

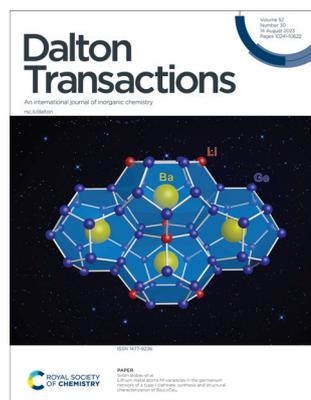
# Dalton Transactions

An international journal of inorganic chemistry incorporating Acta Chemica Scandinavica  
[rsc.li/dalton](http://rsc.li/dalton)

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.

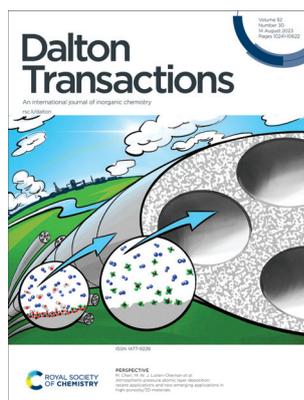
## IN THIS ISSUE

ISSN 1477-9226 CODEN DTARAF 52(30) 10241-10622 (2023)



**Cover**  
See Svilen Bobev *et al.*,  
pp. 10310–10322.

Image reproduced by  
permission of Svilen Bobev  
from *Dalton Trans.*, 2023, **52**,  
10310.



**Inside cover**  
See M. Chen,  
M. W. J. Luiten-Olieman  
*et al.*, pp. 10254–10277.

Image reproduced by  
permission of Inorganic  
Membranes Group,  
University of Twente and  
J. W. F. Timmerman from  
*Dalton Trans.*, 2023, **52**,  
10254.

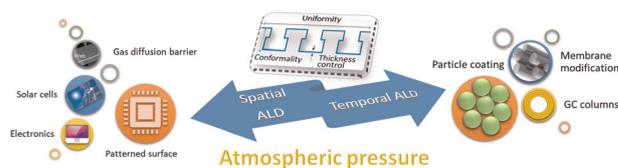
We would like to acknowl-  
edge the artwork created by  
Hilbrand Bos.

## PERSPECTIVE

10254

### Atmospheric-pressure atomic layer deposition: recent applications and new emerging applications in high-porosity/3D materials

M. Chen,\* M. P. Nijboer, A. Y. Kovalgin, A. Nijmeijer,  
F. Roozeboom and M. W. J. Luiten-Olieman\*

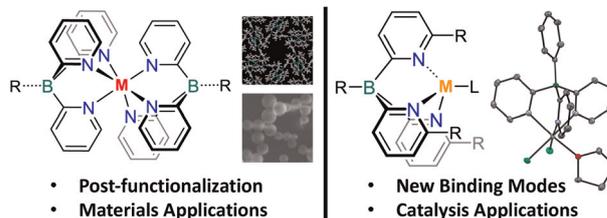


## FRONTIER

10278

### Tris(pyridyl)borates: an emergent class of versatile and robust polydentate ligands for catalysis and materials applications

James McQuade and Frieder Jäkle\*



## Editorial Staff

### Executive Editor

Sally Howells-Wyllie

### Deputy Editor

Mike Andrews

### Development Editors

Michelle Canning, Emily Cuffin-Munday

### Editorial Production Manager

Susannah Davies

### Publishing Editors

Debora Giovannelli, Helen Lunn, Samuel Oldknow, Kate Tustain

### Editorial Assistant

Daphne Houston

### Publishing Assistant

Huw Hedges

### Publisher

Jeanne Andres

For queries about submitted articles please contact Susannah Davies, Editorial Production Manager in the first instance. E-mail [dalton@rsc.org](mailto:dalton@rsc.org)

For pre-submission queries please contact Sally Howells-Wyllie, Editor. Email [dalton-rsc@rsc.org](mailto:dalton-rsc@rsc.org)

Dalton Transactions (electronic: ISSN 1477-9234) is published 48 times a year by the Royal Society of Chemistry, Thomas Graham House, Science Park, Milton Road, Cambridge, UK CB4 0WF.

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: £4441; US\$7972.

