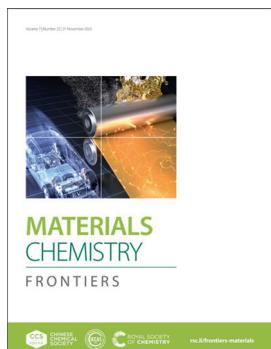


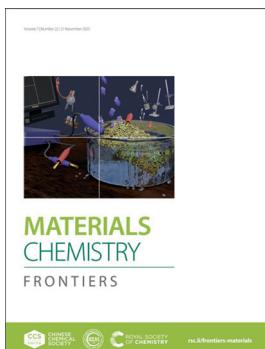
IN THIS ISSUE

ISSN 2052-1537 CODEN MCFAC5 7(22) 5457–5906 (2023)



Cover

See Kuk Young Cho *et al.*, pp. 5475–5499.
Image reproduced by permission of Kuk Young Cho from *Mater. Chem. Front.*, 2023, 7, 5475.



Inside cover

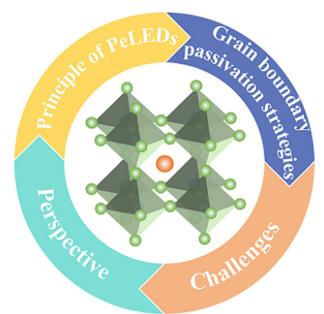
See Jung Kyu Kim, Uk Sim *et al.*, pp. 5843–5857.
Image reproduced by permission of Prof. Uk Sim from *Mater. Chem. Front.*, 2023, 7, 5843.

CHEMISTRY FRONTIERS

5466

High-performance perovskite light-emitting diodes based on grain boundary passivation: progress, challenges and perspectives

Yalian Weng, Eng Liang Lim, Yuanyuan Meng, Junpeng Lin and Zhanhua Wei*

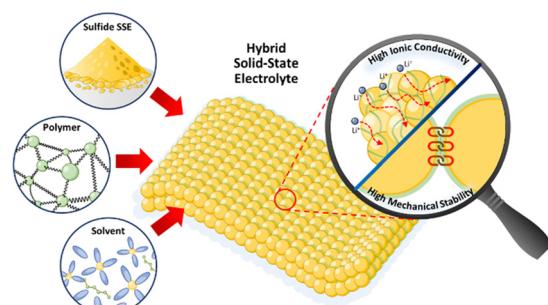


REVIEWS

5475

A review of polymers in sulfide-based hybrid solid-state electrolytes for all-solid-state lithium batteries

Minjae Kim, Junhyeok Seo, Jeanie Pearl Dizon Suba and Kuk Young Cho*



MATERIALS CHEMISTRY

FRONTIERS

EDITORIAL STAFF

Executive Editor

Wenjun Liu

Deputy Editor

Kailin Deng

Development Editor

Cheng Du

Editorial Production Manager

Helen Saxon

Senior Publishing Editor

Becky Webb

Publishing Editors

Kirstine Anderson, Matthew Bown, Laura Cooper, Hannah Fielding, Clare Fitzgerald, Anoushka Handa, Claire Harding, Alan Holder, Charlie Palmer, Rosie Rothwell, Donna Smith, Laura Smith

Assistant Editors

Jie Gao, Yu Zhang

Publisher

Jeanne Andres

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

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

Materials Chemistry Frontiers (electronic: ISSN 2052-1537) is published 24 times a year by the Royal Society of Chemistry, Thomas Graham House, Science Park, Milton Road, Cambridge, UK CB4 0WF.

All orders, or 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 0WF, UK Tel +44 (0)1223 432398; E-mail orders@rsc.org

2023 Annual (electronic) subscription price: £1,369; US\$2,247. 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

An international, high impact journal for cutting-edge researches from all disciplines of materials chemistry.



