

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.

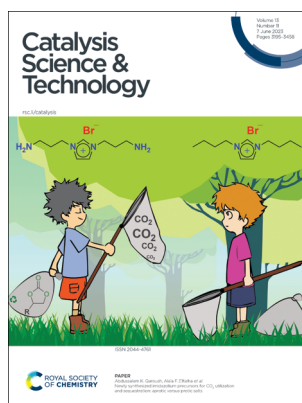
IN THIS ISSUE

ISSN 2044-4761 CODEN CSTAGD 13(11) 3195–3458 (2023)



Cover

See Robert A. Dagle *et al.*, pp. 3231–3244.
Image reproduced by permission of Battelle Memorial Institute from *Catal. Sci. Technol.*, 2023, 13, 3231.



Inside cover

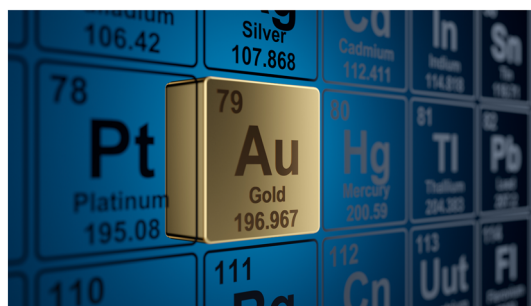
See Abdussalam K. Qaroush, Ala'a F. Eftaiha *et al.*, pp. 3245–3257.
Image reproduced by permission of Malak Al-Anati and Khaleel Assaf from *Catal. Sci. Technol.*, 2023, 13, 3245.

PERSPECTIVE

3205

Design of gold catalysts for activation of H₂ and H-donor molecules: transfer hydrogenation and CO₂ hydrogenation

Jhonatan Luiz Fiorio, Lais Reis Borges, Tomaz Neves-Garcia, Danielle Kimie Kikuchi, Raíza Rosa Garcia Guerra and Liane Marcia Rossi*

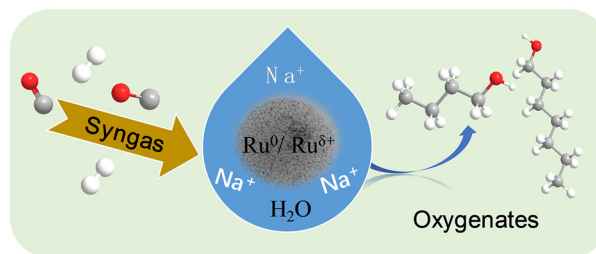


COMMUNICATIONS

3216

Aqueous-phase Fischer–Tropsch reaction for the production of oxygenates from syngas over colloidal ruthenium nanoparticles

Junli Zhang, Fei Yu, Yunlei An, Tiejun Lin* and Liangshu Zhong*



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

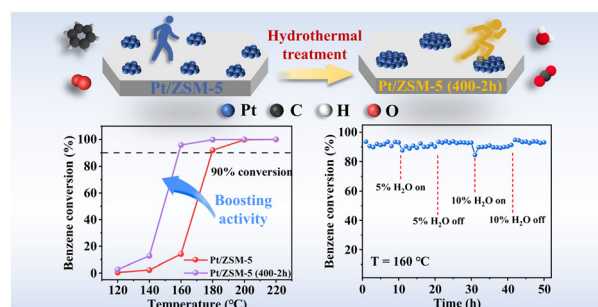


COMMUNICATIONS

3221

Hydrothermal treatment: an effective method to improve the catalytic activity of the Pt/ZSM-5 catalyst for complete benzene oxidation

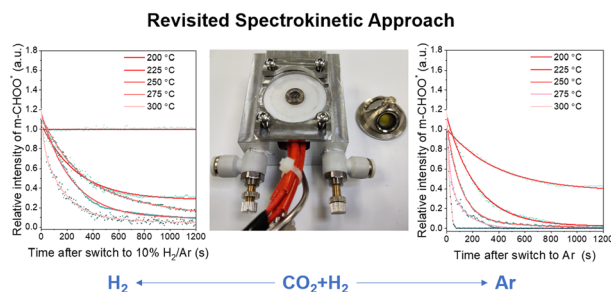
Yunchong Wang, Kaixuan Fu, Haolong Huang, Cangpeng Shan, Yanfei Zheng, Rui Han* and Qingling Liu*



