

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.

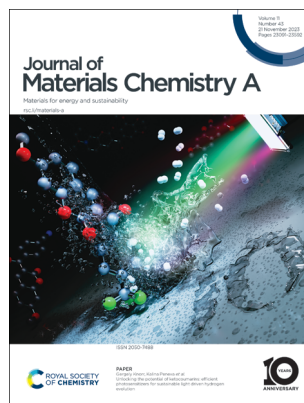
IN THIS ISSUE

ISSN 2050-7488 CODEN JMCAET 11(43) 23091–23592 (2023)



Cover

See Weijie Yang, Zhengyang Gao *et al.*, pp. 23249–23259. Image reproduced by permission of Weijie Yang from *J. Mater. Chem. A*, 2023, **11**, 23249.



Inside cover

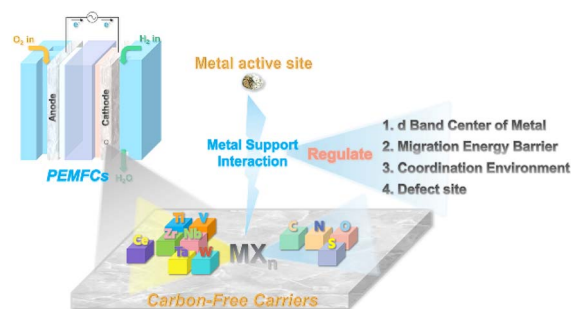
See Gergely Knorr, Kalina Peneva *et al.*, pp. 23260–23269. Image reproduced by permission of Kalina Peneva from *J. Mater. Chem. A*, 2023, **11**, 23260.

REVIEWS

23106

The metal–support interaction effect in the carbon-free PEMFC cathode catalysts

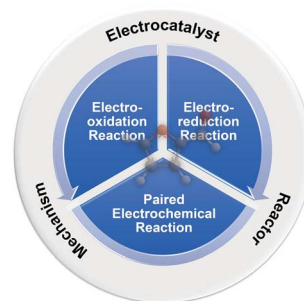
Feilong Dong, Yarong Liu, Zunhang Lv, Changli Wang, Wenxiu Yang* and Bo Wang*



23133

Efficient electrochemical upgradation strategies for the biomass derivative furfural

Xinxin Li, Linchuan Cong, Nan Lin and Cheng Tang*



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, 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

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
D. Lou, City University of Hong Kong, China
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. Schnepf, 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

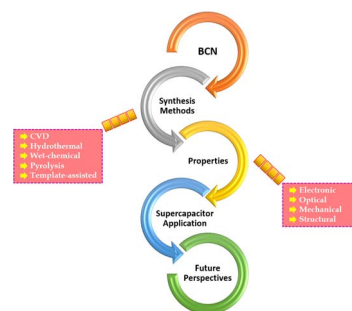


REVIEWS

23148

Boron carbon nitride (BCN): an emerging two-dimensional nanomaterial for supercapacitors

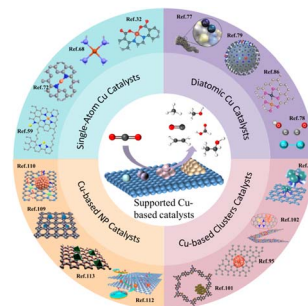
Susmi Anna Thomas* and Jayesh Cherusseri*



23188

Size effects of supported Cu-based catalysts for the electrocatalytic CO₂ reduction reaction

Xiaoran Su, Caiyue Wang, Fang Zhao, Tianxin Wei, Di Zhao* and Jiatao Zhang*

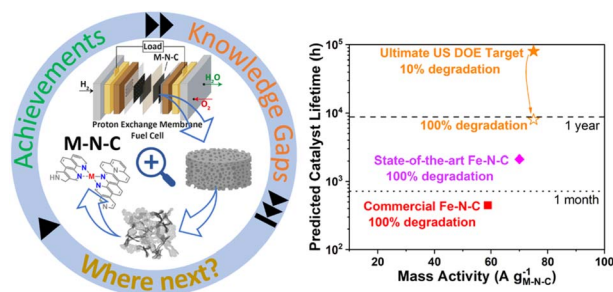


PERSPECTIVE

23211

Atomic metal coordinated to nitrogen-doped carbon electrocatalysts for proton exchange membrane fuel cells: a perspective on progress, pitfalls and prospectives