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)

# Dalton Transactions

An international journal for high quality, original research in inorganic and organometallic chemistry incorporating Acta Chemica Scandinavica  
[rsc.li/dalton](http://rsc.li/dalton)

## Editorial Board

### Chair

Russell Morris, University of St Andrews, UK

### Associate Editors

Paola Ceroni, University of Bologna, Italy  
Vadapalli Chandrasekhar, Indian Institute of Technology Kanpur, India  
Maarit Karpinnen, Aalto University, Finland  
Mi Hee Lim, Korea Advanced Institute of

Science and Technology, South Korea  
Neal Mankad, University of Illinois at Chicago, USA  
Warren Piers, University of Calgary, Canada  
Wolfgang Tremel, Johannes Gutenberg-Universität, Germany  
Takashi Uemura, University of Tokyo, Japan  
Li-Min Zheng, Nanjing University, China

### Members

Jaqueline Kiplinger, Los Alamos National Laboratory, USA  
Sascha Ott, Uppsala University, Sweden

## Advisory Board

Simon Aldridge, University of Oxford, UK  
Santiago Alvarez, University of Barcelona, Spain  
John Arnold, University of California, Berkeley, USA  
Mu-Hyun Baik, KAIST, Korea  
Jitendra Bera, IIT Kanpur, India  
Eszter Borbas, Uppsala University, Sweden  
Holger Braunschweig, Universität Würzburg, Germany  
Xian-He Bu, Nankai University, China  
Raffaella Buonsanti, École Polytechnique Fédérale de Lausanne, Switzerland  
Claire Carmalt, University College London, UK  
Eric Clot, University of Montpellier 2, France  
Catherine Constable-Housecroft, University of Basel, Switzerland  
Amitava Das, Indian Institute of Science and Education Research Kolkata, India  
Jillian Dempsey, University of North Carolina, USA  
Anjana Devi, Ruhr-University Bochum, Germany  
Rasika Dias, University of Texas at Arlington, USA  
Jairton Dupont, University of Nottingham, UK

William Evans, University of California, Irvine, USA  
Harry B. Gray, California Institute of Technology, USA  
Zijian Guo, Nanjing University, China  
Michael Hayward, University of Oxford, UK  
Todd W. Hudnall, Texas State University, USA  
Ilich Ibarra, National Autonomous University of Mexico, Mexico  
Cameron Jones, Monash University, Australia  
Masako Kato, Hokkaido University, Japan  
Takahiko Kojima, University of Tsukuba, Japan  
Jian-Ping Lang, Suzhou University, China  
Jennifer Love, University of British Columbia, Canada  
Stuart Macgregor, Heriot Watt University, UK  
Celia Machado Ronconi, Federal Fluminense University, Brazil  
Laurent Maron, Université de Toulouse, France  
Ellen Matson, Rochester University, USA  
Marinella Mazzanti, École Polytechnique Fédérale de Lausanne (EPFL), Switzerland  
Nils Metzler-Nolte, Ruhr-Universität Bochum, Germany  
Barbara Milani, Università di Trieste, Italy  
Georgii Nikonov, Brock University, Canada

Seiji Ogo, Kyushu University, Japan  
Chris Orvig, University of British Columbia, Canada  
Gerard Parkin, Columbia University, USA  
Eric Rivard, University of Alberta, Canada  
Douglas Stephan, University of Toronto, Canada  
Matthias Tamm, Technische Universität Braunschweig, Germany  
Jinkui Tang, Changchun Institute of Applied Chemistry, China  
Thomas Teets, University of Houston, USA  
Christine Thomas, The Ohio State University, USA  
Ajay Venugopal, Indian Institute of Science Education and Research Thiruvananthapuram, India  
Claudio N. Verani, Wayne State University, USA  
Wai-yeung Wong, Hong Kong Baptist University, China  
Zhiguo Xia, South China University of Technology, China  
Zuowei Xie, Chinese University of Hong Kong, China  
Lin Xu, East China Normal University, China

## Information for Authors

Full details on how to submit material for publication in Dalton Transactions 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/dalton](http://rsc.li/dalton)

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

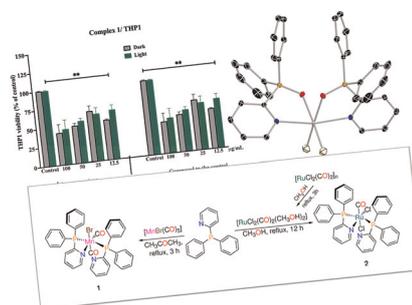


## COMMUNICATIONS

10286

**In vitro cytotoxicity of Mn(II) and Ru(II) carbonyls with a diphenyl pyridyl phosphine coligand towards leukaemia**

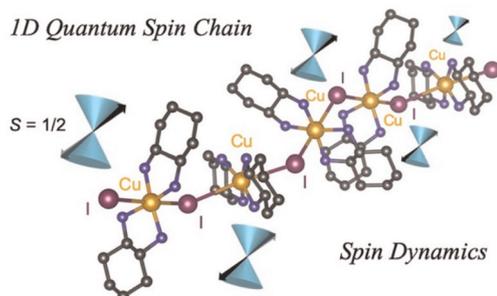
Ahmed M. Mansour,\* Rabaa M. Khaled, Krzysztof Radacki, Zeina Younes, Mariam Gamal, Beatrice Guirguis, Gamal A. E. Mostafa, Essam A. Ali and Ola R. Shehab



