

Journal of Materials Chemistry A

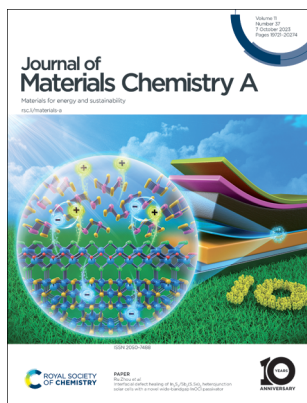
Materials for energy and sustainability

rsc.li/materials-a

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 2050-7488 CODEN JMCAET 11(37) 19721–20274 (2023)



Cover

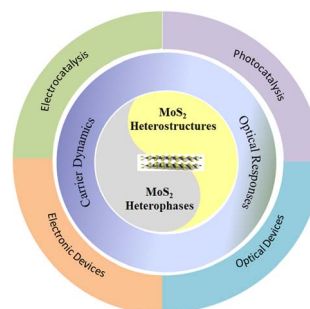
See Ru Zhou *et al.*,
pp. 19914–19924. Image
reproduced by permission of
Ru Zhou from *J. Mater. Chem.*
A, 2023, **11**, 19914.

REVIEWS

19736

Uncovering the photoelectronic/catalytic property modulation and applications of 2D MoS₂: from the perspective of constructing heterogeneous interfaces

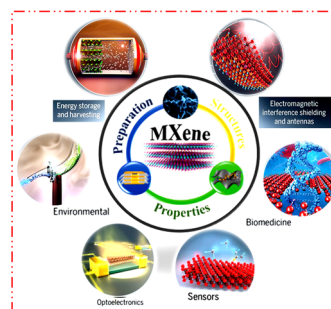
Yan Gao, Bin Wang, Zhao Jiang, Yuqi Wang and Tao Fang*



19764

Recent advances in MXenes: a future of nanotechnologies

Karim Khan,* Ayesha Khan Tareen, Muhammad Iqbal, Iftikhar Hussain, Asif Mahmood, Usman Khan, Muhammad Farooq Khan, Han Zhang and Zhongjian Xie*



Editorial Staff

Executive Editor

Michaela Muehlberg

Deputy Editor

Geraldine Hay

Editorial Production Manager

Jonathon Watson

Senior Publishing Editor

Isobel Tibbetts

Development Editor

Rose Wedgbury

Publishing Editors

Matthew Blow, Chris Dias, Hemna Fathima, Juan Gonzalez, Ellie Griffiths, Rob Hinde, Sam Howell, Clara Humann, Ash Hyde, Francesca Jacklin, Evie Karkera, Shruti Karnik, Tamara Kosikova, Brian Li, Sam Mansell, Carole Martin, Kirsty McRoberts, Yasmin Mehanna, Tiffany Rogers, Cat Schofield, Charu Storr-Vijay, Manman Wang, Ella White, Tom Williams

Editorial Assistant

Daniel Smith

Publishing Assistant

Julie-Ann Roszkowski

Publisher

Sam Keltie

For queries about submitted papers, please contact Jonathon Watson, Editorial Production Manager in the first instance. E-mail: materialsA@rsc.org

For pre-submission queries please contact Michaela Muehlberg, Executive Editor. E-mail: materialsA-rsc@rsc.org

Journal of Materials Chemistry A (electronic: ISSN 2050-7496) is published 48 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 the Royal Society of Chemistry 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: £1968, \$4085. 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

Journal of Materials Chemistry A

rsc.li/materials-a

Journal of Materials Chemistry A, B & C cover high quality studies across all fields of materials chemistry. The journals focus on those theoretical or experimental studies that report new understanding, applications, properties and synthesis of materials. *Journal of Materials Chemistry A* covers materials with applications in energy & sustainability.

Editorial Board

Editor-in-Chief

Anders Hagfeldt, EPFL, Switzerland

Scientific Editors

Serena Cussen, University of Sheffield, UK
Frank Osterloh, University of California, Davis, USA

Associate Editors

Veronica Augustyn, North Carolina State University, USA
Viola Birss, University of Calgary, Canada

Goutam De, S N Bose National Centre for Basic Sciences, India
Ghim Wei Ho, National University of Singapore, Singapore
Yun Jeong Hwang, Seoul National University, South Korea
Kisuk Kang, Seoul National University, South Korea
Subrata Kundu, Central Electrochemical Research Institute (CECRI), India
Dan Li, Jinan University, China
Yi-Chun Lu, Chinese University of Hong Kong

Kong, Hong Kong
Jennifer Rupp, Technical University Munich, Germany
Miriam Unterlass, University of Konstanz, Germany
Lydia Wong, Nanyang Technological University, Singapore
Li-Zhu Wu, Technical Institute of Physics and Chemistry, China
Yusuke Yamauchi, University of Queensland, Australia
Zhen Zhou, Nankai University, China