Angus Pedersen,* Alexander Bagger, Jesús Barrio, Frédéric Maillard, Ifan E. L. Stephens and Maria-Magdalena Titirici*

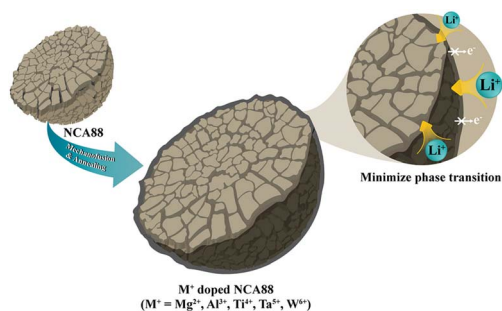


COMMUNICATIONS

23223

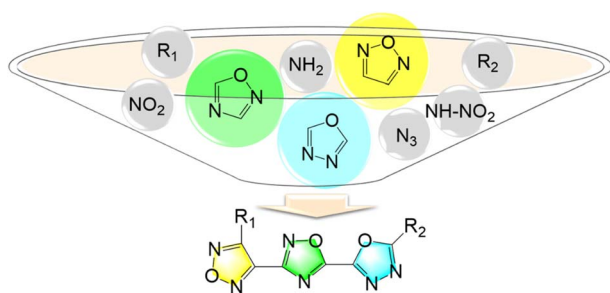
Exploring the impact of metal oxide coating and metal atom doping on the electrochemical performance of Ni-rich cathode materials

Panyawee Bunyanidhi, Nutthaphon Phattharasupakun, Salatan Duangdangchote, Surat Prempluem, Nattanon Joraleechanchai and Montree Sawangphruk*



COMMUNICATIONS

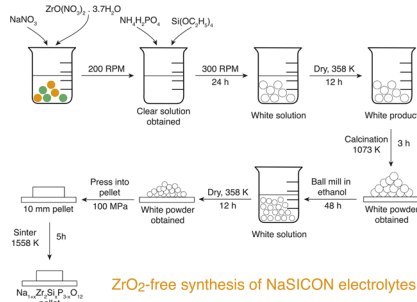
23228



Assembly of three oxadiazole isomers toward versatile energetics

Qi Sun, Zhiyi Jiang, Ning Ding, Chaofeng Zhao, Baojing Tian, Shenghua Li* and Siping Pang*

23233

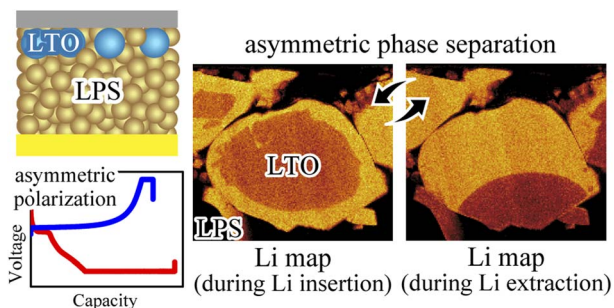


ZrO₂-free synthesis of NaSICON electrolytes

Zirconia-free NaSICON solid electrolyte materials for sodium all-solid-state batteries

Aaron Jue Kang Tieu, Eunike Mahayoni, Yuheng Li, Zeyu Deng, François Fauth, Jean-Noël Chotard, Vincent Seznec, Stefan Adams,* Christian Masquelier* and Pieremanuele Canepa*

23243

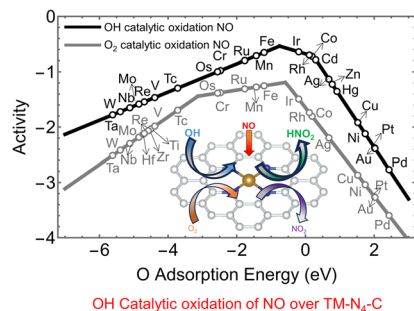


Visualizing asymmetric phase separation driven by surface ionic diffusion in lithium titanate

Yuki Nomura,* Kazuo Yamamoto and Tsukasa Hirayama

PAPERS

23249



Design of single-atom catalysts for NO oxidation using OH radicals

Weijie Yang,* Liugang Chen, Zhenhe Jia, Binghui Zhou, Yanfeng Liu, Chongchong Wu and Zhengyang Gao*