10294

**Spin dynamics in a Heisenberg weak antiferromagnetic chain of an iodide-bridged Cu(II) complex**

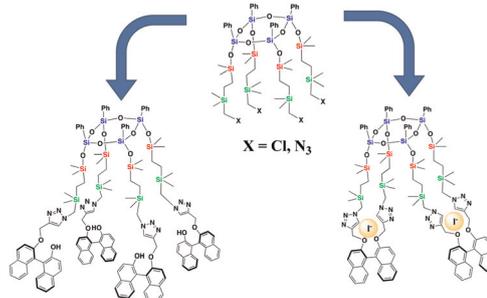
Masanori Wakizaka,\* Mirosław Arczyński, Shraddha Gupta, Shinya Takaishi and Masahiro Yamashita\*



10298

**BINOL and triazole-containing Janus rings and 29-8-29-membered tricyclic ladder-type hybridized siloxane: application in the fluorescence sensing of anions**

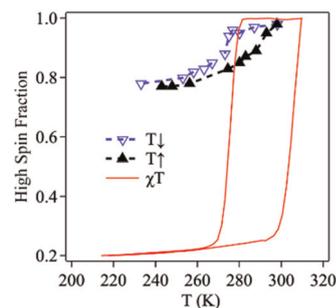
Zhanjiang Zheng,\* Niyaz Yagafarov, Zheng Xu, Armelle Ouali, Nobuhiro Takeda, Yujia Liu\* and Masafumi Unno\*



10305

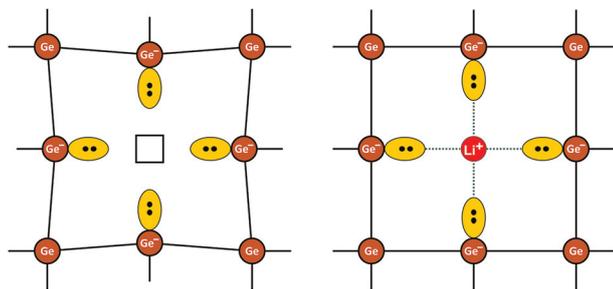
**Is the surface of Hofmann-like spin-crossover {Fe(pz)[Pt(CN)<sub>4</sub>]} the same as its bulk?**

Alejandro Martínez Serra, Archit Dhingra,\* María Carmen Asensio, José Antonio Real and Juan Francisco Sánchez Royo\*



## PAPERS

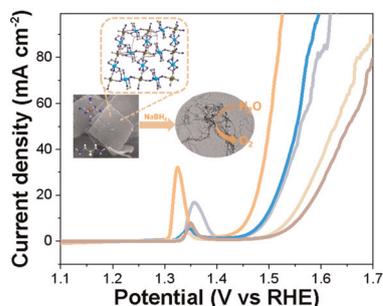
10310



### Lithium metal atoms fill vacancies in the germanium network of a type-I clathrate: synthesis and structural characterization of $\text{Ba}_8\text{Li}_5\text{Ge}_{41}$

Kowsik Ghosh, Alexander Ovchinnikov, Michael Baitinger, Mitja Krnel, Ulrich Burkhardt, Yuri Grin and Svilen Bobev\*

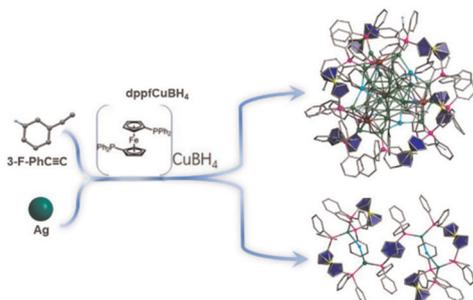
10323



### Ligand leaching enabling improved electrocatalytic oxygen evolution performance

Hongbo Zhou,\* Zi Wei, Albert Akeno Nyaaba, Ziliang Kang, Yashu Liu, Caiyao Chen, Jun Zhu, Xiafang Ji and Guoxing Zhu\*