3226

Revealing the gas sensitive stability of formate species during CO₂ hydrogenation

Didi Li, Shiqing Jin, Zhen Wang, Zhaocong Jiang, Feng Xiong, Jianqiang Wang and Minghui Zhu*

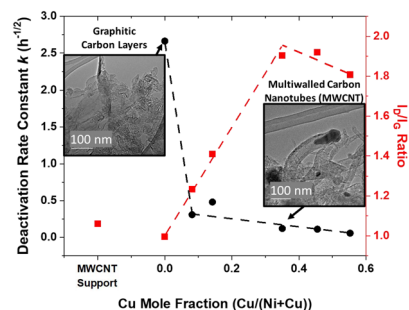


PAPERS

3231

Promotional role of NiCu alloy in catalytic performance and carbon properties for CO₂-free H₂ production from thermocatalytic decomposition of methane

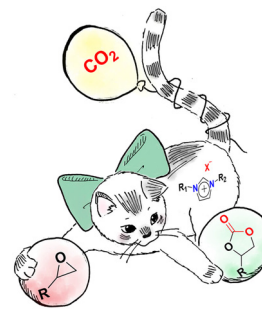
Mengze Xu, Juan A. Lopez-Ruiz, Nickolas W. Riedel, Robert S. Weber, Mark E. Bowden, Libor Kovarik, Changle Jiang, Jianli Hu and Robert A. Dagle*

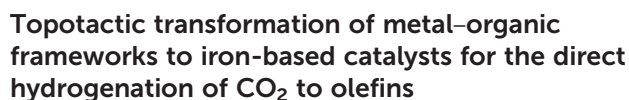


3245

Newly synthesized imidazolium precursors for CO₂ utilization and sequestration: aprotic *versus* protic salts

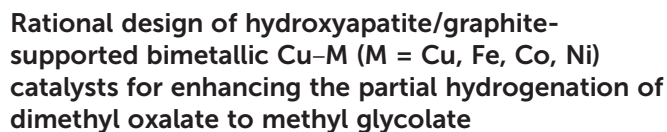
Abdussalam K. Qaroush,* Ala'a F. Eftaiha,* Feda'a M. Al-Qaisi, Khaleel I. Assaf, Suhad B. Hammad, Malak H. Al-Anati, Enas S. Radwan and Firas F. Awwadi





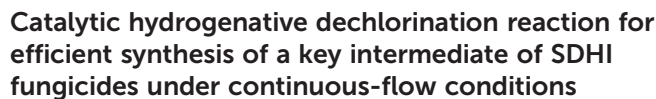
Qingqing Yang, Ruifeng Wang, Xiong Zhang, Shifu Wang,
Qi Yu,* Xiong Su,* Xuning Li* and Yangqiang Huang

3270



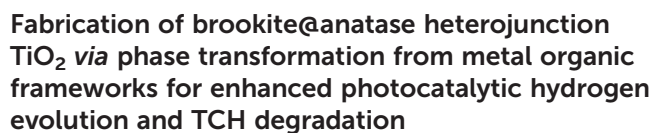
Mohamed Abbas,* JiaMing Wang, Paweł Stelmachowski,
Jiangang Chen* and Andrzej Kotarba

3282



Haruro Ishitani,* Tomoya Kawase, Amrita Das
and Shū Kobayashi*

3292



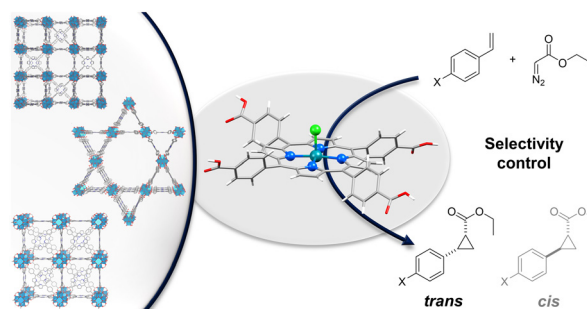
Weina Song, Yamin Liu, Yongli Dong,* Xue Han, Mei Mu, Yan Chen, Wenyan Wang, Pei Wang and Wei Li*

