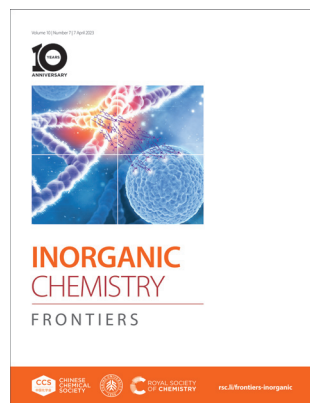


IN THIS ISSUE

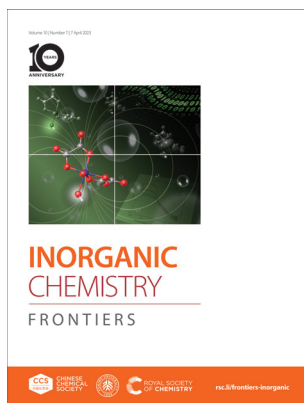
ISSN 2052-1553 CODEN ICFNAW 10(7) 1941–2208 (2023)



Cover

See Patricia Horcajada, Tarita Biver, Adoracion G. Quiroga *et al.*, pp. 1986–1998.

Image reproduced by permission of Lorena Esquinas and Patricia Horcajada from *Inorg. Chem. Front.*, 2023, **10**, 1986.



Inside cover

See Carlos Platas-Iglesias, Mario Chiesa, Mauro Botta *et al.*, pp. 1999–2013.

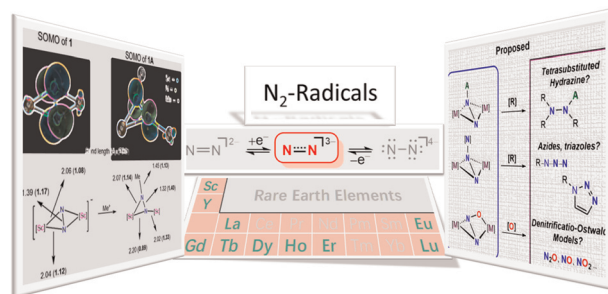
Image reproduced by permission of Mauro Botta from *Inorg. Chem. Front.*, 2023, **10**, 1999.

CHEMISTRY FRONTIERS

1952

The trianionic hydrazido radical (N_2)³⁻: a promising platform for transforming N_2

Josué Rolando Aguilar-Calderón, Junnian Wei* and Zhenfeng Xi*

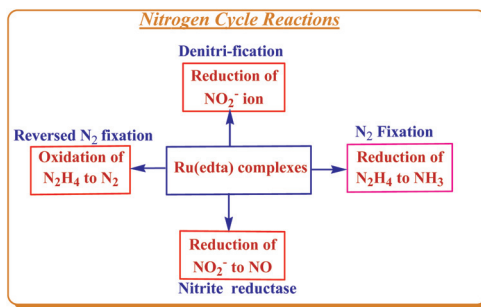


REVIEWS

1958

Prospect of Ru(edta) complexes in nitrogen cycle electrocatalysis: a mini review

Debabrata Chatterjee,* Olga Impert and Rudi van Eldik*



EDITORIAL STAFF

Executive Editor

Wenjun Liu

Deputy Editor

Kailin Deng

Development Editor

Cheng Du

Editorial Production Manager

Helen Saxton

Senior Publishing Editor

Becky Webb

Publishing Editors

Kirstine Anderson, Matthew Bown, Laura Cooper, Emily Cuffin-Munday, Hannah Fielding, Clare Fitzgerald, Anoushka Handa, Claire Harding, Alan Holder, Rosie Rothwell, Donna Smith, Laura Smith

Assistant Editors

Jie Gao, Yu Zhang

Publisher

Jeanne Andres

For queries about submitted papers, please contact Helen Saxton, Editorial Production Manager, in the first instance. E-mail: InorgChemFrontiersPROD@rsc.org

For pre-submission queries please contact Wenjun Liu, Executive Editor. Email: InorgChemFrontiersED@rsc.org

Inorganic Chemistry Frontiers (electronic: ISSN 2052-1553) is published 24 times a year by the Royal Society of Chemistry, Thomas Graham House, Science Park, Milton Road, Cambridge, UK CB4 0WE.