Advisory Board

P. Adelhelm, Humboldt-University Berlin, Germany
R. Ahuja, Uppsala University, Sweden
C. Ania, CNRS Orleans, France
J.-B. Baek, Ulsan National Institute of Science and Technology, Korea
C. Berlinguette, University of British Columbia, Canada
K. Biswas, Jawaharlal Nehru Centre for Advanced Scientific Research, India
E. Bucher, University of Leoben, Austria
M. Chabinye, University of California, Santa Barbara, USA
A. Chattopadhyay, IIT Guwahati, India
J.-S. Chen, Shanghai Jiao Tong University, China
W. Chueh, Stanford University, USA
S. Cussen, University of Sheffield, UK
X. Duan, University of Adelaide, Australia
M. Eddaoudi, King Abdullah University of Science and Technology, Saudi Arabia
T. Edvinsson, Uppsala University, Sweden
X. Feng, Dresden University of Technology, Germany
J. Fleig, Dresden University of Technology, Germany
M. Florea, University of Bucharest, Romania
G. Galli, University of Chicago, USA
N. Garcia-Araez, University of Southampton, UK

UK
G. Grancini, University of Pavia, Italy
J. Huang, Northwestern University, USA
H. Imahori, Kyoto University, Japan
T. Ishihara, Kyushu University, Japan
S. Islam, University of Bath, UK
F. Jiao, University of Delaware, USA
E. Kendrick, University of Birmingham, UK
B. Kim, KAIST, Korea
D.-H. Kim, Ewha Womans University, Korea
U. Kramm, TU Darmstadt, Germany
Y.J. Lee, Hanyang University, Korea
B. Li, Tsinghua University, China
J. Li, Rutgers University, USA
Z. Lin, National University of Singapore, Singapore
B. Lotsch, Max Planck Institute for Solid State Research, Stuttgart, Germany
J. Luo, Nankai University, China
C.-B. Mullins, University of Texas at Austin, USA
A. K. Nandi, IACS, India
L. Nazar, University of Waterloo, Canada
M. Niederberger, ETH Zürich, Switzerland
A.F. Nogueira, University of Campinas, Brazil
C. Osuji, University of Pennsylvania, USA
S. Parker, University of Bath, UK
S. Patil, Indian Institute of Science, Bangalore, India

S. Qiao, University of Adelaide, Australia
Z. Schnopp, University of Birmingham, UK
Z. Shao, Curtin University, Australia
Y. Shimakawa, Kyoto University, Japan
S. Skinner, Imperial College London, UK
M.C. Stefan, University of Texas at Dallas, USA
C.-Y. Su, Sun Yat-Sen University, China
S.-G. Sun, Xiamen University, China
V. Thangadurai, University of Calgary, Canada
M. Titirici, Imperial College London, UK
S. Uk Son, Sungkyunkwan University, Korea
E. Unger, Lund University, Sweden
R.-N. Vannier, ENSC Lille, France
M. Wang, Sun Yat-Sen University, China
M. Wei, Beijing University of Chemical Technology, China
E. Weiss, Northwestern University, USA
C. Williams, University of Oxford, UK
C. Xiong, Boise State University, USA
Y. Xu, University College London, UK
Y.-J. Xu, Fuzhou University, China
M. Ye, Xiamen University, China
Q. Zhang, Tsinghua University, China
X.S. Zhao, University of Queensland, Australia
G. Zheng, Fudan University, China

Information for Authors

Full details on how to submit material for publication in Journal of Materials Chemistry A 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/materials-a. Submissions: The journal welcomes submissions of manuscripts for publication as Full Papers, Communications, Reviews, Highlights and Applications. Full Papers and Communications should describe original work of high quality and impact which must highlight the novel properties or applications (or potential properties/applications) of the materials studied.

Additional details are available from the Editorial Office or <http://www.rsc.org/authors>

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



REVIEWS

19812

Tailoring supports for enhancing the electrocatalytic hydrogen evolution performance of platinum species: a review

Jin Li, Jia Zhang, Jian Zhang, Kunming Pan, Haowen Xu, Haipeng Chen, Guilong Liu, Naiteng Wu,* Changzhou Yuan* and Xianming Liu*

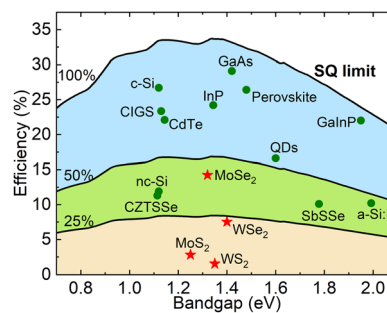


PERSPECTIVE

19845

Advancement of transition metal dichalcogenides for solar cells: a perspective

Farabi Bozheyev

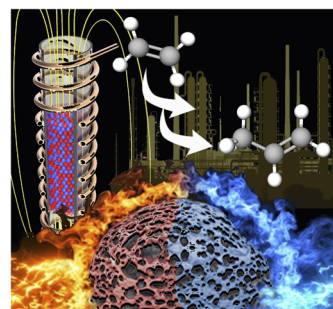


COMMUNICATIONS

19854

Multifunctional materials for catalyst-specific heating and thermometry in tandem catalysis

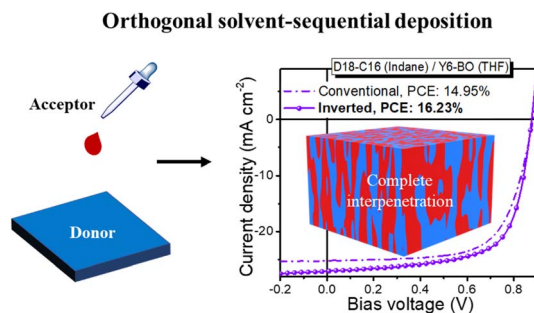
Marcos G. Farpón, Raquel Peláez, Verónica Recio, Burak Atakan, Carlos Zaldo and Gonzalo Prieto*