CHINESE
CHEMICAL
SOCIETY



rsc.li/frontiers-materials

Published in collaboration with the Chinese Chemical Society and Institute of Chemistry, Chinese Academy of Sciences

Editorial Board

Editor-in-Chief

Shu-Hong Yu, University of Science and Technology of China, China

Associate Editors

Shu Seki, Kyoto University, Japan

Andrea Tao, University of California, San Diego, USA

Dan Wang, Institute of Process Engineering, Chinese Academy of Sciences, China

Guillaume Wantz, Université de Bordeaux, France

Huanghao Yang, Fuzhou University, China

Members

Feihe Huang, Zhejiang University, China

Zhen Li, Wuhan University, China

Marina A. Petrukhina, University at Albany, USA

Kazuo Tanaka, Kyoto University, Japan

Advisory Board

Takuzo Aida, The University of Tokyo, Japan
J Paul Atfield, University of Edinburgh, UK
Guillermo C Bazu, UC Santa Barbara, USA
Liming Ding, National Center for Nanoscience and Technology, China
Xinliang Feng, Technische Universität Dresden, Germany
Jiaxing Huang, Northwestern University, USA
Parameswar K. Iyer, Indian Institute of Technology Guwahati, India
Samson Jenekhe, University of Washington, USA
Hu Kuang, Jiangnan University, China
Mario Leclerc, Université Laval, Canada
Xingjie Liang, National Center for Nanoscience and Technology, China
Bin Liu, National University of Singapore, Singapore
Dongsheng Liu, Tsinghua University, China
Shaquin Liu, Harbin Institute of Technology, China
Xianjun Loh, Institute of Materials Research

and Engineering, Singapore
Mark J MacLachlan, University of British Columbia, Canada
Krzysztof Matyjaszewski, Carnegie Mellon University, USA
Klaus Müllen, Max Planck Institute for Polymer Research, Germany
Thuy Quyen Nguyen, University of California, Santa Barbara, USA
Kyoko Nozaki, The University of Tokyo, Japan
Anjun Qin, South China University of Technology, China
Olof Ramström, University of Massachusetts Lowell, USA
John Reynolds, Georgia Institute of Technology, USA
Ulrich Scherf, University of Wuppertal, Germany
Patrick Théato, Karlsruhe Institute of Technology, Germany
Christoph Weder, University of Fribourg, Switzerland

Karen L. Wooley, Texas A&M University, USA
James Wuest, Université de Montréal, Canada
Dongsheng Xu, Peking University, China
Jiannian Yao, Institute of Chemistry, Chinese Academy of Sciences, China
Juyoung Yoon, Ewha Womans University, South Korea
Jihong Yu, Jilin University, China
Deqing Zhang, Institute of Chemistry, Chinese Academy of Sciences, China
Hua Zhang, City University of Hong Kong, China
Qichun Zhang, City University of Hong Kong, China
Tierui Zhang, Technical Institute of Physics and Chemistry, China
Xi Zhang, Tsinghua University, China
Yuliang Zhao, National Center for Nanoscience and Technology, China
Weihong Zhu, East China University of Science & Technology, China

Community Board

Tayebeh Ameri, University of Munich, Germany
Derya Baran, King Abdullah University of Science and Technology, Saudi Arabia
Xiaoyao Cao, Xiamen University, China
Changle Chen, University of Science and Technology of China, China
Sijie Chen, Karolinska Institutet, Hong Kong, China
Dan Ding, Nankai University, China
Kenneth Graham, University of Kentucky, USA

Xinggui Gu, Beijing University of Chemical Technology, China
Yuning Hong, La Trobe University, Australia
Zhong'an Li, Huazhong University of Science and Technology, China
Yingying Lu, Zhejiang University, China
T. N. Narayanan, Tata Institute of Fundamental Research, India
Shohei Saito, Kyoto University, Japan
Youhong Tang, Flinders University, Australia
Takaya Terashima, Kyoto University, Japan
Reji Varghese, Indian Institute of Science Education and Research, India

Jiangyan Wang, Institute of Process Engineering, Chinese Academy of Sciences, China
Yan Wei, Peking University School and Hospital of Stomatology, China
Haihua Xiao, Institute of Chemistry, Chinese Academy of Sciences, China
Yurui Xue, Shandong University, China
Jing Yu, Nanyang Technological University, Singapore
Guoqiang Zhang, University of Science and Technology of China, China