All orders, with cheques made payable to the Royal Society of Chemistry, should be sent to RSC Order Department, Royal Society of Chemistry, Thomas Graham House, Science Park, Milton Road, Cambridge, CB4 0WE, UK Tel +44 (0)1223 432398; E-mail orders@rsc.org

2023 Annual (electronic) subscription price: £2,182; US\$3,492. 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

INORGANIC CHEMISTRY

FRONTIERS

An international, high quality journal for interdisciplinary research between inorganic chemistry and related subjects.



CHINESE
CHEMICAL
SOCIETY



rsc.li/frontiers-inorganic

Published in collaboration with the Chinese Chemical Society and College of Chemistry and Molecular Engineering, Peking University

Editorial Board

Editor-in-Chief

Song Gao, Peking University, Sun Yat-sen University, China

Associate Editors

Jun Chen, Nankai University, China
Paula Diaconescu, University of California, Los Angeles, USA
Svetlana Mintova, Université de Caen, France
Justin J. Wilson, Cornell University, USA
Teppei Yamada, The University of Tokyo, Japan
Zhiping Zheng, Southern University of Science and Technology, China

Members

Hiroshi Kitagawa, Kyoto University, Japan
Yu Tang, Lanzhou University, China
Xianran Xing, University of Science and Technology Beijing, China
Nanfeng Zheng, Xiamen University, China

Advisory Board

Christopher J. Chang, University of California, Berkeley, USA
Chi-Ming Che, University of Hong Kong, China
Ling Chen, Beijing Normal University, China
Xiaoming Chen, Sun Yat-Sen University, China
Eugenio Coronado, University of Valencia, Spain
Yi Cui, Stanford University, USA
Patrick Gámez, University of Barcelona, Spain
Hairong Guan, University of Cincinnati, USA
Andy Hor, University of Hong Kong, China
Zhaomin Hou, RIKEN, Japan
Xile Hu, École Polytechnique Fédérale de Lausanne, Switzerland
Mercouri Kanatzidis, Northwestern University,

USA
Jaqueline L. Kiplinger, Los Alamos National Laboratory, USA
Yadong Li, Tsinghua University, China
Wenbin Lin, University of Chicago, USA
Yi Lu, University of Texas at Austin, USA
P. S. Mukherjee, Indian Institute of Science, India
Wonwoo Nam, Ewha Womans University, Korea
Hiroshi Nishihara, University of Tokyo, Japan
Hiroki Oshio, University of Tsukuba, Japan
Oleg Ozerov, Texas A&M University, USA
Manfred Scheer, University of Regensburg, Germany

Baolian Su, University of Namur, Belgium
Jean Pascal Sutter, Laboratory of Coordination Chemistry, CNRS, France
Richard Winpenny, University of Manchester, UK
Yi Xie, University of Science and Technology of China, China
Zuwei Xie, The Chinese University of Hong Kong, China
Chunhua Yan, Peking University, China
Hong-Cai Joe Zhou, Texas A&M University, USA
Xiaodong Zou, Stockholm University, Sweden
Qichun Zhang, City University of Hong Kong, China

Information for Authors

Full details on how to submit material for publication in Inorganic Chemistry Frontiers 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/frontiers-inorganic

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 Partner Organisations 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

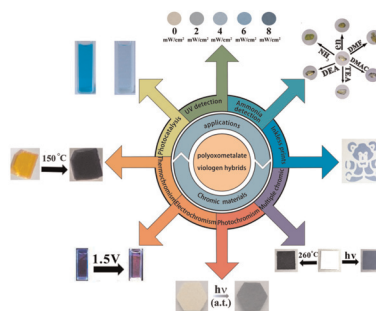


REVIEWS

1965

Recent progress in polyoxometalate–viologen photochromic hybrids: structural design, photochromic mechanism, and applications