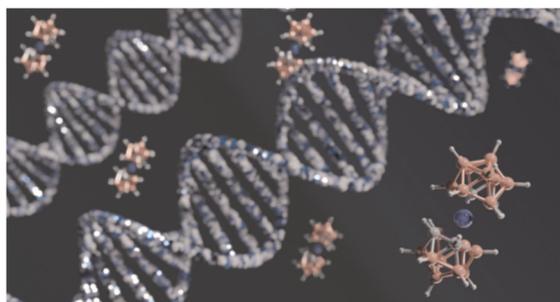
10332



### DppfCuBH<sub>4</sub>: new reducing agents for the synthesis of ferrocene-functionalized metal nanoclusters

Meng Wang, Simin Li, Huijun Chen, Xueli Sun, Jing Sun, Yanyuan Jia,\* Shuo Guo, Cunfa Sun\* and Hui Shen\*

10338



### Cobalt bis(dicarbollide) is a DNA-neutral pharmacophore

Krzysztof Fink,\* Jakub Cebula, Zdeněk Tošner, Mateusz Psurski, Mariusz Uchman and Tomasz M. Goszczyński

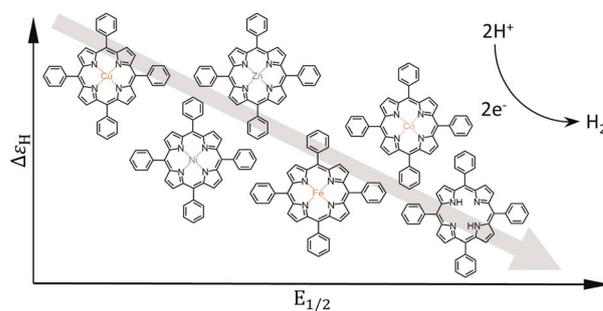


## PAPERS

10348

### Tetraphenylporphyrin electrocatalysts for the hydrogen evolution reaction: applicability of molecular volcano plots to experimental operating conditions

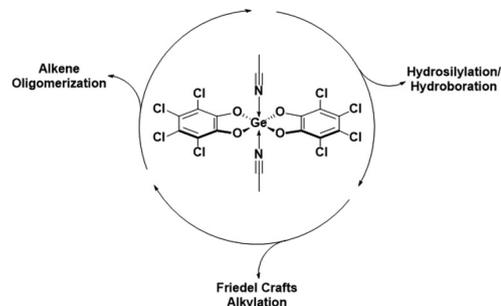
Felicia Zaar, C. Moyses Araujo, Rikard Emanuelsson, Maria Strømme and Martin Sjödin\*



10363

### Expanding the scope of bis(catecholato)germane catalysis: hydrosilylation, hydroboration, Friedel–Crafts alkylation and oligomerization

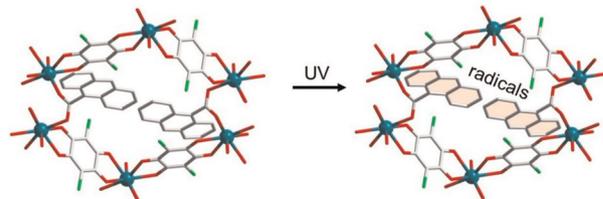
Andrew T. Henry, Dana A. R. Nanan and Kim M. Baines\*



10372

### Modulation of magnetization dynamics of an Er(III) coordination polymer by the conversion of a ligand to a radical using UV light

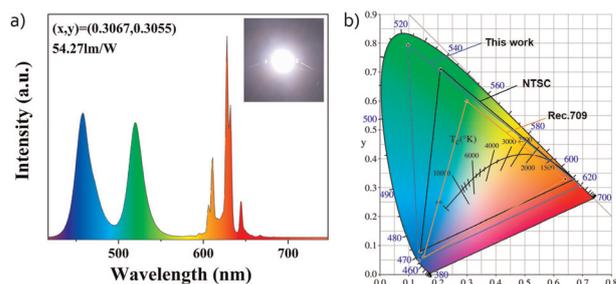
Xiaoshuang Gou, Ning Liu, Yuewei Wu, Wenlong Lan, Mengmeng Wang, Wei Shi\* and Peng Cheng\*



10378

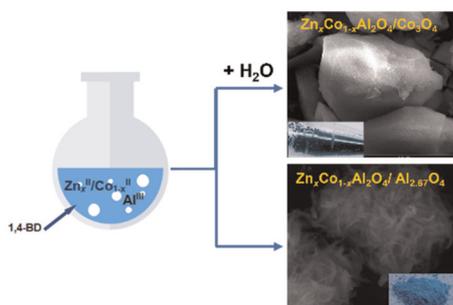
### Highly efficient CsPbBr<sub>3</sub>@glass@polyurethane composite film as flexible liquid crystal display backlight

Guoxing Zhang, Dongliang Jiang, Xinghua Zhu, Yuemei Lan, Dong Wang, Xuejie Zhang, Bo Wang, Yan Gao, Qingguang Zeng and Yan Chen\*