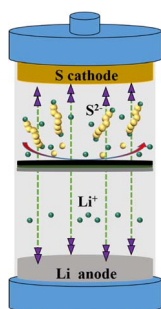
19860

Orthogonal solvent-sequential deposition of a nonfullerene acceptor solution on polymer donor film: complete interpenetration and highly efficient inverted organic solar cells

Haizhen Liu, Zesheng Zhang, Dong Yuan, Mingqing Chen, Haiying Jiang, Jiahao Liang, Xing Chen, Di Sun, Lianjie Zhang, Linlin Liu, Yuguang Ma and Junwu Chen*



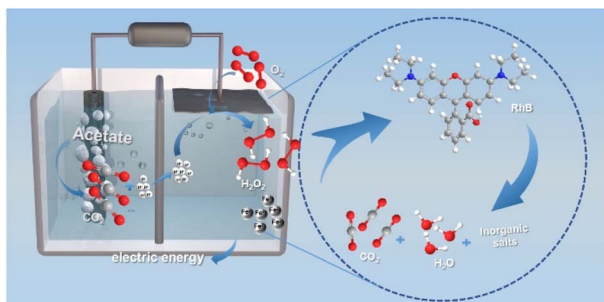
19870



A separator coated with commercial LiFePO_4 and conductive carbon for Li-S battery with good cycling performance

Shuang Xia, Zhichao Chen, Lixuan Yuan, Jie Song, Qi Zhou, Xinhai Yuan,* Lili Liu, Lijun Fu, Yuhui Chen and Yuping Wu*

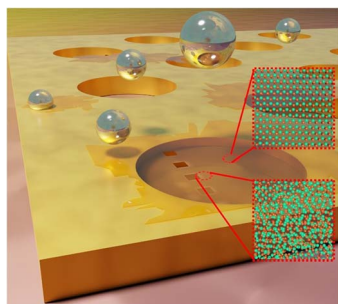
19877



Trace Mn decorating nitrogen-doped carbon electrocatalysts for self-powered bio-electro-fenton cells toward simulated wastewater treatment

Jun Xiao, Fengfeng Xiong, Shenjie Yu, Kai Chen, Suqin Ci* and Zhenhai Wen*

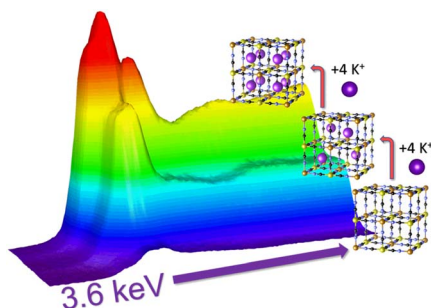
19890



Patterning edge-like defects and tuning defective areas on the basal plane of ultra-large MoS_2 monolayers toward the hydrogen evolution reaction

Bianca Rocha Florindo, Leonardo H. Hasimoto, Nicolli de Freitas, Graziâni Candioto, Erika Nascimento Lima, Cláudia de Lourenço, Ana B. S. de Araujo, Carlos Ospina, Jefferson Bettini, Edson R. Leite, Renato S. Lima, Adalberto Fazzio, Rodrigo B. Capaz and Murilo Santhiago*

19900



Direct monitoring of the potassium charge carrier in Prussian blue cathodes using potassium K-edge X-ray absorption spectroscopy

Alexander J. Mayer, Owain T. Beynon, Andrew J. Logsdail, K. G. Upul Wijayantha, Sandra E. Dann, José F. Marco, Joshua D. Elliott, Matteo Aramini, Giannantonio Cibin and Simon A. Kondrat*

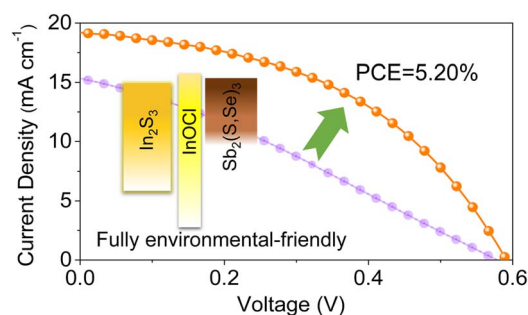


PAPERS

19914

Interfacial defect healing of $\text{In}_2\text{S}_3/\text{Sb}_2(\text{S,Se})_3$ heterojunction solar cells with a novel wide-bandgap InOCl passivator

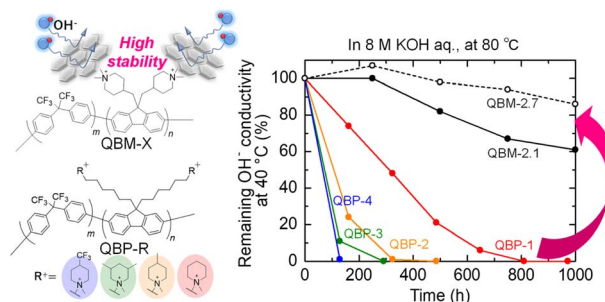
Changxue Wang, Dongdong Li, Xiaoli Mao, Lei Wan, Zhen Cheng, Jun Zhu, Robert L. Z. Hoyer and Ru Zhou*



