

# Catalysis Science & Technology

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

[rsc.li/catalysis](http://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(21) 6079–6332 (2023)



### Cover

See Zhen Liu *et al.*, pp. 6137–6145.  
Image reproduced by permission of Zhen Liu from *Catal. Sci. Technol.*, 2023, 13, 6137.



### Inside cover

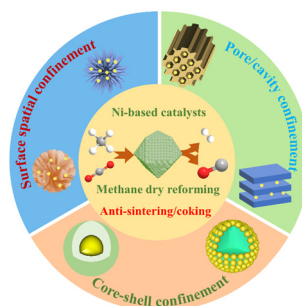
See Shinya Ariyasu, Osami Shoji *et al.*, pp. 6146–6152.  
Image reproduced by permission of Osami Shoji & Shinya Ariyasu from *Catal. Sci. Technol.*, 2023, 13, 6146.

## MINI REVIEW

6089

### Confinement effects over Ni-based catalysts for methane dry reforming

Chongchong Chen, Jiaojiao Wei, Yao Lu, Melis Seher Duyar, Yuanyuan Huang, Ling Lin\* and Runping Ye\*

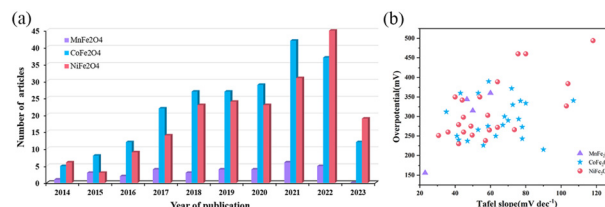


## REVIEW

6102

### Research progress of spinel $\text{CoFe}_2\text{O}_4$ as an electrocatalyst for the oxygen evolution reaction

Hongxin Wang, Qiming Hu, Jiangyuan Qiu, Rui Guo and Xuanwen Liu\*



## Editorial Staff

### Executive Editor

Maria Southall

### Deputy Editor

Bianca Provost

### Editorial Production Manager

Chris Goodall

### 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

Chris Goodall, Editorial Production Manager, in the first instance.

E-mail [catalysis@rsc.org](mailto:catalysis@rsc.org)

For pre-submission queries please contact

Maria Southall, Executive Editor.

E-mail [catalysis-rsc@rsc.org](mailto: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](mailto: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](http://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](mailto:advertising@rsc.org)

For marketing opportunities relating to this journal, contact [marketing@rsc.org](mailto:marketing@rsc.org)

# Catalysis Science & Technology

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

[rsc.li/catalysis](http://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, City University of Hong Kong, Hong Kong  
Núria López, Institut Català d'Investigació Química, Spain  
Will Medlin, University of Colorado Boulder, USA  
Regina Palkovits, RWTH Aachen, Germany

Xiulan 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  
Bhalchandra 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 Scalano, 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](http://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

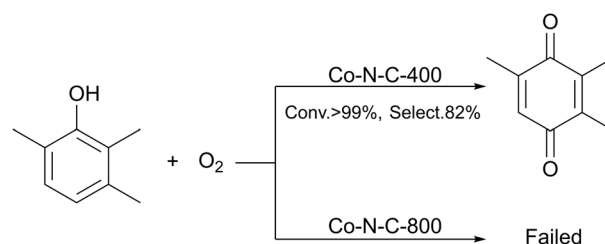


## COMMUNICATIONS

6126

**Selective oxidation of substituted phenols with Co–N–C catalysts fabricated *via* low temperature heat treatment**

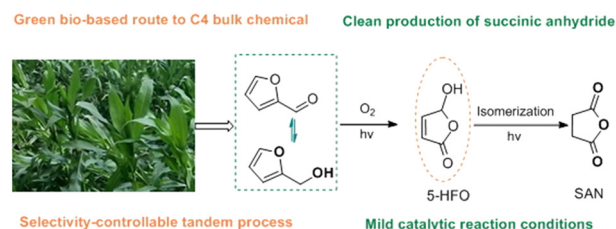
Bairui Guo, Zhongtian Du,\* Xiaoyu Shen, Mengjing Han, Yanbin Zhao, Jingjie Luo and Changhai Liang\*