## PAPERS

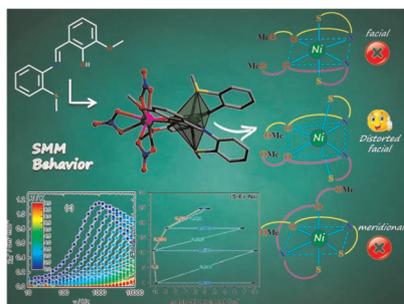
10386



### Deciphering the role of water and a zinc-doping process in a polyol-based approach for obtaining Zn/Co/Al-based spinels: toward “green” mesoporous inorganic pigments

Maria-Gabriela Alexandru, Adelina-Carmen Ianculescu,\* Oana Carp, Daniela C. Culita, Silviu Preda, Cristian D. Ene, Bogdan Stefan Vasile, Vasile-Adrian Surdu, Adrian-Ionut Nicoara, Florentina Neatu, Ioana Pintilie and Diana Visinescu\*

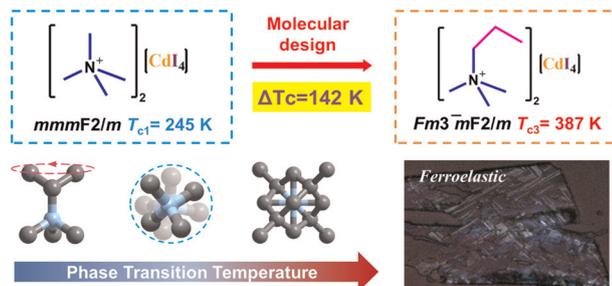
10402



### Lanthanoid coordination prompts unusually distorted pseudo-octahedral Ni<sup>II</sup> coordination in heterodinuclear Ni–Ln complexes: synthesis, structure and understanding of magnetic behaviour through experiment and computation

Biswarup Dutta, Thierry Guizouarn, Fabrice Pointillart, Kamil Kotrle, Radovan Herchel and Debashis Ray\*

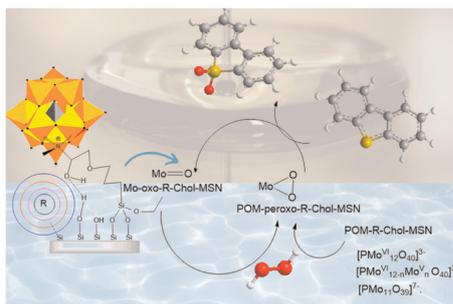
10415



### Methyl regulation triggers high-temperature ferroelastic phase transition

Si-Yue Zhang, Zhi-Cheng Zhang, Tie Zhang, Hao-Fei Ni, Zhi-Xu Zhang, Da-Wei Fu\* and Hai-Feng Lu\*

10423



### Enhanced adsorption–catalysis combination for the removal of sulphur from fuels using polyoxometalates supported on amphipathic hybrid mesoporous silica nanoparticles

Josefa Ortiz-Bustos, Helena Pérez del Pulgar, Yolanda Pérez\* and Isabel del Hierro\*

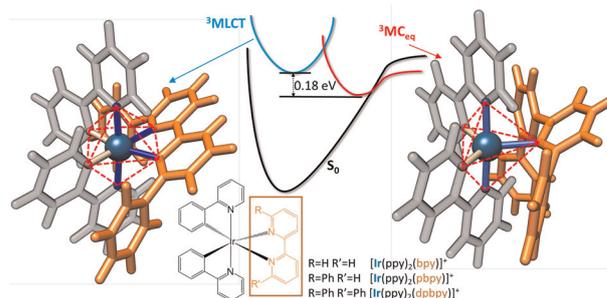


## PAPERS

10437

### On the importance of equatorial metal-centered excited states in the photophysics of cyclometallated Ir(III) complexes

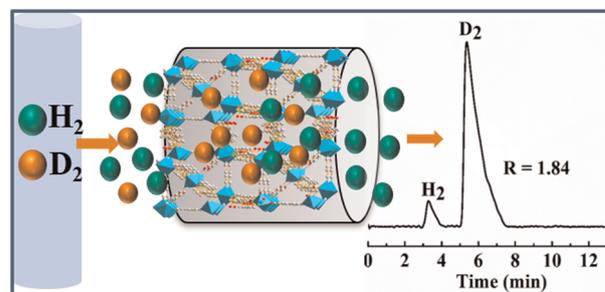
Iván Soriano-Díaz, Enrique Orti\* and Angelo Giussani\*



10448

### Rapid diffusion of H<sub>2</sub> and strong adsorption of D<sub>2</sub> in Ni-4PyC realized the efficient separation of H<sub>2</sub>/D<sub>2</sub> by gas chromatography