PAPERS

3304

Stereo-controlled cyclopropanation catalysis within the confined pores of porphyrin MOFs

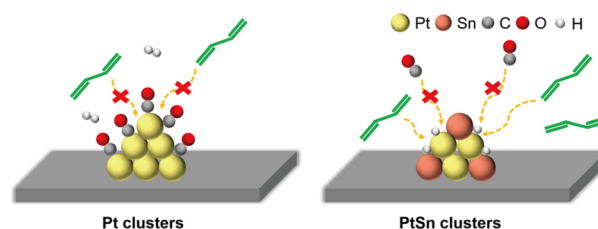
Karina Hemmer, Raphael Bühler, Martin Elsner, Mirza Cokoja* and Roland A. Fischer*



3313

Insights into the electronic modulation of bimetallic Pt–Sn cluster for the selective hydrogenation of 1,3-butadiene

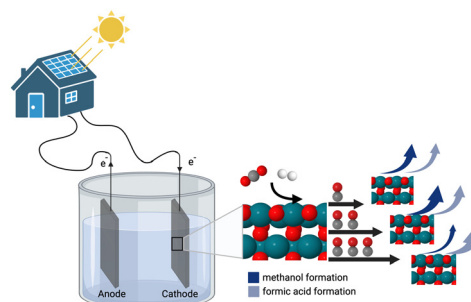
Nengfeng Gong, Huizi He, Hongliu Wan,* Huaming Hou, Ziyu Zhou, Yibo Yang, Gaolei Qin, Anping Yin, Yuhang Cai, Xiaodong Sun,* Yongwang Li and Zhi Cao*



3321

Electrochemical CO₂ reduction towards formic acid and methanol on transition metal oxide surfaces as a function of CO coverage

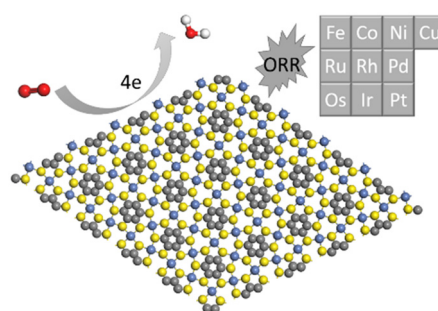
Narges Atrak, Ebrahim Tayyebi and Egill Skúlason*



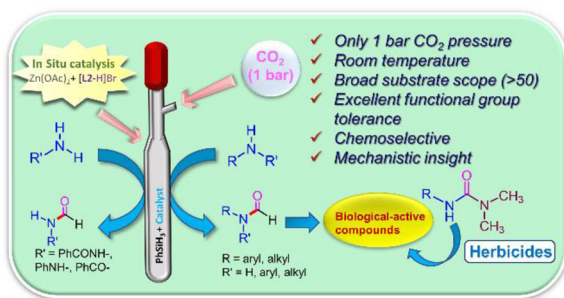
3337

Computational screening of two-dimensional metal-benzenehexathial for the oxygen reduction reaction

Shuya Wei, Xiaocheng Zhou,* Yu Wang and Yafei Li*



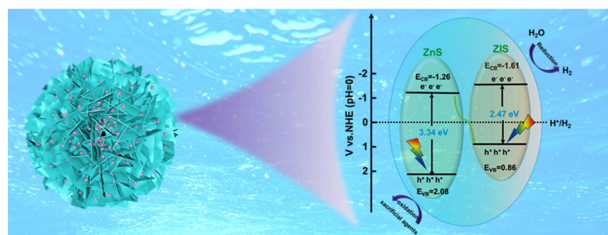
3344



N-Heterocyclic carbene supported zinc catalysed N-formylation of diverse N-H functionalities with carbon dioxide under ambient conditions