6132

**From biomass to C4 chemicals: selective transformation of bio-based furans to succinic anhydride in the presence of oxygen**

Xiaoqian Gao, Xinli Tong,\* RuiChen Liu and Yi Zhang

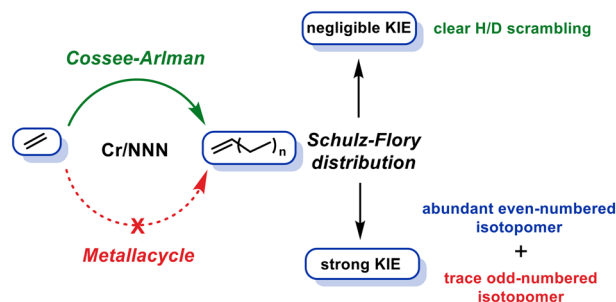


## PAPERS

6137

**Unravelling the chain growth mechanism in Cr/NNN-catalysed ethylene oligomerization**

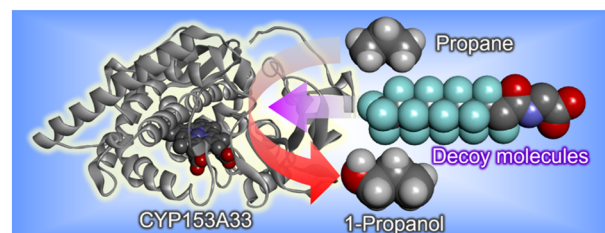
Jiale Peng, Mengyu Zhu, Long Chen and Zhen Liu\*



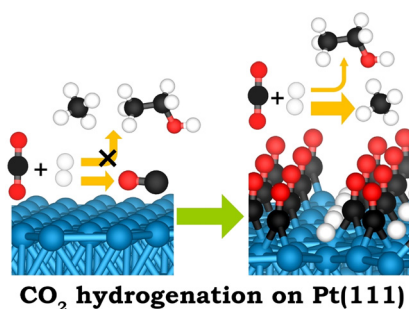
6146

**Highly selective hydroxylation of gaseous alkanes at the terminal position by wild-type CYP153A33**

Yusaku Kodama, Shinya Ariyasu,\* Masayuki Karasawa, Yuichiro Aiba and Osami Shoji\*



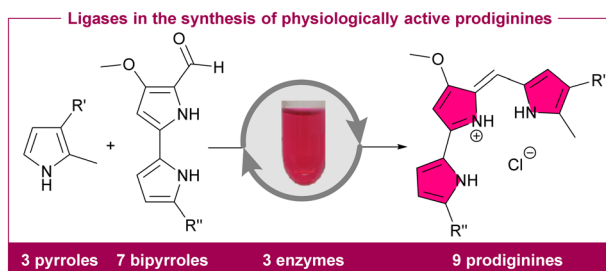
6153



### Essential role of CO coverage in CO<sub>2</sub> hydrogenation over Pt(111)

Yongjie Xi,\* Tingting Wang, Jia Wang, Jinlei Li and Fuwei Li\*

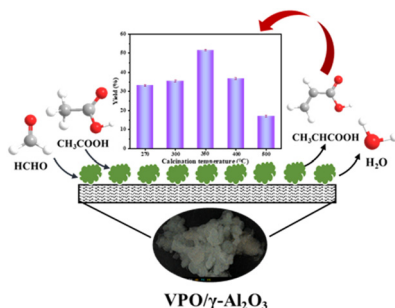
6165



### New prodiginosin derivatives – chemoenzymatic synthesis and physiological evaluation against cisplatin-resistant cancer cells

Tim Moritz Weber, Alexandra Leyens, Lena Berning, Björn Stork and Jörg Pietruszka\*