Li Li,* Yang-Tao Yu, Yang Hua, Xiao-Nan Li and Hong Zhang*

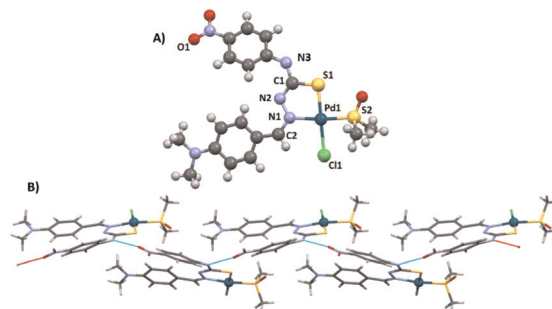


RESEARCH ARTICLES

1986

Two novel Pd thiosemicarbazone complexes as efficient and selective antitumoral drugs

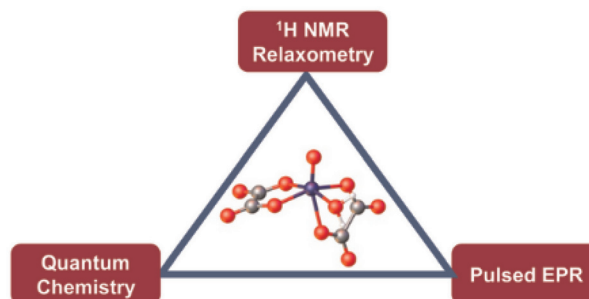
Tania Hidalgo, David Fabra, Raul Allende, Ana I. Matesanz, Patricia Horcajada,* Tarita Biver* and Adoracion G. Quiroga*



1999

Magnetic and relaxation properties of vanadium(IV) complexes: an integrated ^1H relaxometric, EPR and computational study

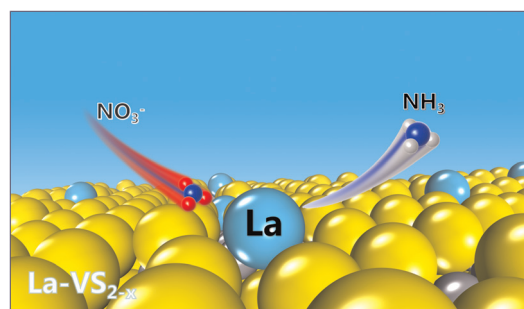
Valeria Lagostina, Fabio Carniato, David Esteban-Gómez, Carlos Platas-Iglesias,* Mario Chiesa* and Mauro Botta*



2014

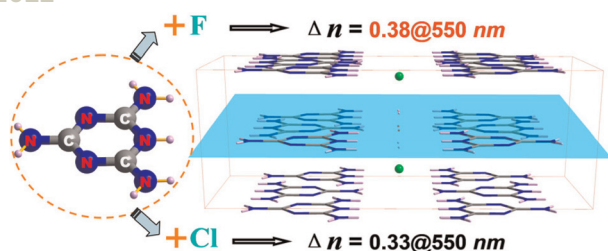
Rare-earth La-doped VS_{2-x} for electrochemical nitrate reduction to ammonia

Guohui Wang, Peng Shen, Kai Chen, Yali Guo, Xiaolin Zhao and Ke Chu*



RESEARCH ARTICLES

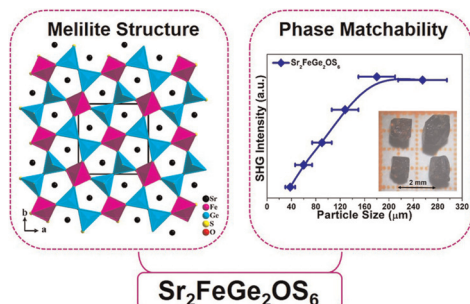
2022



β -($C_3H_7N_6$) $_2Cl_2 \cdot H_2O$ and ($C_3H_7N_6$)F $\cdot H_2O$: two UV birefringent crystals induced by uniformly aligned structural groups