Sangita Sahoo, Subarna Manna and Arnab Rit*

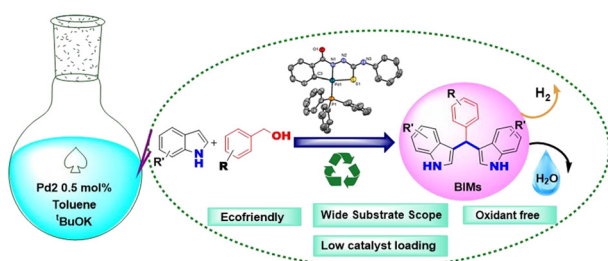
3351



A Z-scheme ZnIn₂S₄/ZnS heterojunction catalyst: insight into enhanced photocatalytic performance and mechanism

Shuaishuai Liu, Yuchen Mao, Zhiyuan Su, Fan Fang, Kun Li, Yuhuan Wu, Puyu Liu, Peng Li* and Kun Chang*

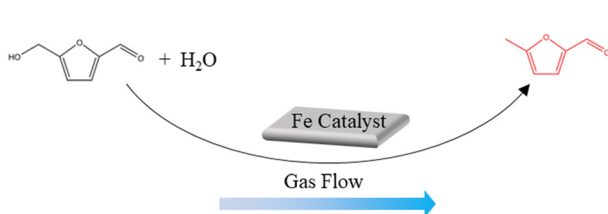
3358



Orthometallated Pd(II) C^NAS pincer complex catalyzed sustainable synthesis of bis(indolyl) methanes via acceptorless dehydrogenative coupling of alcohols

Savarimuthu Selvan Clinton, Rengan Ramesh* and Jan Grzegorz Malecki

3366



Hydrogenolysis of 5-hydroxymethylfurfural by *in situ* produced hydrogen from water on an iron catalyst

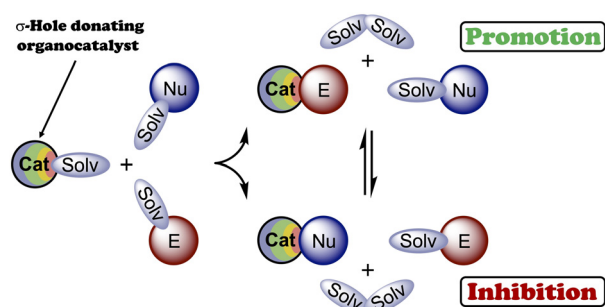
Xin Li, Peng Rui, Tongqi Ye,* Xin Yao, Rulong Zhou, Dongdong Li, Sheng Wang, James H. Carter* and Graham J. Hutchings



3375

Solvent-modulated binding selectivity of reaction substrates to onium-based σ -hole donors

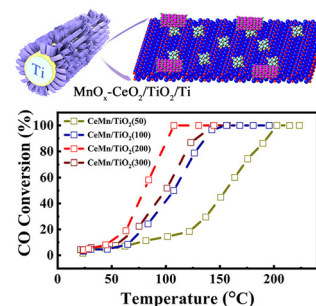
Alexandra A. Sysoeva, Alexander S. Novikov, Mikhail V. Il'in and Dmitrii S. Bolotin*



3386

Fabrication of high-performance $\text{CeO}_2\text{-MnO}_x/\text{TiO}_2/\text{Ti}$ monolithic catalysts for low-temperature and stable CO oxidation

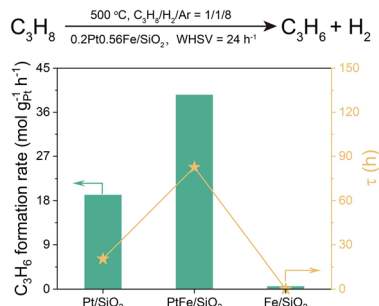
Junchao Wang, Xinyue Tang, Jing Li, Shizhi Dong, Xinglai Zhang and Baodan Liu*



3395

A promoted PtFe/SiO₂ catalyst with low Pt concentration for propane dehydrogenation