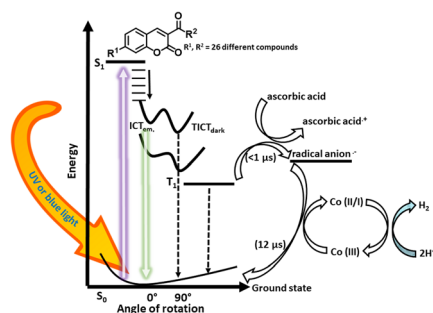


PAPERS

23260

Unlocking the potential of ketocoumarins: efficient photosensitizers for sustainable light driven hydrogen evolution

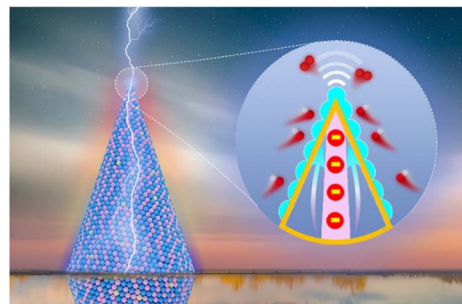
Gergely Knorr,^{*} Konrad Hotzel, Avinash Chettri, Artem Skabeev, Maria Wächtler, Benjamin Dietzek-Ivanšić and Kalina Peneva^{*}



23270

Tip effect assisted high active sites for oxygen evolution reaction tuned using transition metals (Cr, Fe and Mo) doped with CoP

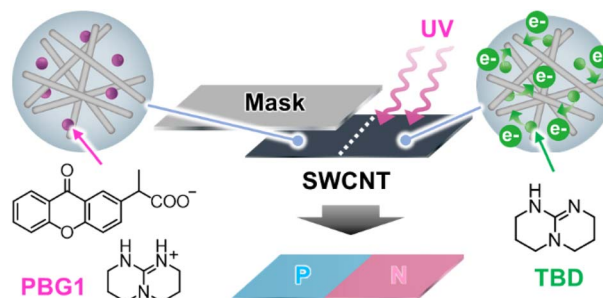
Xiaoyun Zhang, Shifan Zhu, Yixue Xu and Yuqiao Wang^{*}



23278

Photolithographic p–n patterning of single-walled carbon nanotube sheets using photobase generators

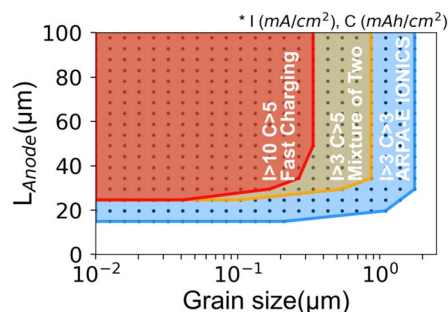
Naoki Tanaka, Mei Yamamoto, Itsuki Yamaguchi, Aoi Hamasuna, Emi Honjo and Tsuyohiko Fujigaya^{*}



23288

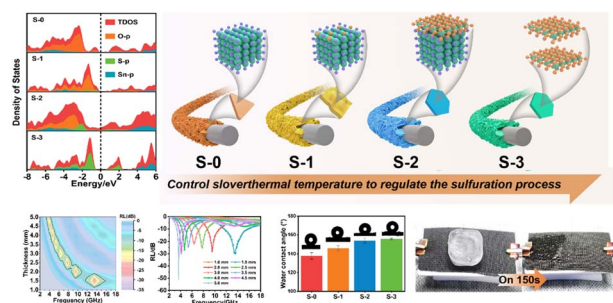
Exploiting grain boundary diffusion to minimize dendrite formation in lithium metal-solid state batteries

Jeong Seop Yoon, Hafeez Sulaimon and Donald J. Siegel^{*}



PAPERS

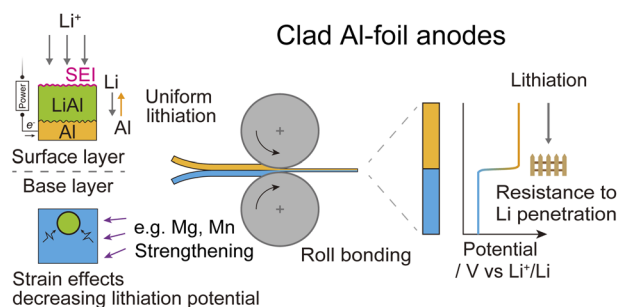
23300



Boosted interfacial charge dynamics on the SnO₂/SnS₂ heterointerface by gradient sulfur diffusion for microwave absorption and electric–thermal conversion