Information for Authors

Full details on how to submit material for publication in Materials 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-materials

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

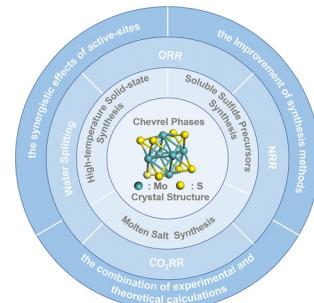


REVIEWS

5500

Chevrel phases: synthesis, structure, and electrocatalytic applications

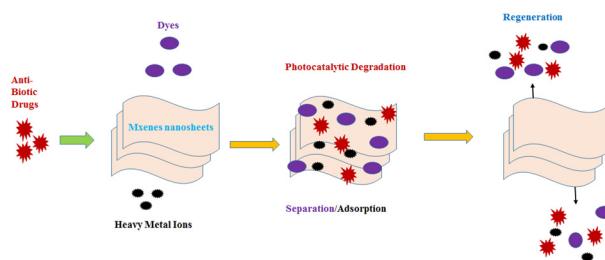
Wanling Zhang, Wenbiao Zhang, Jingwen Tan, Yi Tang
and Qingsheng Gao*



5519

MXene-based nanocomposites: emerging candidates for the removal of antibiotics, dyes, and heavy metal ions

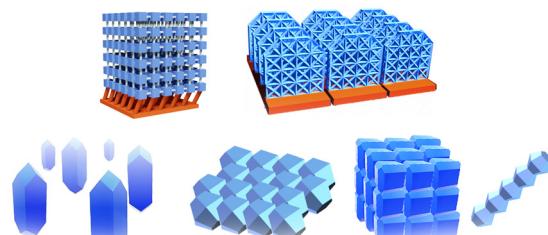
Hyder Ali, Akbar Ali, Jamil Ahmed Buledi,
Ayaz Ali Memon,* Amber Rehana Solangi, Jun Yang* and
Khalid Hussain Thebo*



5545

Macroscopic alignment of metal–organic framework crystals in specific crystallographic orientations

Jonghoon Park, Hoi Bi Moon* and Jin Yeong Kim*

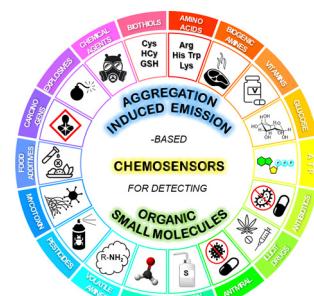


Macroscopic aligned MOFs

5561

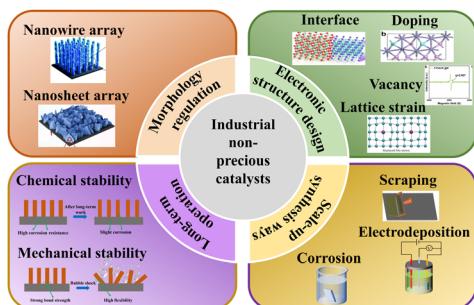
Recent advances in aggregation-induced emission (AIE)-based chemosensors for the detection of organic small molecules

Ming Hui Chua,* Bryan Yat Kit Hui,
Kang Le Osmund Chin, Qiang Zhu, Xiaogang Liu* and
Jianwei Xu*



REVIEWS

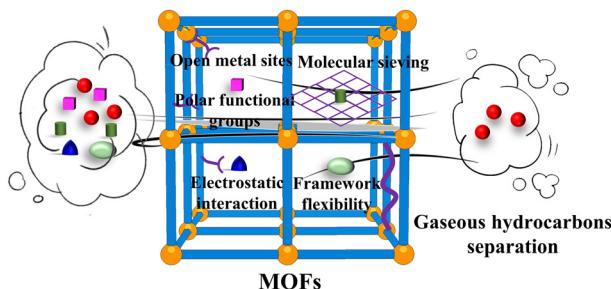
5661



Non-precious metal-based catalysts for water electrolysis to produce H₂ under industrial conditions