19925

The effect of the piperidinium structure on anion-exchange membranes for applications in alkaline water electrolysis cells

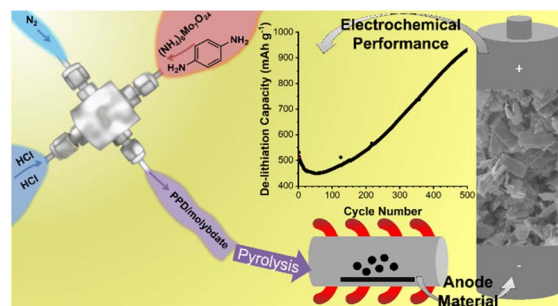
Yoshihiro Ozawa, Toshio Iwataki, Makoto Uchida, Katsuyoshi Kakinuma and Kenji Miyatake*



19936

Continuous wet chemical synthesis of $\text{Mo}(\text{C,N,O})_x$ as anode materials for Li-ion batteries

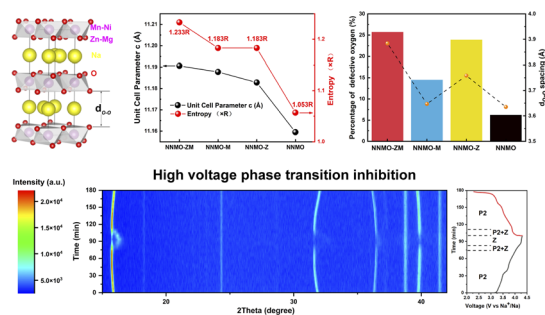
Mana Abdirahman Mohamed, Stefanie Arnold, Oliver Janka, Antje Quade, Jörg Schmauch, Volker Presser* and Guido Kikelbick*



19955

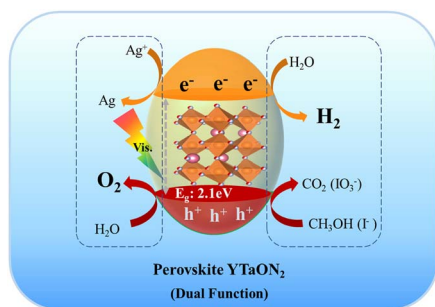
Entropy modulation strategy of P2-type layered transition metal oxide cathodes for sodium-ion batteries with a high performance

Yusong Wang, Yingshuai Wang, Yuhang Xing, Chunyu Jiang, Yanfei Pang, Hongfeng Liu, Feng Wu and Hongcai Gao*



PAPERS

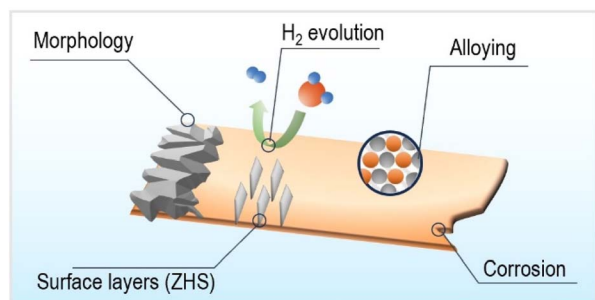
19965



Single phase of perovskite YTaON_2 synthesized for photocatalytic water reduction and oxidation under visible-light irradiation

Hai Zou, Yunfeng Bao, Shiwen Du, Xueshang Xin, Yu Qi, Guosheng Shao and Fuxiang Zhang*

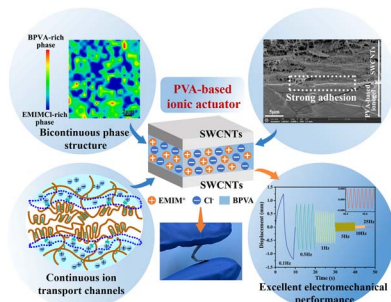
19970



Selection criteria for current collectors for highly efficient anode-free Zn batteries

Omer Blumen, Gil Bergman, Keren Schwartzman, Sara Harpaz, Sri Harsha Akella, Munseok S. Chae, Netta Bruchiel-Spanier,* Netanel Shpigel* and Daniel Sharon*

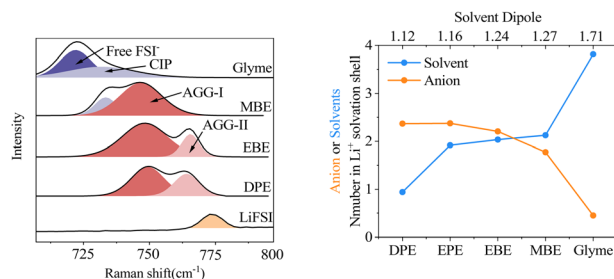
19981



Construction of poly(vinyl alcohol)-based ionogels with continuous ion transport channels enables high performance ionic soft actuators

Jinlong Cao, Zhen Zhang, Lin Ye* and Xiaowen Zhao*

19996



Single-oxygen linear ether (SOLE) based electrolytes for fast-charging and low-temperature Li-ion batteries