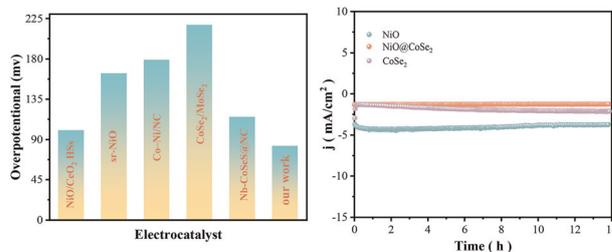
Lingyun Kong, Enming Ping, Chunyan Ding, Lijuan Zhang,\* Yunshan Zhou\* and Nan Chen



10457

### NiO@CoSe<sub>2</sub> nanostructures for high-performance asymmetric supercapacitors and efficient electrocatalysts

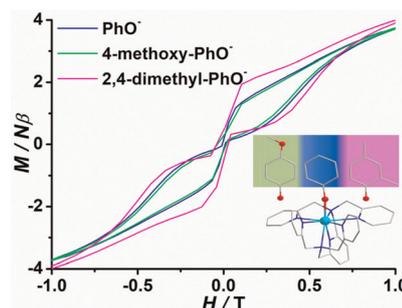
Xingyu Liu, Mengdi Wang, Ahmad Umar and Xiang Wu\*



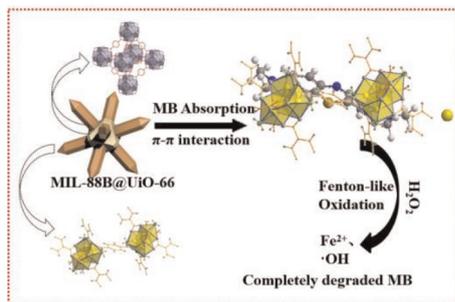
10465

### Boosting the mono-axial crystal field in stable high-coordinate Dy(III) single-ion magnets by substitution of the phenoxy axial ligand

Ben Zhang, Yang Zhou, Chang Dong, Yi Xiang, Yanbo Shi, Chennan Zhang, Aihua Yuan, Shaojun Zheng,\* Zhao-Yang Li,\* Yi-Quan Zhang,\* Yong Yang and Lei Chen\*



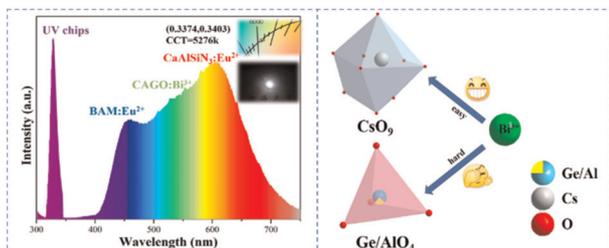
10472



### Co-adsorption and Fenton-like oxidation in the efficient removal of methylene blue by MIL-88B@UiO-66 nanoflowers

Pingping Teng, Ying Liu, Zhongqiao Sun, Hao Meng, Yide Han and Xia Zhang\*

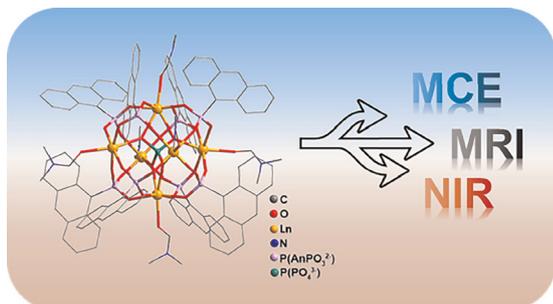
10481



### A metal-to-metal charge transfer induced green-yellow phosphor CsAlGe<sub>2</sub>O<sub>6</sub>:Bi<sup>3+</sup> for full-spectrum LED devices

Shuo Yang, Chuqi Wang, Xiaoxi Ma, Chuang Wang,\* Yujuan Dong, Enlai Dong, Ge Zhu\* and Shuangyu Xin\*

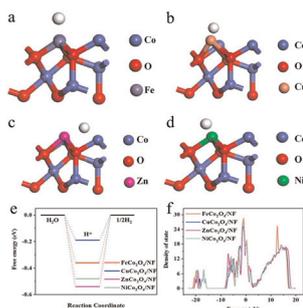
10489



### Octahedral lanthanide clusters containing a central PO<sub>4</sub><sup>3-</sup> anion: structural, luminescent, magnetic and relaxometric properties

Yi-Ping Qu, Xin-Da Huang, Kui Xu, Song-Song Bao and Li-Min Zheng\*

10499



### Controlled synthesis of ACo<sub>2</sub>O<sub>4</sub> (A = Fe, Cu, Zn, Ni) as an environmentally friendly electrocatalyst for urea electrolysis