Lixiang He, Guang Yu, Yujia Cheng,* Ni Wang and Wencheng Hu*

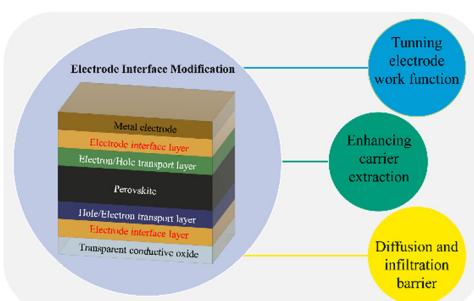
5693



Recent progress in metal-organic frameworks for the separation of gaseous hydrocarbons

Jing-Hong Li, Jun-Xian Chen, Rui-Biao Lin* and Xiao-Ming Chen*

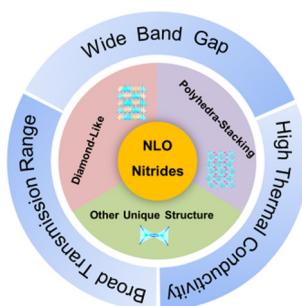
5731



Recent advances in electrode interface modifications in perovskite solar cells

Jiantao Wang and Hsing-Lin Wang*

5744



Nitrides: a promising class of nonlinear optical material candidates

Xin Zhao, Chensheng Lin, Haotian Tian, Chao Wang, Ning Ye and Min Luo*

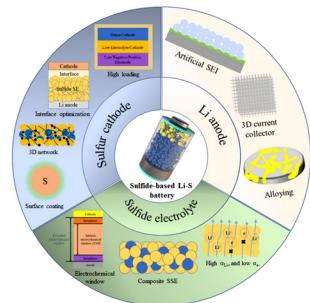


REVIEWS

5760

Research progress of all-solid-state lithium–sulfur batteries with sulfide solid electrolytes: materials, interfaces, challenges, and prospects

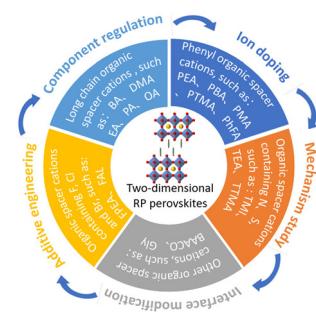
Limao Du, Rui Wu, Zhan Wu, Hui Huang, Yang Xia,*
Yongping Gan, Wenkui Zhang,* Xinhui Xia, Xinping He
and Jun Zhang*



5786

Recent progress of two-dimensional Ruddlesden–Popper perovskites in solar cells

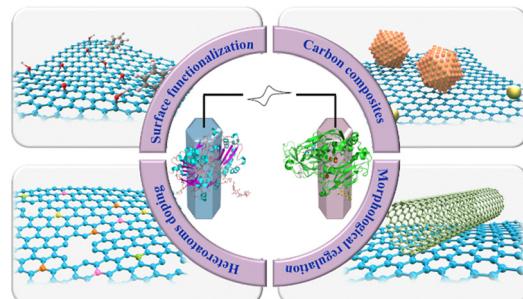
Chao Wang, Xinhe Dong, Feifan Chen, Guozhen Liu*
and Haiying Zheng*



5806

Engineering carbon nanomaterials toward high-efficiency bioelectrocatalysis for enzymatic biofuel cells: a review