Zongjian Li, Jing Liu, Xinying Bi, Yunan Qin and Tao Gao*

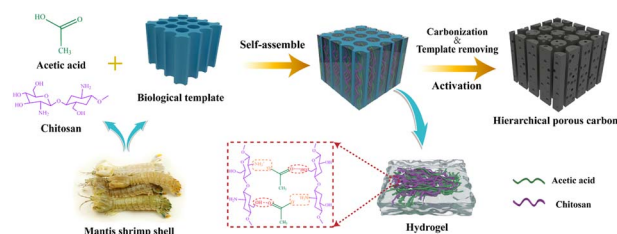


PAPERS

20011

Green fabrication of pore-modulated carbon aerogels using a biological template for high-energy density supercapacitors

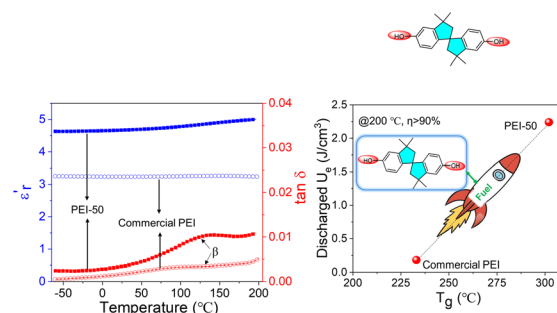
Yangkai Sun, Dan Xu,^{*} Zijian He, Zihang Zhang, Liwu Fan and Shurong Wang^{*}



20021

High-temperature resistant polyetherimides containing a twisted spirane structure for capacitive energy storage

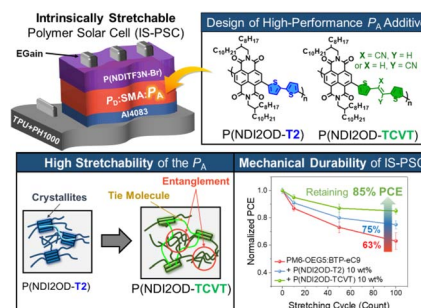
Yanan Duan, Thumawadee Wongwirat, Tianxiong Ju, Shihai Zhang, Junji Wei^{*} and Lei Zhu



20031

Design of mechanically-robust naphthalenediimide-based polymer additives for high-performance, intrinsically-stretchable polymer solar cells

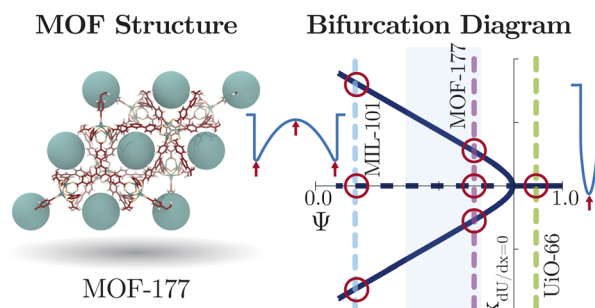
Chulhee Lim, Sanghun Park, Dong Jun Kim, Jin-Woo Lee, Jin-Su Park, Soodeok Seo, Donguk Kim, Felix Sunjoo Kim,^{*} Taek-Soo Kim^{*} and Bumjoon J. Kim^{*}



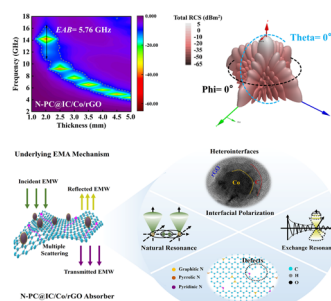
20043

Effect of pore size on heat release from CO₂ adsorption in MIL-101, MOF-177, and UiO-66

Gunjan Auti, Yuki Kametani, Hibiki Kimura, Soumyadeep Paul, Wei-Lun Hsu, Shinpei Kusaka, Ryotaro Matsuda, Takashi Uemura, Shohei Chiashi and Hirofumi Daiguji^{*}



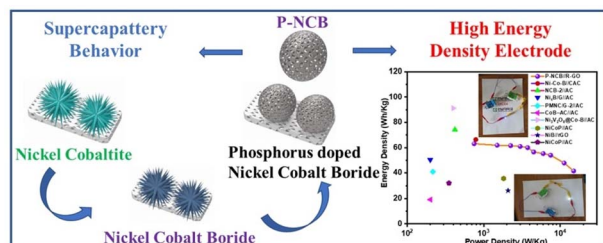
20055



Multistage coupling of interface and core-shell engineering of a cobalt-based heterostructure for integration of multiple electromagnetic absorption

Jun Zhou, Hu Guo, Jun Di, Guigao Liu and Wei Jiang*

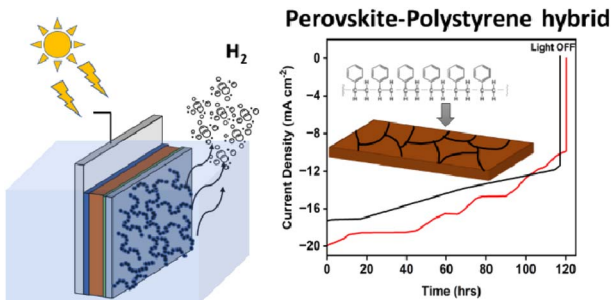
20065



Enhancing high-performance supercapattery electrodes: harnessing structural and compositional synergies via phosphorus doping on bimetallic boride for rapid charging

Amarnath T. Sivagurunathan, T. Kavinkumar, Selvaraj Seenivasan, Yongchai Kwon* and Do-Heyoung Kim*