Yaoguo Shen,* Liang Ma, Guofa Dong,* Hualiang Yu and Junhua Luo

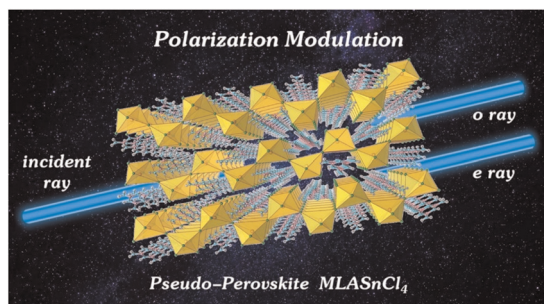
2030



Melilite oxychalcogenide $Sr_2FeGe_2OS_6$: a phase-matching IR nonlinear optical material realized by isomorphous substitution

He-Di Yang, Sheng-Hua Zhou, Mao-Yin Ran, Xin-Tao Wu, Hua Lin* and Qi-Long Zhu*

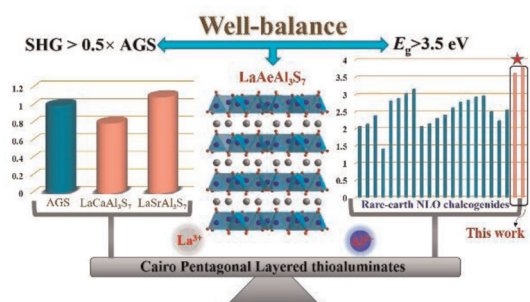
2039



A hybrid halide lead-free pseudo-perovskite with large birefringence

WeiQi Huang, Xiaolong Wu, Belal Ahmed, Yanqiang Li, Yang Zhou, Han Wang, Yipeng Song, Xiaojun Kuang, Junhua Luo and Sangen Zhao*

2045



LaAeAl $_3$ S $_7$ (Ae = Ca, Sr): Cairo pentagonal layered thioaluminates achieving a good balance between a strong second harmonic generation response and a wide bandgap

Jingjing Xu, Kui Wu,* Bingbing Zhang, Haohai Yu* and Huaijin Zhang*

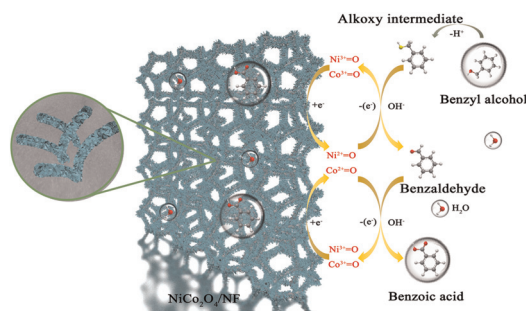


RESEARCH ARTICLES

2053

***In situ* construction of NiCo₂O₄ nanosheets on nickel foam for efficient electrocatalytic oxidation of benzyl alcohol**

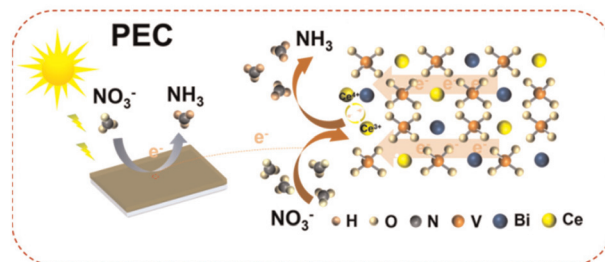
Min Xu, Jing Geng, Hui Xu, Shengbo Zhang* and Haimin Zhang*



2060

Understanding the role of Ce sites for boosting PEC-NIRR without externally applied potentials

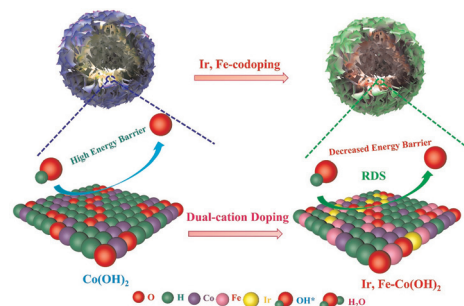
Lijing Liu, Yajie Bai, Zhenzhen Huang, Guanhua Wang, Jianguo Cui, Hongye Bai* and Weiqiang Fan*