Ping Li, Yanhong Wang, Xiaoqiang Du\* and Xiaoshuang Zhang

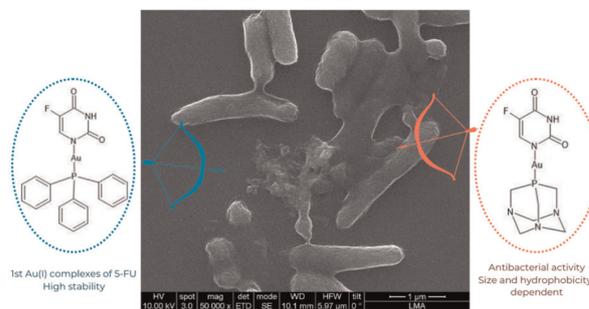


## PAPERS

10507

**Antibacterial properties of phosphine gold(I) complexes with 5-fluorouracil**

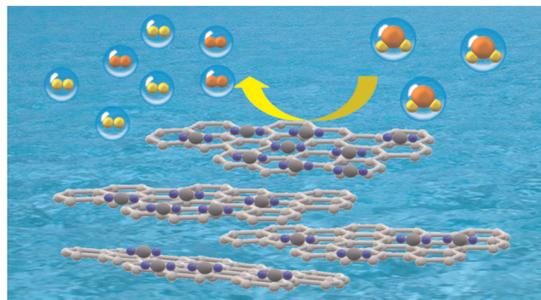
Ricardo Ferrando, Scott G. Mitchell, Elena Atrián-Blasco\* and Elena Cerrada\*



10515

**RuO<sub>2</sub> nanoparticles anchored on g-C<sub>3</sub>N<sub>4</sub> as an efficient bifunctional electrocatalyst for water splitting in acidic media**

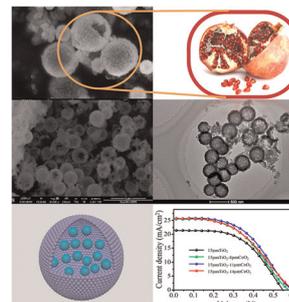
Yun Wu, Rui Yao, Qiang Zhao, Jinping Li and Guang Liu\*



10522

**Preparation of a CeO<sub>2</sub> ball-core structure and its application in quantum dot sensitized solar cells**

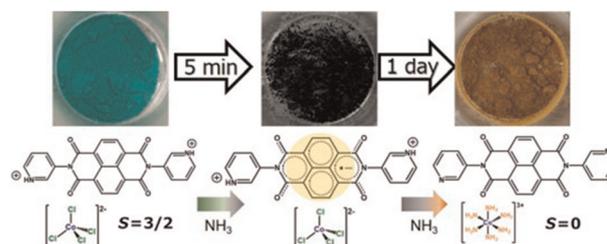
Shusen Yang, Jie Sun, Chenxuan Dai, Zixin Wang, Zeyuan Ma, Wenming Zhang\* and Ling Li\*



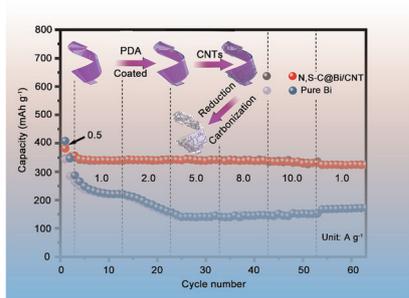
10531

**Thermosalient effect of a naphthalene diimide and tetrachlorocobaltate hybrid and changes of color and magnetic properties by ammonia vapor**

Shunya Masuda, Sotaro Kusumoto,\* Masaya Okamura, Shiro Hikichi, Ryuya Tokunaga, Shinya Hayami, Yang Kim and Yoshihiro Koide\*



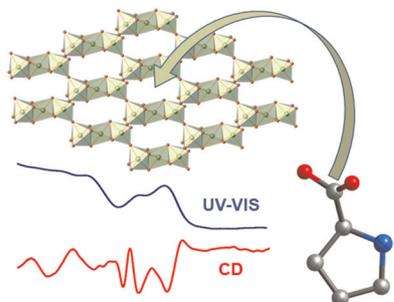
10537



### Bi nanoparticles confined in N,S co-doped carbon nanoribbons with excellent rate performance for sodium-ion batteries

Guirong Huang, Qiushi Huang, Zhe Cui, Jinqi Zhu, Mengluan Gao, Wenqing Wang, Fuming Weng, Qian Liu\* and Rujia Zou\*

