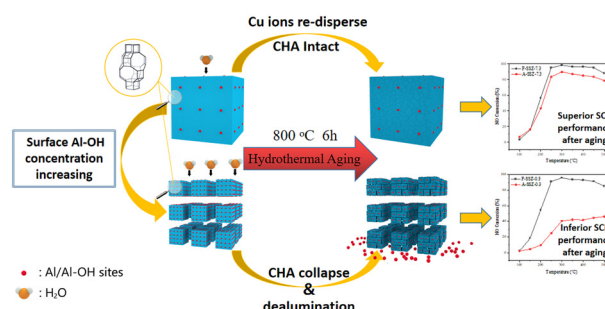
Menghui Liu, Chenhui Wang, Zifan Cao, Aiqun Kong, Yusheng Gao, Jinli Zhang, You Han, Wei Li* and Yan Fu*



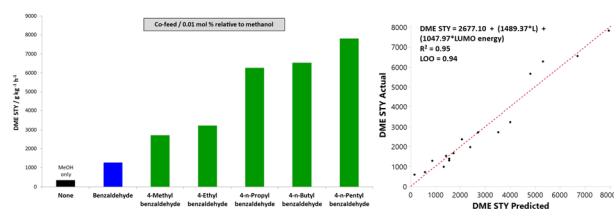
3579

Revealing the effect of crystal size on the high-temperature hydrothermal stability of Cu/SSZ-13 NH₃-SCR catalysts

Huabo Liu, Meiqing Shen, Chen Wang, Jun Wang, Jianqiang Wang and Gurong Shen*



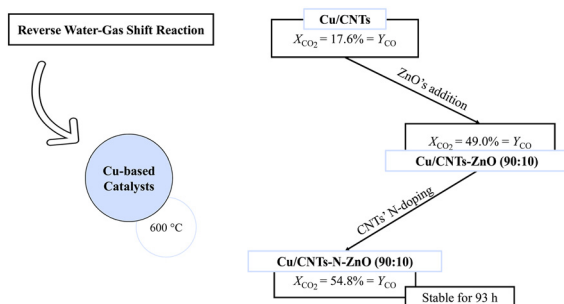
3590



Aromatic aldehydes as tuneable and ppm level potent promoters for zeolite catalysed methanol dehydration to DME

Zhiqiang Yang, Benjamin J. Dennis-Smith*, Corneliu Buda, Amie Easey, Fiona Jackson, Gregory A. Price, Neil Sainty, Xingzhi Tan, Zhuoran Xu and Glenn J. Sunley*

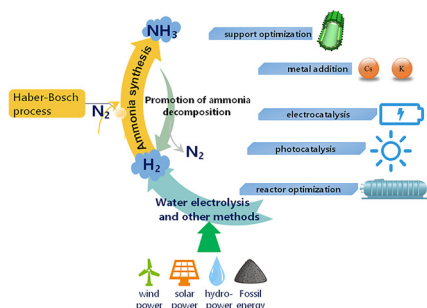
3606



Enhancing the performance of Cu catalysts for the reverse water-gas shift reaction using N-doped CNT-ZnO composite as support

Ana Rita Querido, Liliana P. L. Gonçalves, Yury V. Kolen'ko, M. Fernando R. Pereira and O. Salomé G. P. Soares*

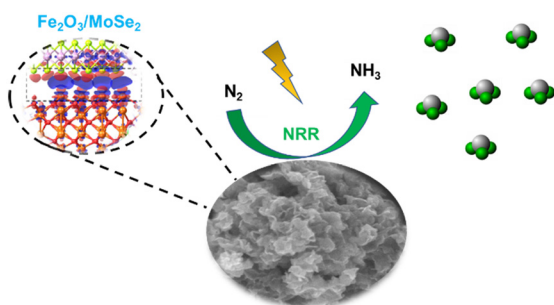
3614



Promotion effects of different methods in CO_x-free hydrogen production from ammonia decomposition

Daotong Liang, Chao Feng, Li Xu, Da Wang, Yuanshuai Liu, Xuebing Li* and Zhong Wang*

3629



MOF-derived Fe₂O₃/MoSe₂ composites for promoted electrocatalytic nitrogen fixation

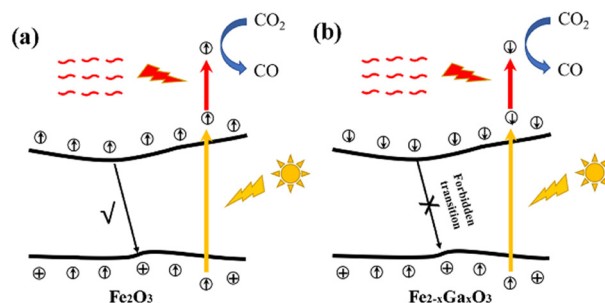
Liming Huang, Leiming Tao*, Kui Pang, Shuying He, GuanHua Zhu, LinHai Duan, Chenglin Wen, Changlin Yu and Hongbing Ji*



3638

Enhanced thermal assisted photocatalysis reduction of carbon dioxide over a $\text{Fe}_{2-x}\text{Ga}_x\text{O}_3$ solid solution

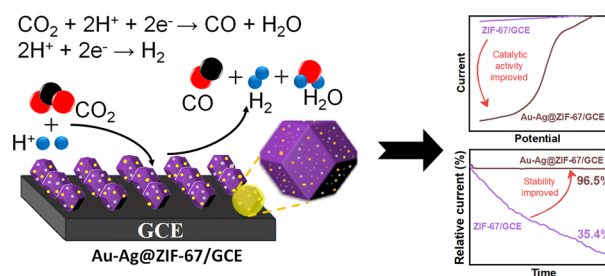
Lingtong Lin, Danning Xing, Caiyun Zhang, Yuanyuan Liu,* Zeyan Wang, Peng Wang, Zhaoke Zheng, Hefeng Cheng, Ying Dai and Baibiao Huang*