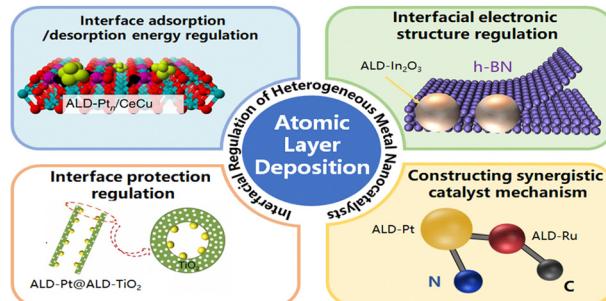
Jiangi Ye, Jinhua Lu* and Dan Wen*



5826

Precise control of the catalyst interface at the atomic level

Ruijie Dai, Zhixi Guan, Daying Guo* and Bin Xi*



RESEARCH ARTICLES

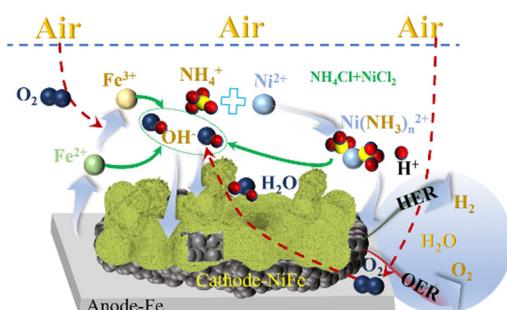
5843



***In situ* decorated Cu₂FeSnS₄ nanosheet arrays for low voltage hydrogen production through the ammonia oxidation reaction**

Younghu Lim, Subramani Surendran, Won So, Sathyaranarayanan Shanmugapriya, Chanmin Jo, Gnanaprakasam Janani, Hyeonuk Choi, Hyun Soo Han, Heechae Choi, Young-Hoon Yun, Tae-Hoon Kim, Myeong-Jin Kim, Kyoungsuk Jin, Jung Kyu Kim* and Uk Sim*

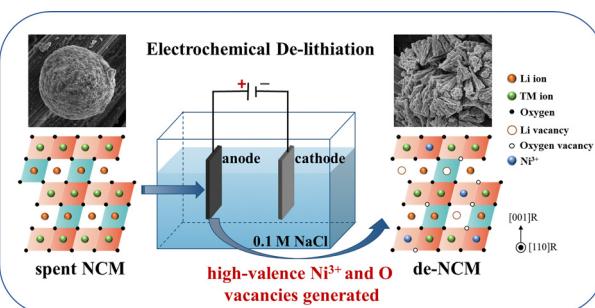
5858



Accelerating corrosion of iron foam enables a bifunctional catalyst for overall water splitting

Yunhua Liu, Jianfei Mao, Yujie Yuan, Hongsheng Huang, Xianguo Ma, Xiaoqin Li* and Zhaoyu Jin*

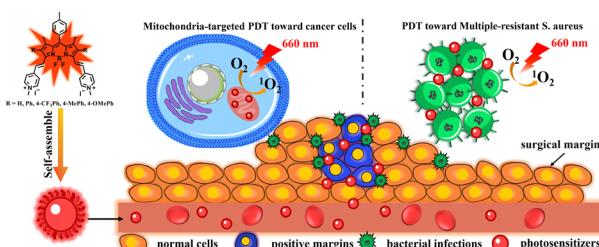
5868



High-valence Ni³⁺ construction and stability by electrochemical de-lithiation boosting oxygen evolution

Shujing Li, Xiaoming Zhu, Xiaohan Wang, Wenshu Luo, Xu Yu, Qiuyun Guo, Kunming Song, Han Tian,* Xiangzhi Cui* and Jianlin Shi

5879



BODIPY-based photosensitizers with simultaneous photodynamic antitumor and antibacterial effects

Bin-Kai Liu, Ji Zheng, Hui Wang,* Li-Ya Niu* and Qing-Zheng Yang*

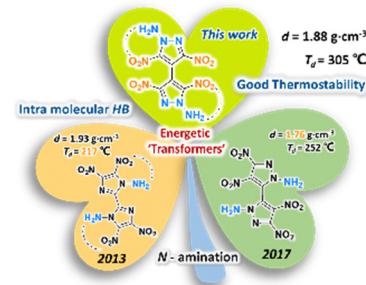


RESEARCH ARTICLES

5891

Energetic bi-diazole 'transformers' toward high-energy thermostable energetic compounds

Jingwei Meng, Teng Fei,* Jinxiong Cai, Qi Lai, Jinya Zhang, Siping Pang* and Chunlin He*



5898

Controllable growth of WO_3 @GDY heterointerface for efficient NH_3 synthesis

Xiaoyu Luan, Lu Qi, Zhiqiang Zheng, Shuya Zhao, Huimin Liu, Runyu Liu, Zhaoyang Chen, Jiayu Yan, Yurui Xue* and Yuliang Li*