Zhenkuang Lei, Mingqiang Ning,^{*} Xueheng Zhuang, Qikui Man^{*} and Baogen Shen

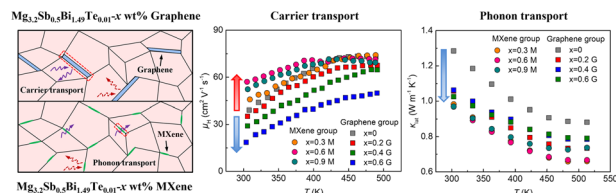
23311



Inserting a lithiation potential gap as a factor for degradation control in aluminum-foil anodes by utilizing roll-bonding processes

Hongyi Li,^{*} Shohei Nishimura, Yuki Nakata, Shingo Matsumoto, Takitaro Yamaguchi, Hiroaki Hoshikawa, Toshiaki Kumagai and Tetsu Ichitsubo^{*}

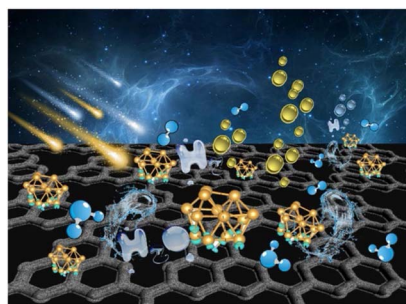
23319



Interfacial modulation to achieve low lattice thermal conductivity and enhanced thermoelectric performance in n-type Mg₃(Sb, Bi)₂-based materials via graphene and MXene

Bang-Zhou Tian, Yi-Yan Liao, Fang Xu, Xiao-Ling Qiu, Fu-Jie Zhang and Ran Ang^{*}

23330



Nanoengineered Au–carbon nitride interfaces enhance photocatalytic pure water splitting to hydrogen

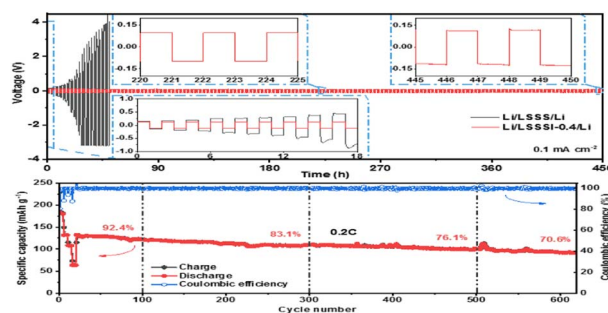
Ingrid F. Silva, Soumyabrata Roy,^{*} Pawan Kumar, Zhi Wen Chen, Ivo F. Teixeira, Astrid Campos-Mata, Loudiana M. Antônio, Luiz O. Ladeira, Humberto O. Stumpf, Chandra Veer Singh, Ana Paula C. Teixeira, Md Golam Kibria^{*} and Pulickel M. Ajayan^{*}



23342

Sn-doped thioantimonate superionic conductors with high air stability and enhanced Li-ion conduction for all-solid-state lithium batteries

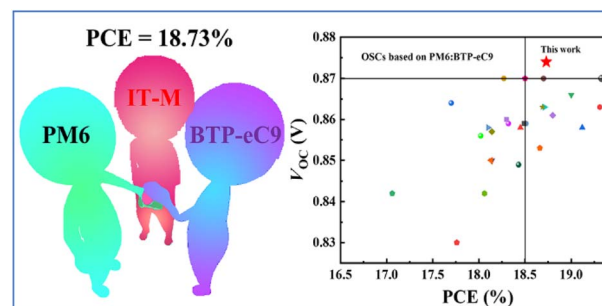
Zhihui Ma, Jie Shi, Di Wu, Dishuang Chen, Shuai Shang, Xuanhui Qu and Ping Li*



23354

18.73% efficiency organic solar cells with a medium bandgap acceptor as a third component

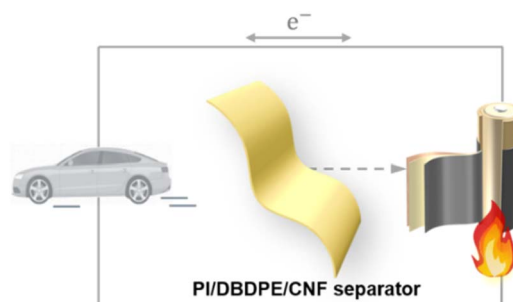
Zheling Zhang, Yang Zhang, Zhenqi Deng, Tianhuan Huang, Dongjie Wang, Xiaoling Zhang,* Qiaogan Liao* and Jian Zhang