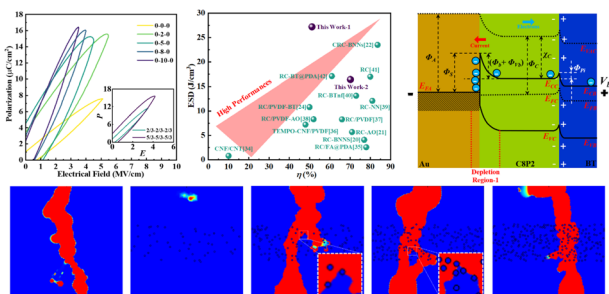
20079



Stable perovskite photocathodes for efficient hydrogen evolution in acidic and basic conditions

Saikiran Khamgaonkar, Qiaoyun Chen, Kevin Musselman and Vivek Maheshwari*

20089



Ultrahigh energy storage capacity in multilayer-structured cellulose-based dielectric capacitors caused by interfacial polarization-coupled Schottky barrier height

Zixiong Sun,* Jiaqi Liu, Hansong Wei, Qing Guo, Yuhang Bai, Shibo Zhao, Siting Wang, Lei Li, Yutao Zhang, Ye Tian, Xiaohua Zhang, Hongmei Jing, Yongping Pu and Sufeng Zhang*

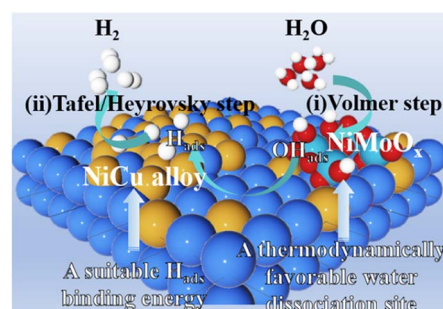


PAPERS

20102

Multisite synergistic-modulating elementary steps for efficient alkaline hydrogen evolution via NiCu/NiMoO_x nanocomposites

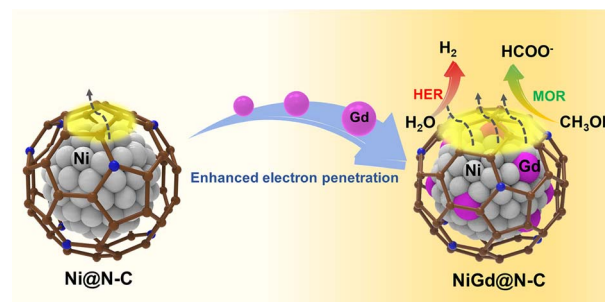
Haiyao Li, Zhimin Li,* Zhishan Li, Zhengfu Zhang, Chengping Li and Jinsong Wang*



20112

Enhanced electron penetration triggering interfacial charge redistribution in N-doped graphene-wrapped NiGd nanoparticles for coupling methanol electroreforming to H₂ production

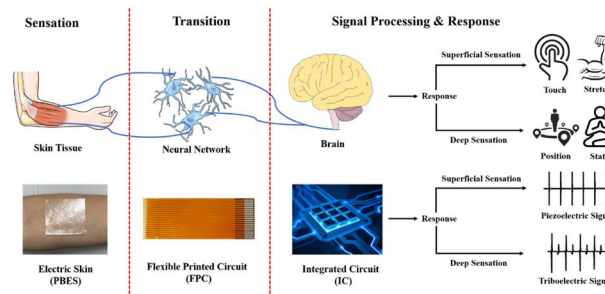
You Xu, Qingsong Zhou, Tianlun Ren, Tiantian Liu, Hongjie Yu, Kai Deng, Ziqiang Wang, Liang Wang* and Hongjing Wang*



20120

Stretchable and self-healing electronic skin based on a piezoelectric/triboelectric polyester elastomer for deep and superficial sensation

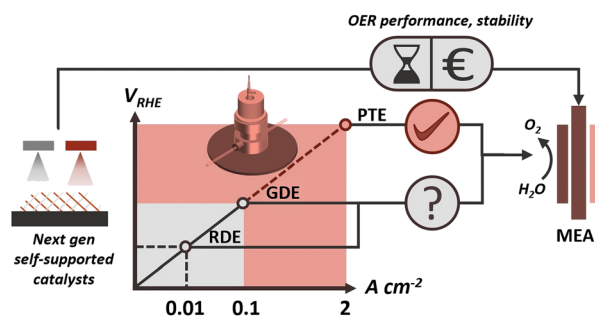
Yanxiu Qiao, Qian Zhang, Yong Xiang, Zhao Wang* and Xiaoran Hu*



20129

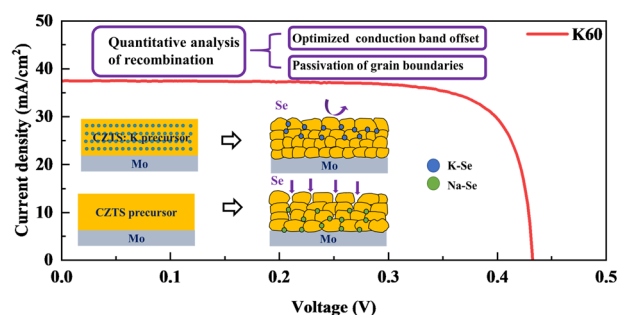
Bridging the gap between basic research and application: a half-cell setup for high current density measurements of Ir-based oxygen evolution reaction catalysts on porous transport electrodes