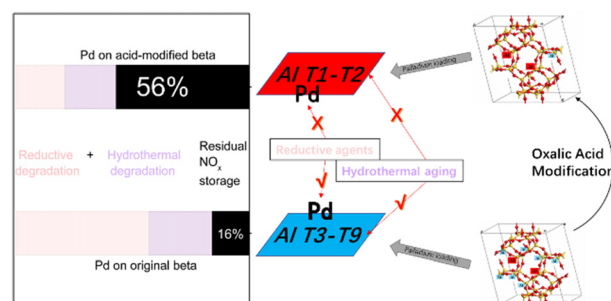
Lei Luo, Zekun Zeng, Tao Zhou, Jun Luo, Xiaoheng Chen, Xu Li,* Han Yan* and Jie Zeng



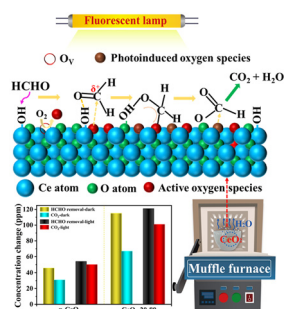
3403

Ultra-stable Pd ions at Al T1/T2 sites on a dealuminated Pd/beta passive NO_x adsorber

Yi Zhu, Jun Wang, Chen Wang, Jianqiang Wang, Gurong Shen* and Meiqing Shen*



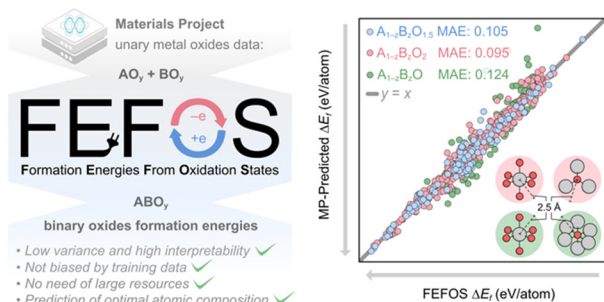
3416



Water pretreatment promoting the removal of indoor formaldehyde over nano-CeO₂ at ambient temperature

Meng Zhang, Jiaqi Chen, Zhihua Xu,* Yingjie Ding, Zhaoxiong Yan,* Lin Yue and Ling Shi

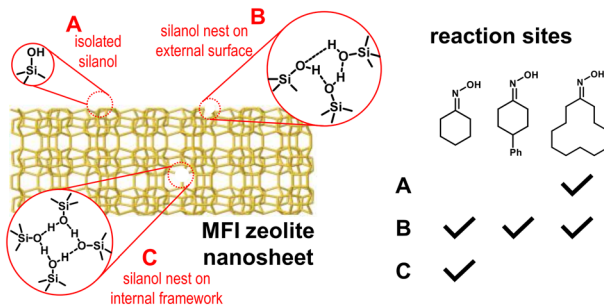
3427



FEFOS: a method to derive oxide formation energies from oxidation states

Michael John Craig,* Felix Kleuker, Michal Bajdich* and Max García-Melchor*

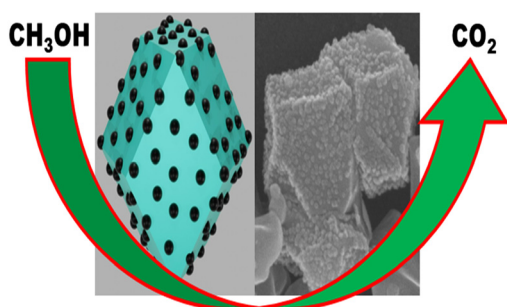
3436



Surface silanol sites in mesoporous MFI zeolites for catalytic Beckmann rearrangement

Hanyoung Park, Jisuk Bang, Hongjun Park, Jaeheon Kim, Jeong-Chul Kim, Jeong Young Park* and Ryong Ryoo*

3445



ZIF-8@CoFe₂O₄ as a highly efficient bifunctional electrocatalyst for the methanol oxidation and oxygen evolution reactions

T. V. M. Sreekanth, K. Prasad, J. Yoo,* J. Kim* and K. Yoo*