23360

Porous, robust, thermally stable, and flame retardant nanocellulose/polyimide separators for safe lithium-ion batteries

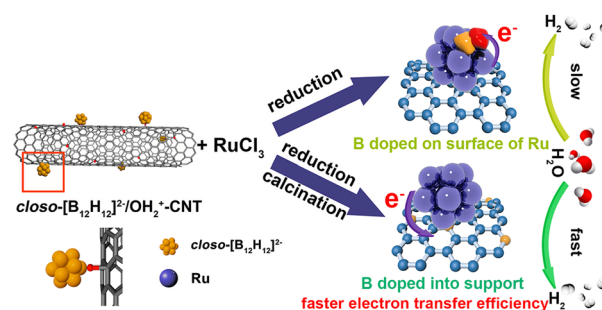
Yi Liu, Chao Li, Chunxing Li, Linhe Xu, Shuang Zhou, Ze Zhang, Junxian Zhang, Das Soham, Rong Fan, Hao Liu, Gang Chen, Yuanyuan Li, Tong Ling, Zhipeng Li, Jinsong Tao* and Jiayu Wan*



23370

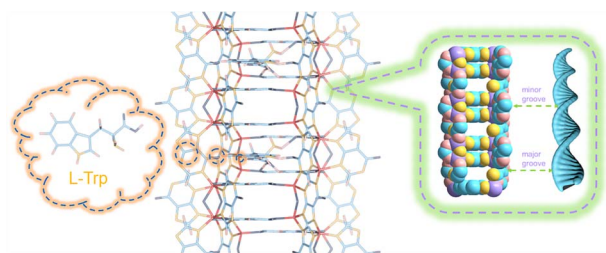
Engineering different B doping modes on Ru active sites for efficient alkaline hydrogen evolution

Xuzhuo Sun, Cancan Cao, Yuying Fu, Jing Chen, Bo Li,* Liuqing Fan, Jing Yang* and Haibo Zhang*



PAPERS

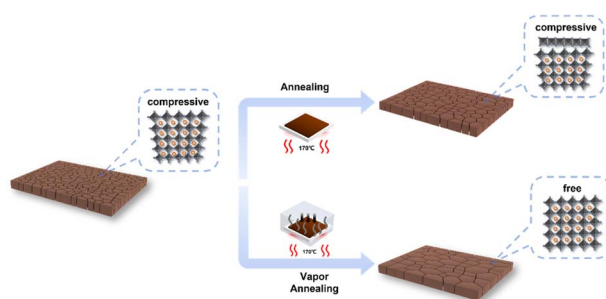
23376



Adaptive host–guest chiral recognition in nanoarchitectonics with biomimetic MOF mimicking DNA

Xiaohui Niu,* Rui Zhao, Yongqi Liu, Mei Yuan, Hongfang Zhao, Hongxia Li, Xing Yang, Hui Xu and Kunjie Wang*

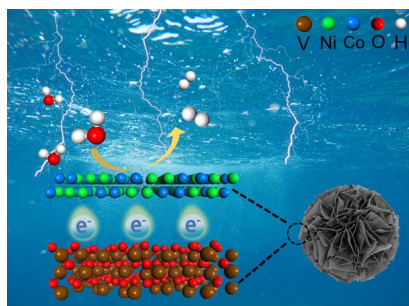
23387



A stress relaxation strategy for preparing high-quality organic–inorganic perovskite thin films via a vapor–solid reaction

Shenghan Hu, Changyu Duan, Hongqiang Du, Shuang Zeng, Anqi Kong, Yuanyuan Chen, Yong Peng, Yi-Bing Cheng and Zhiliang Ku*

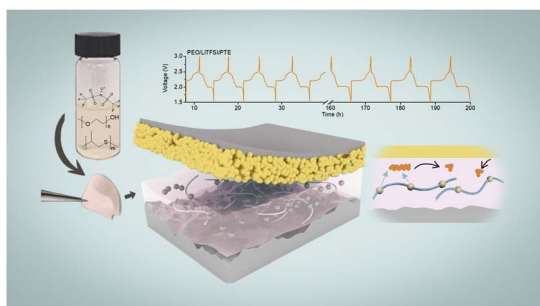
23397



An interface engineering induced hierarchical NiCo/V₂O₃/C Schottky heterojunction catalyst for large-current-density hydrogen evolution reaction