Pablo Collantes Jiménez, Gustav K. H. Wiberg, Gustav W. Sievers, Volker Brüser and Matthias Arenz*



PAPERS

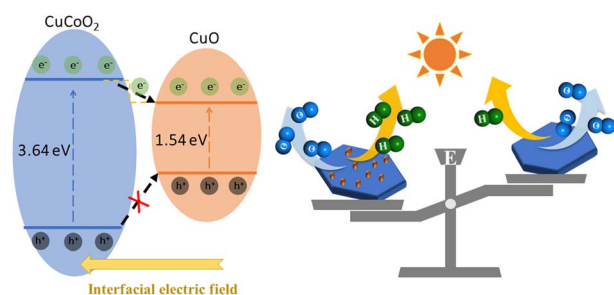
20139



Crystallization mechanism and defect passivation of $\text{Cu}_2\text{ZnSn}(\text{S},\text{Se})_4$ thin film solar cells *via in situ* potassium doping

Liangzheng Dong, Shengye Tao, Ming Zhao,*
Daming Zhuang,* Yafei Wang, Hanpeng Wang,
Mengyao Jia, Junsu Han and Hongwei Zhu

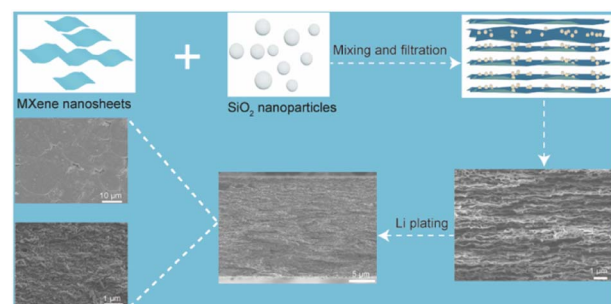
20151



$\text{CuCoO}_2/\text{CuO}$ heterostructure: understanding the role of band alignment in selective catalysis for overall water splitting

Yi-Man Zhang, Zong-Yan Zhao,* Wen Tang,
Jian-Yong Feng,* Jin Zhang, Qing-Ju Liu, Zhao-Sheng Li
and Zhi-Gang Zou

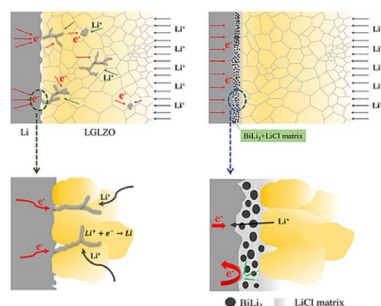
20165



Lithiophilic SiO_2 nanoparticle pillared MXene nanosheets for stable and dendrite-free lithium metal anodes

Shuaiqi Wang, Yaru Li, Xiaozhe Zhou, Yi Yang
and Gang Chen*

20174



Li^+ selective transport network-assisted high-performance of garnet-based solid electrolyte for Li metal batteries

Guoqiang Zhao, Changwei Luo* and Qingsong Hua*

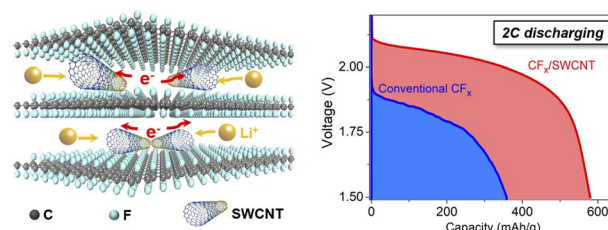


PAPERS

20187

Boosting the rate performance of primary Li/CF_x batteries through interlayer conductive network engineering

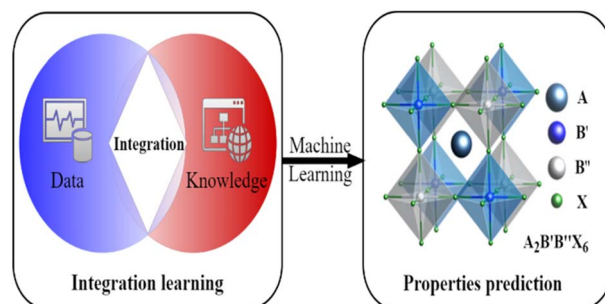
Fan Zhang, Yingying Lan, Renjie Li, Jianlin Wang, Shengxiang Wu, Lejuan Cai, Yu Zhao and Wenlong Wang*



20193

A domain knowledge enhanced machine learning method to predict the properties of halide double perovskite A₂B⁺B³⁺X₆

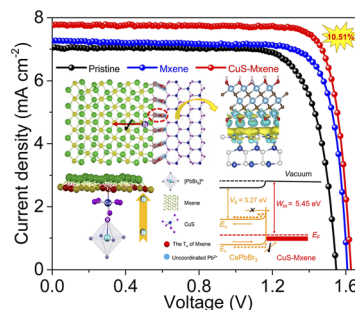
Xiao Wei, Yunong Zhang, Xi Liu, Junjie Peng, Shengzhou Li, Renchao Che and Huiran Zhang*



20206

A self-assembled CuS–MXene bridge for hole-boosting 10.51%-efficiency all-inorganic tri-brominated perovskite solar cells