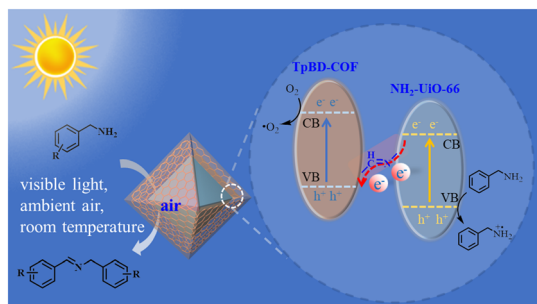
6185



### Kinetics and optimization studies of modified VPO/γ-Al<sub>2</sub>O<sub>3</sub> catalyst prepared *in situ* for cross-aldol condensation

Hui Guo, Tingting Ge,\* Yuchao Li, Yuxia Li, Yanxia Zheng, Xinpeng Guo, Haofer Huang, Ming Wang and Cuncun Zuo\*

6198



### Construction of core-shell MOF@COF hybrids with a Z-scheme heterojunction for efficient visible light photocatalysis

Jun Pang, Weijie Chen, Jintao Hu, Jie Cheng, Mingqiang Tang, Zewei Liu and Rong Tan\*

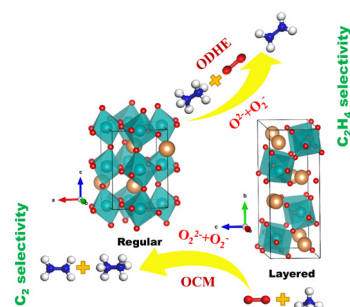


## PAPERS

6211

# $\text{ANbO}_3$ ( $A = \text{Na, K}$ ) and $A'_2\text{Nb}_2\text{O}_7$ ( $A' = \text{Ca, Sr}$ ) composite oxides for oxidative coupling of methane and oxidative dehydrogenation of ethane: perovskite vs. layered perovskite

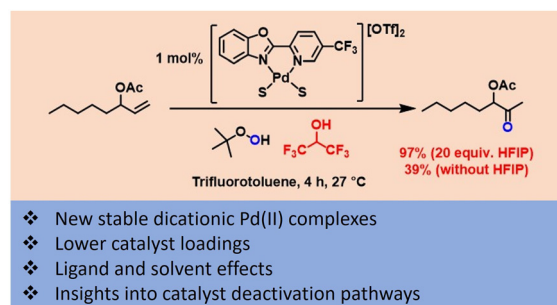
Junwei Xu,\* Xusheng Zhong, Rumeng Ouyang, Xiuzhong Fang, Xianglan Xu and Xiang Wang\*



6224

# Enhancing the performance for palladium catalysed *tert*-butyl hydroperoxide-mediated Wacker-type oxidation of alkenes

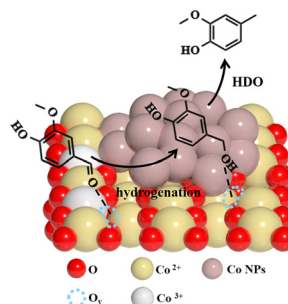
Matthew N. Blair, Meadhbh Murray-Williams, Calum Maguire, Clare L. Brown, Qun Cao, Hongxin Chai, Yitong Li, Róisín L. O'Hagan, Paul Dingwall, Panagiotis Manesiotis, Catherine L. Lyall, John P. Lowe, Ulrich Hintermair, Peter C. Knipe and Mark J. Muldoon\*



6233

# Carbon-supported Co/Co<sub>3</sub>O<sub>4</sub> hybrid catalyst: an efficient non-noble metal catalyst for the hydrodeoxygenation of vanillin