Danyang Li, Jingkai Wang, Shenghui Wang, Bingxian Chu, Rongyao Li, Bin Li, Lihui Dong, Minguang Fan* and Zhengjun Chen*

23405



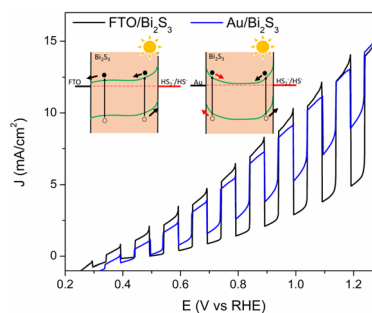
Interfacial chemistry and ion-transfer mechanism for a tailored poly(thioether)-enabled hybrid solid polymer electrolyte with electrochemical properties in all-solid-state lithium–sulfur batteries

Yuhan Li, Kai Xi, Mingbo Ma, Shiyao Lu, Hu Wu, Xiaohan Cao, Xinghong Zhang* and Shujiang Ding*



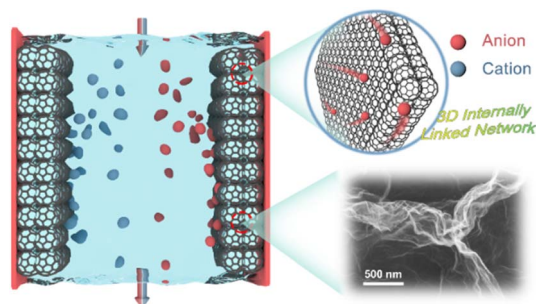
PAPERS

23418

Substrate controls photovoltage, photocurrent and carrier separation in nanostructured Bi_2S_3 filmsSherdil Khan,^{*} Sahar Daemi, Maria Kanwal, Chengcan Xiao and Frank E. Osterloh^{*}

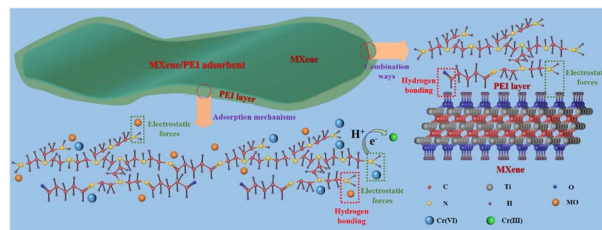
23430

Large-surface-area porous monolith of graphene for electrochemical capacitive deionization

Jinjue Zeng, Tao Wang, Yue Wang, Lei Gao, Dandan Sun, Cong Ge, Dingfei Deng, Hongda Zhu, Yoshio Bando, Ruiqing Li,^{*} Pengcheng Dai^{*} and Xuebin Wang^{*}

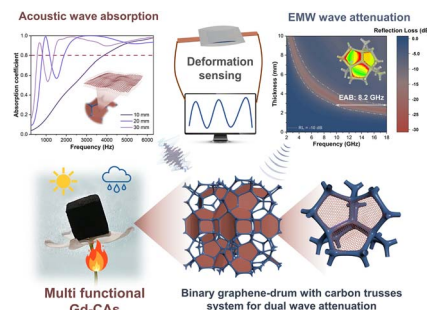
23438

Synchronously enhanced storage stability and adsorption ability of MXene achieved by grafting polyethylenimine

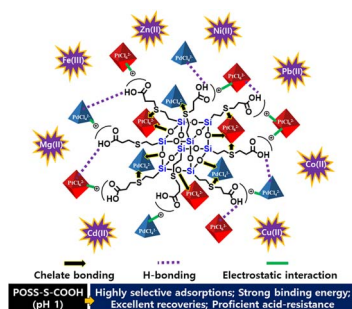
Liang Li, Xian-ying Shi, Ting Huang,^{*} Nan Zhang and Yong Wang^{*}

23452

Robust graphene-drum bridged carbon aerogels for broadband acoustic and electromagnetic attenuation

Yijing Zhao, Tianxiao Niu, Xinyu Dong, Yong Yang^{*} and Wei Zhai^{*}

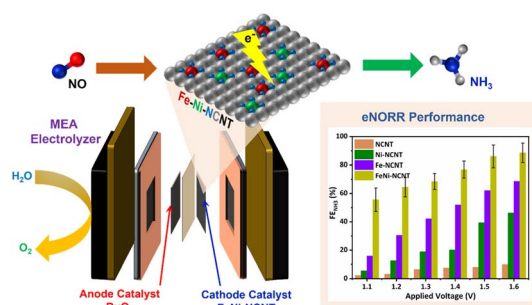
23463



Single-step synthesis of prominently selective and easily regenerable POSS functionalized with high loadings of sulfur and carboxylic acids