2067

Dual-cation doping precisely reducing the energy barrier of the rate-determining step for promoting oxygen-evolving activity

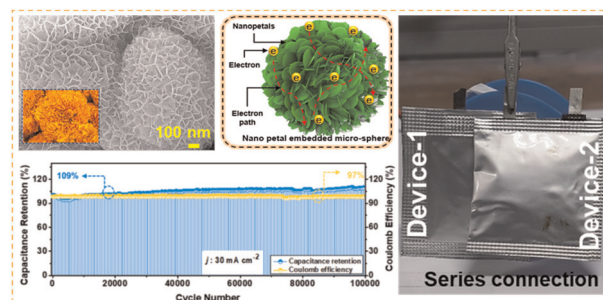
Hui Xu,* Cheng Wang, Bingji Huang, Hongyuan Shang and Yukou Du*



2075

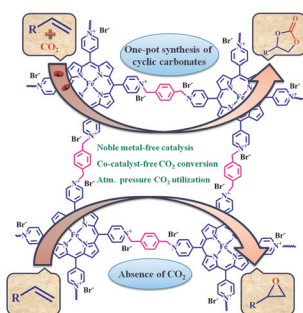
Rational construction of porous marigold flower-like nickel molybdenum phosphates *via* ion exchange for high-performance long-lasting hybrid supercapacitors

Ampasala Surya Kiran, Bhimanaboina Ramulu, Shaik Junied Arbaz, Edugulla Girija Shankar, Manchi Nagaraju and Jae Su Yu*



RESEARCH ARTICLES

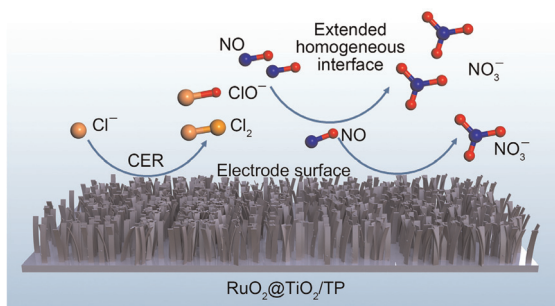
2088



Ionic Fe(III)-porphyrin frameworks for the one-pot synthesis of cyclic carbonates from olefins and CO₂

Rajesh Das, Sahil Kamra and C. M. Nagaraja*

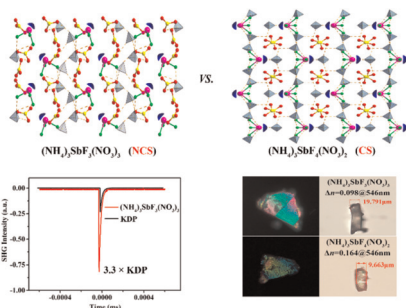
2100



Integrating RuO₂@TiO₂ catalyzed electrochemical chlorine evolution with a NO oxidation reaction for nitrate synthesis

Longcheng Zhang, Jie Liang, Xun He, Qin Yang, Yongsong Luo, Dongdong Zheng, Shengjun Sun, Jing Zhang, Hong Yan, Binwu Ying,* Xiaodong Guo* and Xuping Sun*

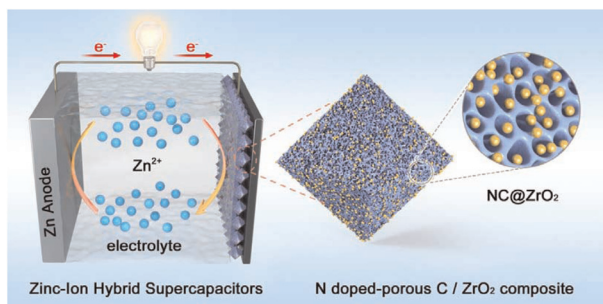
2107



Low temperature molten salt synthesis of noncentrosymmetric (NH₄)₃SbF₃(NO₃)₃ and centrosymmetric (NH₄)₃SbF₄(NO₃)₂

Qin Wang, Jinxuan Ren, Dan Wang, Liling Cao, Xuehua Dong, Ling Huang,* Daojiang Gao and Guohong Zou*