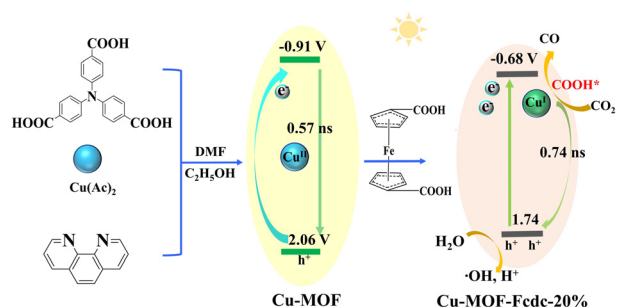
Zhihua Zhu, Chaochong Zhang, Peng Zhou,\* Bo Han,\* Zehui Zhang\* and Bing Liu\*



6238

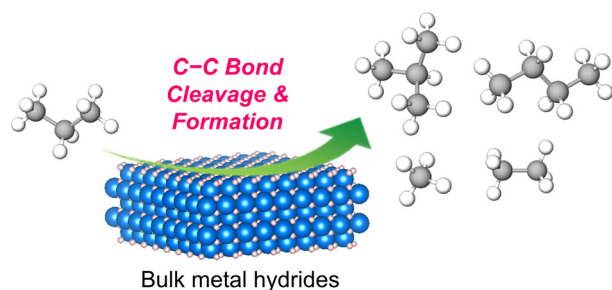
# Cu-Fe bimetallic MOF enhances the selectivity of photocatalytic CO<sub>2</sub> reduction toward CO production

Huayong Yang, Min Zhang, Zhongjie Guan and Jianjun Yang\*





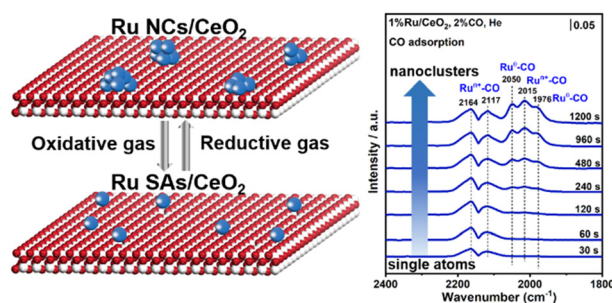
6247



### Propane metathesis and hydrogenolysis over titanium hydride catalysts

Mengwen Huang, Yosuke Tomimuro, Shinta Miyazaki, Shinya Mine, Takashi Toyao, Yoyo Hinuma, Yasuharu Kanda, Masaaki Kitano, Ken-ichi Shimizu\* and Zen Maeno\*

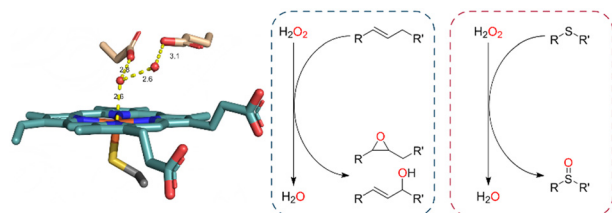
6254



### Spectroscopic investigation of the structural transformation of Ru in the Ru/CeO<sub>2</sub> catalyst

Kai Xu, Xiu-Cui Hu, Chao Ma, Peng Wang, Wei-Wei Wang\* and Chun-Jiang Jia\*

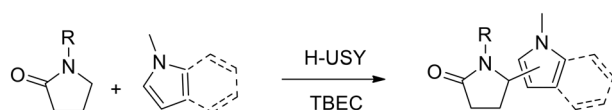
6264



### Natural alternative heme-environments allow efficient peroxxygenase activity by cytochrome P450 monooxygenases

Ana C. Ebrecht, Martha S. Smit\* and Diederik J. Opperman\*

6274



- ◆ Transition Metal-Free
- ◆ Broad Substrate Scope
- ◆ Mild Reaction Conditions
- ◆ Selective

### Transition-metal-free, oxidative C(sp<sup>3</sup>)-H arylation of amides with zeolite catalysts

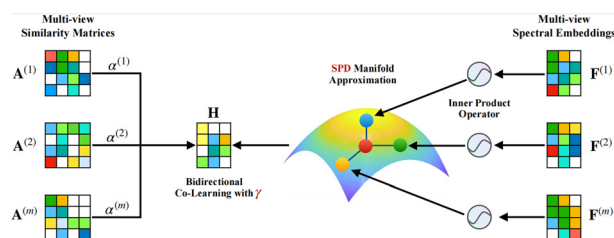
Jannick Vercammen,\* Besir Krasniqi and Dirk De Vos\*