Haribandhu Chaudhuri, Che-Ryong Lim and Yeoung-Sang Yun*

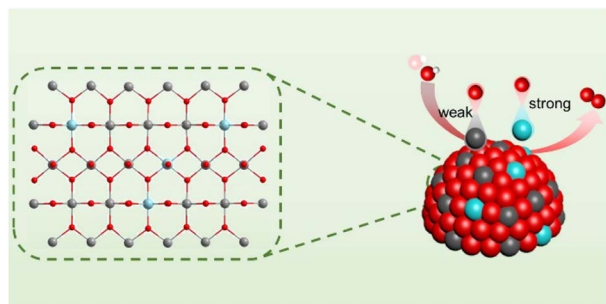
23479



Electrochemical synthesis of ammonia from nitric oxide in a membrane electrode assembly electrolyzer over a dual Fe–Ni single atom catalyst

Sridhar Sethuram Markandaraj, Dinesh Dhanabal and Sangaraju Shanmugam*

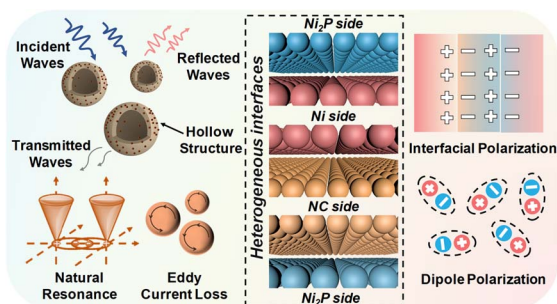
23489



Competitive adsorption of oxygen-containing intermediates on ruthenium–tin solid-solution oxides for alkaline oxygen evolution

Shuyu Jia, Jiachen Zhang, Qicheng Liu, Caini Ma, Yawen Tang* and Hanjun Sun*

23498



Optimizing dielectric polarization for electromagnetic wave attenuation via an enhanced Maxwell–Wagner–Sillars effect in hollow carbon microspheres

Baojun Wang, Hao Wu, Wenxuan Hou, Zhifeng Fang, Heqin Liu, Fangzhi Huang, Shikuo Li* and Hui Zhang*

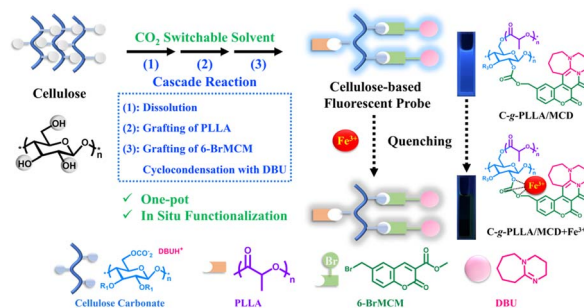


PAPERS

23511

One-pot *in situ* functionalization of cellulose in a CO₂ switchable solvent for the fluorescent detection of Fe³⁺

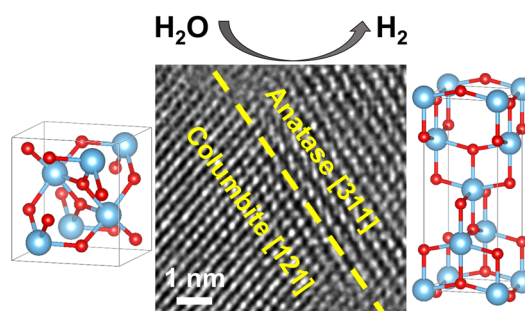
Xiaobo Yu, Yiting Xu, Fei Liu,* Wei Zhang, Yi Sun, Yajin Fang, Lanyun Fang, Xiaofeng He, Haining Na* and Jin Zhu



23523

Understanding high photocatalytic activity of the TiO₂ high-pressure columbite phase by experiments and first-principles calculations

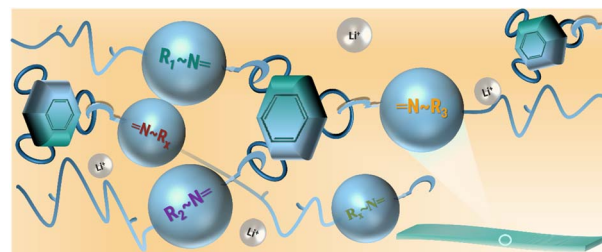
Jacqueline Hidalgo-Jiménez, Taner Akbay, Tatsumi Ishihara and Kaveh Edalati*