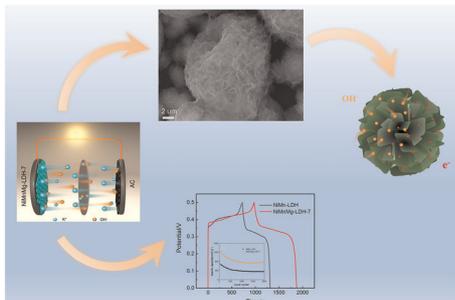
10545



### Structural diversity in proline-based lead bromide chiral perovskites

Valerii Y. Sirenko, Olesia I. Kucheriv, Igor O. Fritsky, Elzbieta Gumienna-Kontecka, Ioan-Andrei Dascălu, Sergiu Shova and Il'ya A. Gural'skiy\*

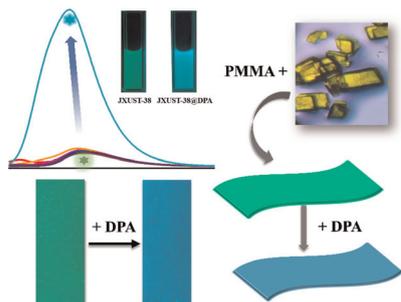
10557



### Mg doping of NiMn-LDH with a three-dimensional porous morphology for an efficient supercapacitor

Biao Zhang, Ying Yang, Jingliang Cai, Xiaolong Hou, Caini Yi, Xuan Liao, Yuping Liu, Changguo Chen, Danmei Yu\* and Xiaoyuan Zhou\*

10567



### A highly stable chain-based Eu<sup>III</sup> metal-organic framework as a turn-on and blue-shift luminescent sensor for dipicolinic acid

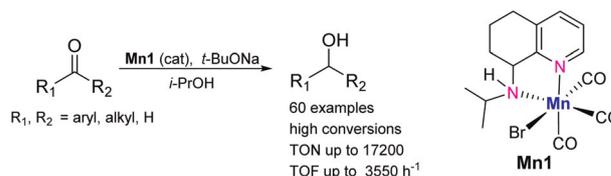
Li Wang, Yu-Lian Zhu, Teng-Fei Zheng, Zi-Hao Zhu,\* Yan Peng, Yong-Quan Wu, Jing-Lin Chen, Sui-Jun Liu\* and He-Rui Wen



10574

### Robust and efficient transfer hydrogenation of carbonyl compounds catalyzed by *NN*-Mn(I) complexes

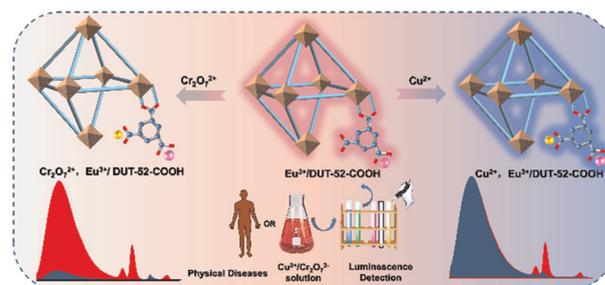
Zheng Wang,\* Ning Ma, Xiaochi Lu, Ming Liu, Tian Liu, Qingbin Liu,\* Gregory A. Solan\* and Wen-Hua Sun\*



10584

### A new dual-ligand DUT-52-type metal–organic framework for ratiometric luminescence detection of aqueous-phase $\text{Cu}^{2+}$ and $\text{Cr}_2\text{O}_7^{2-}$

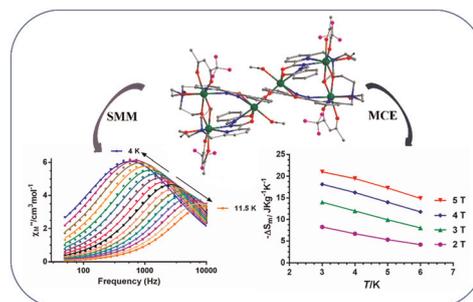
Xue Wen, Wenjun Zhang,\* Cong Ding, Zhongfa Li and Chengyue Xin



10594

### Synthesis, structures and magnetic studies of hexanuclear lanthanide complexes: SMM behavior of the $\text{Dy}^{\text{III}}$ analogue and MCE properties of the $\text{Gd}^{\text{III}}$ analogue

Pawan Kumar, Pankaj Kalita, María A. Palacios, Vierandra Kumar, Joydev Acharya, Enrique Colacio\* and Vadapalli Chandrasekhar\*



10609

### Pd-NHC catalysed regioselective activation of B(3,6)-H of *o*-carborane – a synergy between experiment and theory

Jia-Wei Yu, Cai-Yan Zhang, Gregory A. Chass, Jing-Xuan Zhang, Wei-Hua Mu\* and Ke Cao\*