2115



A UiO-66-NH₂ MOF derived N doped porous carbon and ZrO₂ composite cathode for zinc-ion hybrid supercapacitors

Xiaoqi Wang, Hu Hong, Shuo Yang, Shengchi Bai, Rui Yang, Xu Jin, Chunyi Zhi* and Bo Wang*

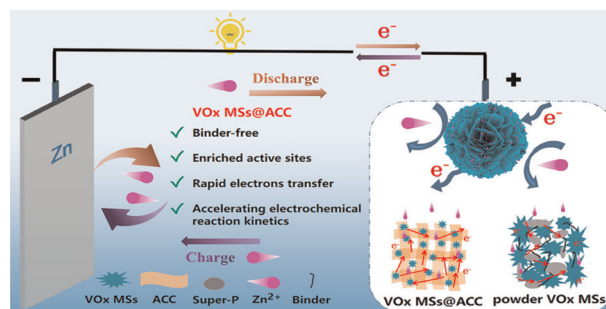


RESEARCH ARTICLES

2125

In situ growth of amorphous vanadium oxide nanospheres on carbon cloth as free-standing cathodes used in high performance aqueous zinc-ion batteries

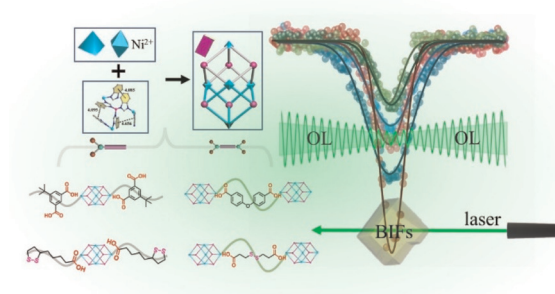
Xuguang Han, Yan Zhang,* Mengmeng Liu, Yifei Sun, Wenshan Gou, Zhao Xu and Chang Ming Li*



2136

Ligand evolution on trigonal bipyramidal boron imidazolate cages for enhanced optical limiting

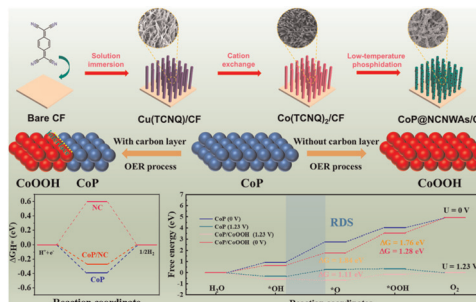
Jun-Qiang Chen, Hai-Xia Zhang,* Zhi-Run Wang, Qin-Long Hong and Jian Zhang*



2145

N-doped carbon nanowire array confined cobalt phosphides as efficient bifunctional electrocatalysts for water splitting

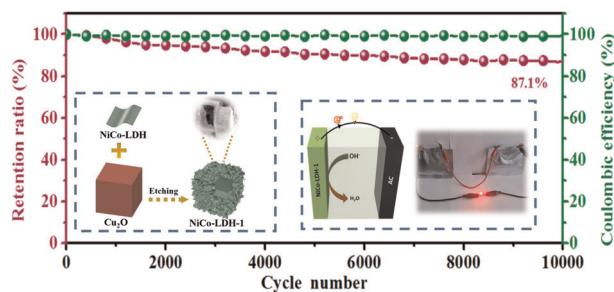
Shunlian Ning, Qikai Wu, Yuguang Zhu, Shilong Liu, Wei Zhou, Luo Mi, Kai Zhou, Dengke Zhao,* Xiyun Zhang* and Nan Wang*



2154

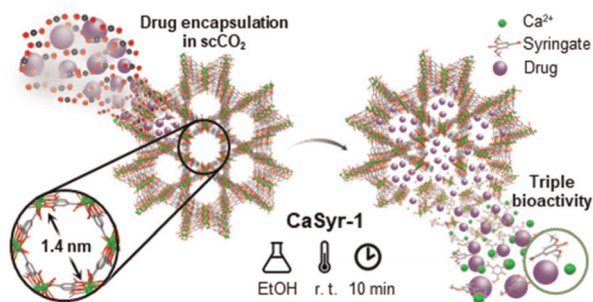
NiCo layered double hydroxide nanocages for high-performance asymmetric supercapacitors