23536

Self-curing solid-state electrolytes based on transamination bond exchange for reliable lithium batteries

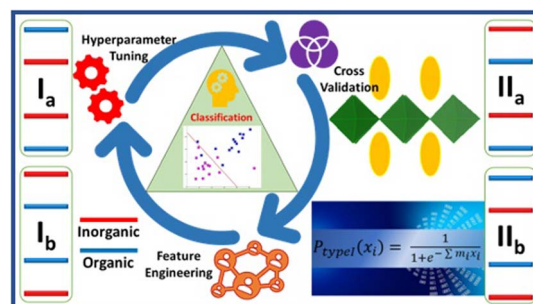
Yu-Te Chen, Rohan Paste, Hong-Cheu Lin* and Chih Wei Chu*



23547

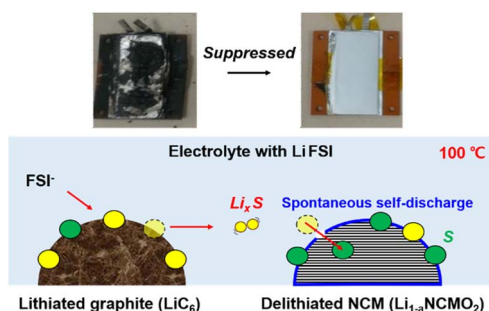
Machine learning-driven prediction of band-alignment types in 2D hybrid perovskites

Eti Mahal, Diptendu Roy, Surya Sekhar Manna and Biswarup Pathak*



PAPERS

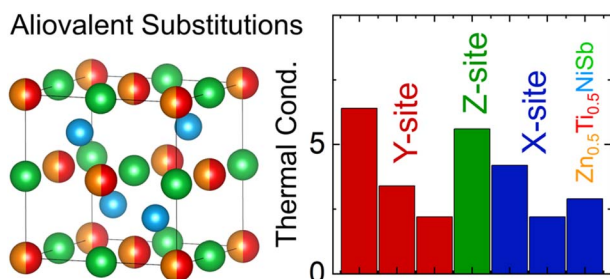
23556



A self-discharging reaction mediated by imide salt enables the prevention of explosive thermal runaway in high-Ni material/graphite full cells

Yongho Shin, Kyungho Ahn, Chulhaeng Lee and Byoungwoo Kang*

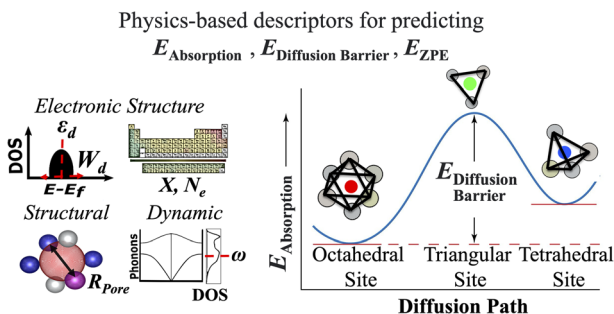
23566



Thermoelectric properties of the aliovalent half-Heusler alloy $\text{Zn}_{0.5}\text{Ti}_{0.5}\text{NiSb}$ with intrinsic low thermal conductivity

Blair F. Kennedy, Simon A. J. Kimber, Stefano Checchia, A. K. M. Ashiquzzaman Shawon, Alexandra Zevalkink, Emmanuelle Suard, Jim Buckman and Jan-Willem G. Bos*

23576



Simple local environment descriptors for accurate prediction of hydrogen absorption and migration in metal alloys

Vladislav Korostelev, James Wagner and Konstantin Klyukin*

CORRECTIONS

23589

Correction: Controllable design of multi-metallic aerogels as efficient electrocatalysts for methanol fuel cells

Lanqing Li, Wei Gao, Jianqi Ye, Haoxin Fan and Dan Wen*



CORRECTIONS

23590

Correction: Prussian blue and its analogues as functional template materials: control of derived structure compositions and morphologiesBehnoosh Bornamehr,^{*} Volker Presser,^{*} Aldo J. G. Zarbin,^{*} Yusuke Yamauchi^{*} and Samantha Husmann^{*}