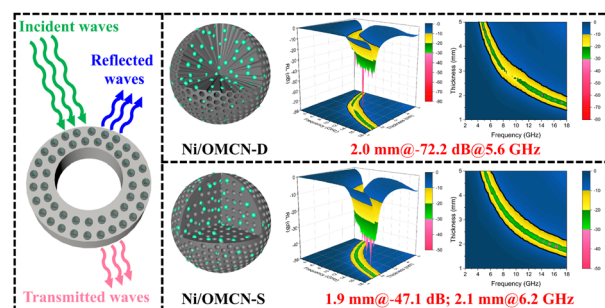
Weilin Liu, Xinpeng Yao, Benlin He,* Haojie Sui, Meng Wei, Haiyan Chen, Jialong Duan and Qunwei Tang*



20215

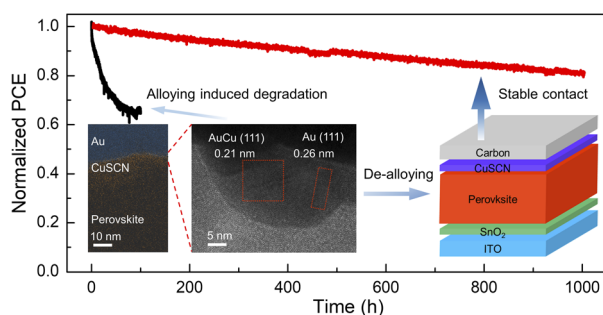
Kinetics-mediated assembly assisted precise synthesis of magnetic ordered mesoporous carbon nanospheres for ultra-efficient electromagnetic wave absorption

Mengmeng Wei, Kai Liu, Qingyan Li, Hongwei Zhang, Guoxian Zhang, Qiuyu Zhang* and Baoliang Zhang*



PAPERS

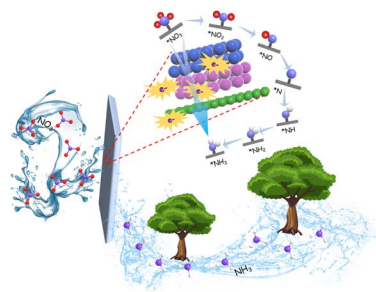
20225



Unveiling and overcoming the interfacial degradation between CuSCN and metal electrodes in perovskite solar cells

Pengjie Hang, Chenxia Kan, Ge Li, Jiangsheng Xie,*
Biao Li, Yuxin Yao, Degong Ding, Zechen Hu, Deren Yang
and Xuegong Yu*

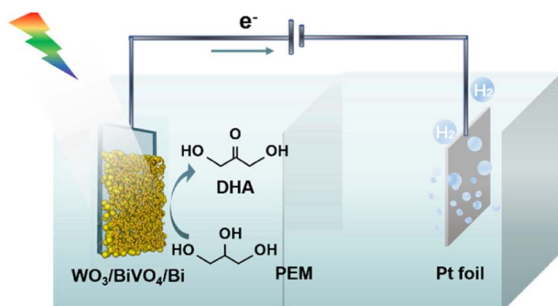
20234



High Faraday efficiency of Cu₁Co₁-BCN based on a dodecahydro-closo-dodecaborate hybrid for electrocatalytic reduction of nitrate to ammonia

Jiajia Wang, Zhengyu Fan, Haixu Zhao, Xun Liu, Mai Zheng,
Long Zhang,* Yingtang Zhou,* Lijie Sun, Jinghuan Liu
and Haibo Zhang*

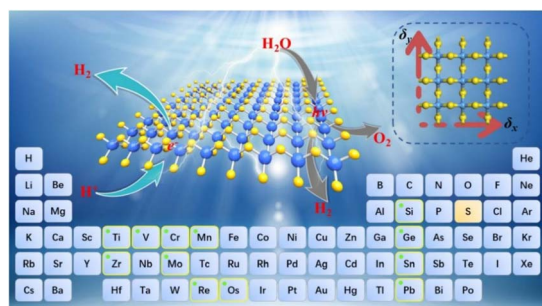
20242



Enhanced photoelectrochemical oxidation of glycerol to dihydroxyacetone coupled with hydrogen generation via accelerative middle hydroxyl dehydrogenation over a Bi⁰/Bi³⁺ interface of a cascade heterostructure

Xinyan Feng, Xuefan Feng and Fuqin Zhang*

20254



Computational discovery of diverse functionalities in two-dimensional square disulfide monolayers: auxetic behavior, high curie temperature ferromagnets, electrocatalysts, and photocatalysts

Yu Liu, Wenlong Li, Fengyu Li* and Zhongfang Chen*



CORRECTIONS

20270

Correction: Fireproof ultrastrong all-natural cellulose nanofiber/montmorillonite-supported MXene nanocomposites with electromagnetic interference shielding and thermal management multifunctional applicationsRui Cheng, Ying Wu, Bin Wang,^{*} Jinsong Zeng, Jinpeng Li,^{*} Jun Xu, Wenhua Gao and Kefu Chen

20271

Correction: Converting benzene into γ -graphyne and its enhanced electrochemical oxygen evolution performanceQiaodan Li, Chaofan Yang, Lulu Wu, Hui Wang and Xiaoli Cui^{*}