6281

## Screening of steam-reforming catalysts using unsupervised machine learning

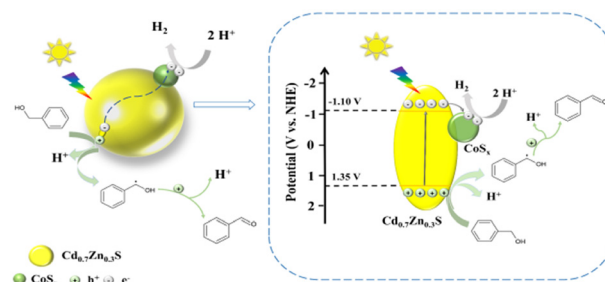
Yujia Liu, Zhenwei Liang, Jiazhun Huang, Biqi Zhong, Xiaojun Yang\* and Tiejun Wang\*



6291

## Dual-functional photocatalyst of $\text{CoS}_x/\text{Cd}_{0.7}\text{Zn}_{0.3}\text{S}$ without noble metals for efficient selective benzaldehyde synthesis coupled with $\text{H}_2$ production

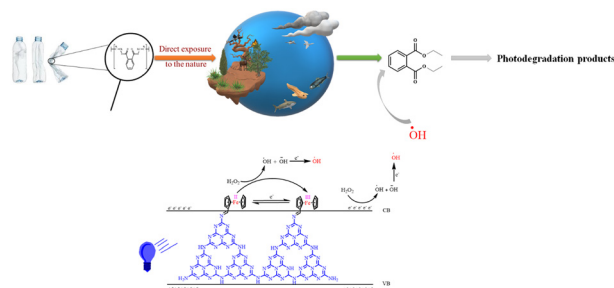
Xinan Chen, Jiaqi Yu, Zifan Zhang, Zizhong Zhang, Tao Ji and Wenyue Su\*



6297

## Removal of hazardous diethyl phthalate released from plastics using mesoporous graphitic carbon nitride boosted with ferrocene ( $\text{Fc/g-C}_3\text{N}_4$ ) under visible light

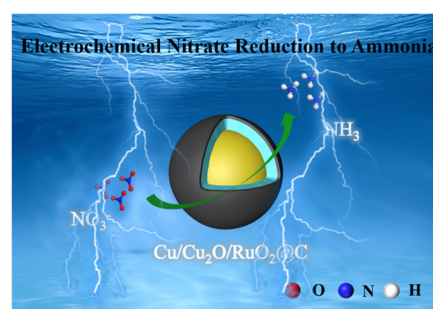
Mohammad Bashiri, Mona Hosseini-Sarvari,\* Yanlong Gu and Dengyue Zheng

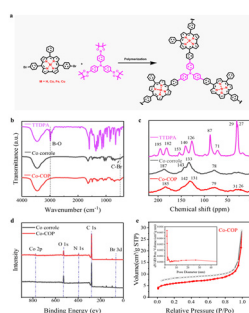


6313

## Preparation of Ru-doped Cu-based catalysts for enhanced electrochemical ammonia synthesis from efficient electrocatalytic nitrate reduction

Anmin Liu,\* Guangxin Li, Jianghui Cao, Fang Zhao, Xiru Chen, Qianqian Hua, Liguao Gao, Tingli Ma and Xuefeng Ren\*





## Spatial, well-defined metal-corrole-based covalent organic polymers for remarkably enhanced multipurpose electrocatalysis and high-performance zinc–air batteries

Yan-Fang Yao, Zhen-Yu Huang, Wan-Yue Xie, Si-Jing Huang,\* Zheng-Yan Liu, Gang Yang, Jian-Shan Ye, Hai-Yang Liu\* and Xin-Yan Xiao\*