3645

Efficient electrochemical CO_2 conversion by cobalt-based metal organic frameworks modified by bimetallic gold–silver nanostructures

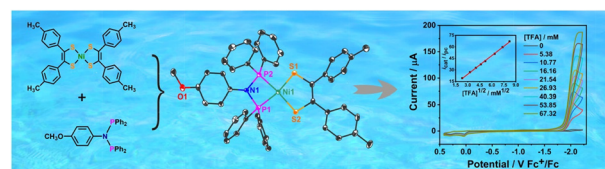
Mohammadali Beheshti, Mohsen Saeidi, MahsaSadat Adel-Rastkhiz, Shohreh Shahrestani, Ali Zarrabi, Jing Bai, Abdolreza Simchi* and Samineh Akbarmolaie



3655

Electrocatalytic hydrogen evolution by robust square planar nickel complexes in an S_2P_2 coordination environment

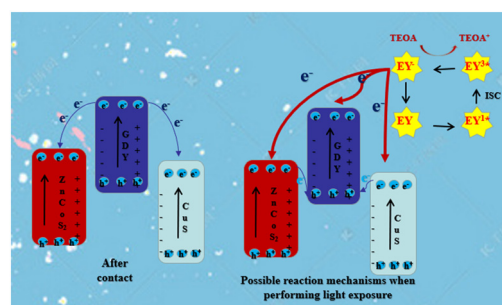
Luo Chen, Tao Li, Bin Xie,* Chuan Lai,* Run-Wu Ji, Jia-Yu He, Jia-Xi Cao, Meng-Nan Liu, Wei Li and Dong-Liang Zhang



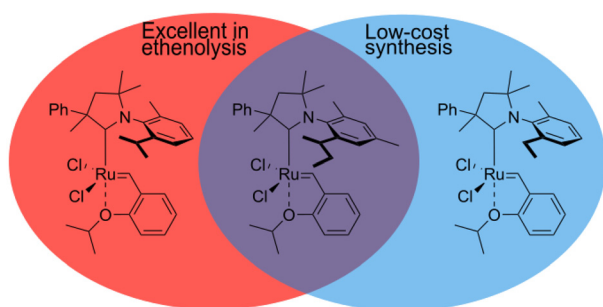
3667

Graphdiyne ($\text{C}_n\text{H}_{2n-2}$) coupled with ZnCo-MOF double S-scheme heterojunction forms an efficient electron transport layer and its characterization via *in situ* XPS

Linqing Zhang, Xuanpu Wang, Youji Li* and Zhiliang Jin*



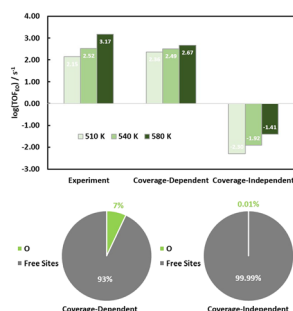
3682



Aza-Claisen rearrangement as a key step in synthesis of specialised anilines used in the production of efficient ethenolysis catalysts

Adrian Sytniczuk, Filip Struzik, Vishal Purohit, Karol Grela and Anna Kajetanowicz*

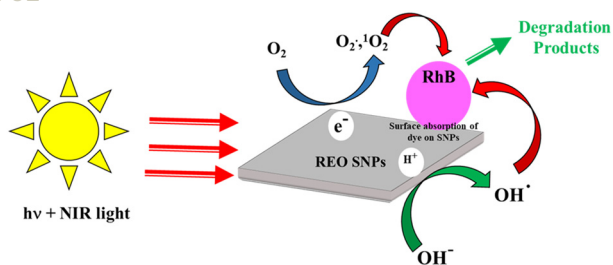
3689



Insights into coverage-affected selective catalytic oxidation of ethylene on Ag(111) from comprehensive microkinetic analyses

Zhuozheng Wang, Wenbo Xie, Yarong Xu, Menglei Jia, Jiayan Xu and P. Hu*

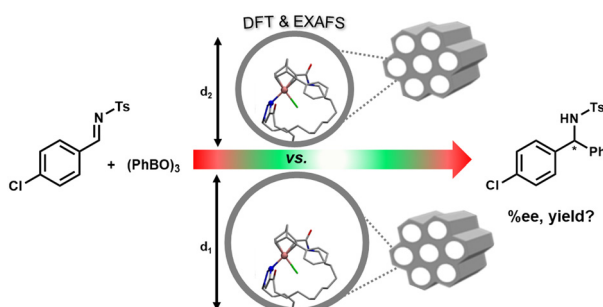
3701



Synthesis of high yield, crystalline and thermally stable rare earth (Sm, Eu, Gd) oxide square nanoplates for near-infrared light activatable photocatalysis

Sanjeevan Rajagopal, Suresh Thangudu and Kuo Chu Hwang*

3709



Tethering chiral Rh diene complexes inside mesoporous solids: experimental and theoretical study of substituent, pore and linker effects on asymmetric catalysis

M. Kirchhof, K. Gugeler, A.-K. Beurer, F. R. Fischer, D. Batman, S. M. Bauch, S. Kolin, E. Nicholas, R. Schoch, C. Vogler, S. R. Kousik, A. Zens, B. Plietker, P. Atanasova, S. Naumann, M. Bauer, J. R. Bruckner, Y. Traa, J. Kästner and S. Laschat*