Hualin Jiang, Qi Ke, Xianhua Qiu, Jiezheng Chen, Pinghua Chen,* Shuai Wang, Xubiao Luo and Bingying Rao



RESEARCH ARTICLES

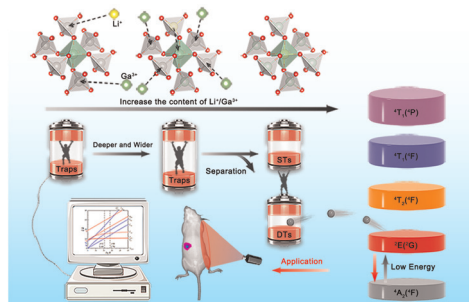
2165



Facile, fast and green synthesis of a highly porous calcium-syringate bioMOF with intriguing triple bioactivity

Albert Rosado,* Oriol Vallcorba, Blanca Vázquez-Lasa, Luís García-Fernández, Rosa Ana Ramírez-Jiménez, María Rosa Aguilar, Ana M. López-Periago, Concepción Domingo* and José A. Ayllón*

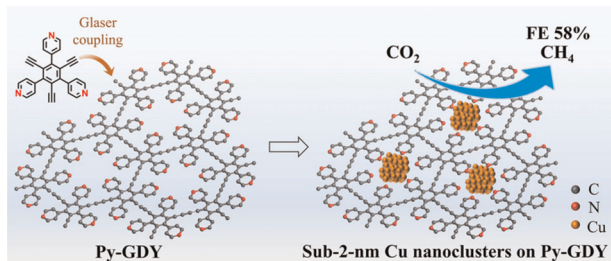
2174



Regulating the trap distribution of $\text{ZnGa}_2\text{O}_4:\text{Cr}^{3+}$ by $\text{Li}^+/\text{Ga}^{3+}$ doping for upconversion-like trap energy transfer NIR persistent luminescence

Junqing Xiahou, Qi Zhu,* Fan Li, Minghui Jin, Lin Zhu, Sai Huang, Tao Zhang, Xudong Sun and Ji-Guang Li*

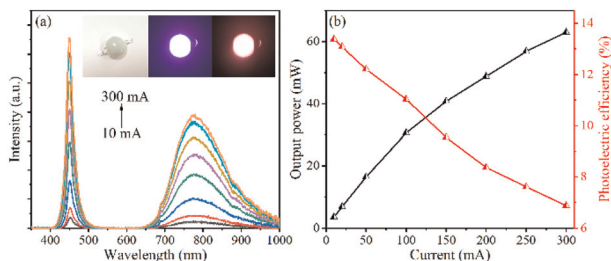
2189



Pyridyl-containing graphdiyne stabilizes sub-2 nm ultrasmall copper nanoclusters for the electrochemical reduction of CO₂

Hao Dai, Haiyuan Zou, Tao Song, Lei Gao, Shuting Wei, Hong Liu, Huatian Xiong, Changshui Huang and Lele Duan*

2197



Improving and broadening luminescence in $\text{Gd}_{2-x}\text{Al}_x\text{GaSbO}_7:\text{Cr}^{3+}$ phosphors for NIR LED applications

Siyu Guo, Ligan Ma, Muniran Abudureyimu, Rongfei Wei,* Fumin Lu, Fangfang Hu and Hai Guo*



CORRECTION

2206

Correction: An in solution adsorption characterization technique based on the response to an external magnetic field of porous paramagnetic materials: application on supramolecular metal–adenine frameworks containing heterometallic heptameric clusters

Jon Pascual-Colino, Rubén Pérez-Aguirre, Garikoitz Beobide, Oscar Castillo,* Imanol de Pedro, Antonio Luque, Sandra Mena-Gutiérrez and Sonia Pérez-Yáñez

