

# Energy & Environmental Science

rsc.li/ees

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 1754-5706 CODEN EESNBY 17(1) 1–356 (2024)



### Cover

See Yu Wang,  
Zaiping Guo et al.,  
pp. 123–133.  
Image reproduced by  
permission of Yu Wang  
from *Energy Environ. Sci.*,  
2024, 17, 123.



### Inside cover

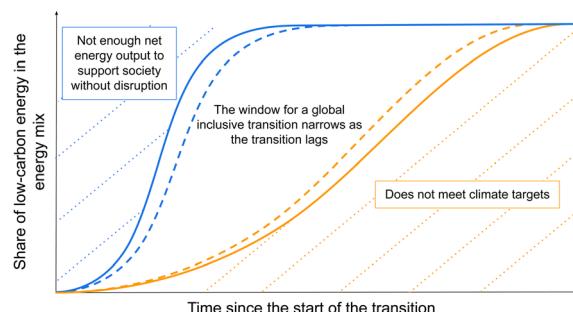
See Cheolmin Park et al.,  
pp. 134–148.  
Image reproduced by  
permission of  
Cheolmin Park from  
*Energy Environ. Sci.*,  
2024, 17, 134.

## OPINION

11

### Emerging consensus on net energy paves the way for improved integrated assessment modeling

Louis Delannoy,\* Matthieu Auzanneau, Baptiste Andrieu, Olivier Vidal, Pierre-Yves Longaretti, Emmanuel Prados, David J. Murphy, Roger W. Bentley, Michael Carbajales-Dale, Marco Raugei, Mikael Höök, Victor Court, Carey W. King, Florian Fizaine, Pierre Jacques, Matthew Kuperus Heun, Andrew Jackson, Charles Guay-Boutet, Emmanuel Aramendia, Jianliang Wang, Hugo Le Boulzec and Charles A.S. Hall

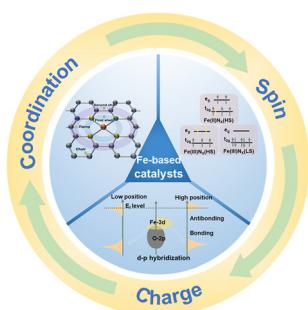


## REVIEW

27

### Unified ORR mechanism criteria via charge–spin–coordination of Fe functional units

Kexin Song, Binbin Yang, Xu Zou, Wei Zhang\* and Weitao Zheng\*



# Fuelling your energy research



## Energy & Environmental Science

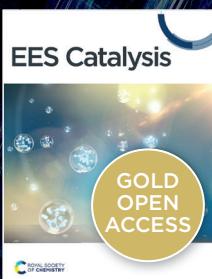
Agenda-setting research in energy science and technology

### Chair of the Editorial Board

Jenny Nelson, Imperial College London, UK

Impact factor 2021: 39.714, median time to first decision (peer reviewed articles only): 46 days\*.

[rsc.li/ees](https://rsc.li/ees)



## EES Catalysis

Exceptional research on energy and environmental catalysis

### Editor-in-Chief

Shizhang Qiao, University of Adelaide, Australia

Median time to first decision (peer reviewed articles only): 24 days\*.

[rsc.li/ees-catalysis](https://rsc.li/ees-catalysis)



## Sustainable Energy & Fuels

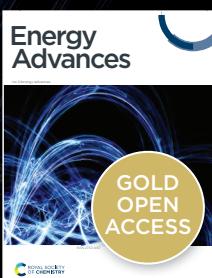
Driving the development of sustainable energy technologies through cutting edge research

### Editor-in-Chief

Garry Rumbles, National Renewable Energy Laboratory and University of Colorado Boulder, USA

Impact factor 2021: 6.813, median time to first decision (peer reviewed articles only): 28 days\*.

[rsc.li/sustainable-energy](https://rsc.li/sustainable-energy)



## Energy Advances

Embracing research at the nexus of energy science and sustainability

### Editor-in-Chief

Volker Presser, Leibniz Institute for New Materials, Germany

Median time to first decision (peer reviewed articles only): 32 days\*.

[rsc.li/energy-advances](https://rsc.li/energy-advances)

**Submit your work today**

[rsc.li/energy](https://rsc.li/energy)

\*Visit [rsc.li/metrics-explainer](https://rsc.li/metrics-explainer) for more information

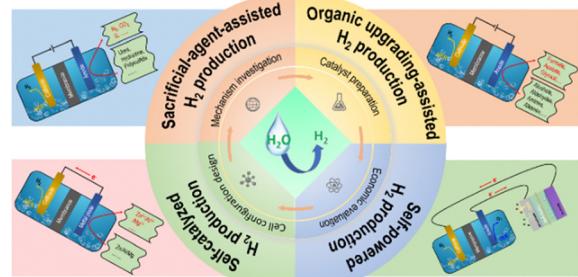
Registered charity number: 207890

## PERSPECTIVE

49

**Water electrolysis for hydrogen production: from hybrid systems to self-powered/catalyzed devices**

Jin-Tao Ren, Lei Chen, Hao-Yu Wang, Wen-Wen Tian and Zhong-Yong Yuan\*

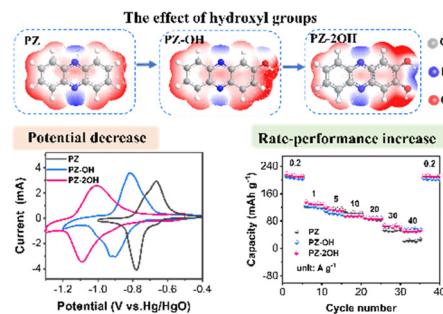


## COMMUNICATION

114

**Tailoring hydroxyl groups of organic phenazine anodes for high-performance and stable alkaline batteries**

Huilin Cui, Dechao Zhang, Zhuoxi Wu, Jiaxiong Zhu, Pei Li, Chuan Li, Yue Hou, Rong Zhang, Xiaoqi Wang, Xu Jin, Shengchi Bai and Chunyi Zhi\*

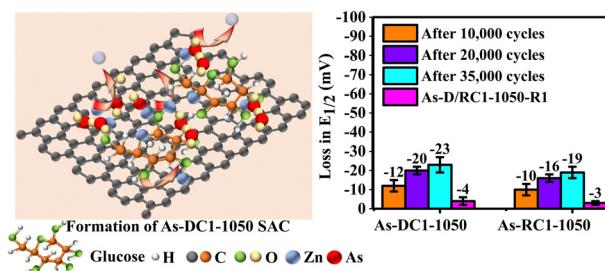


## PAPERS

123

**High-loading As single-atom catalysts harvested from wastewater towards efficient and sustainable oxygen reduction**

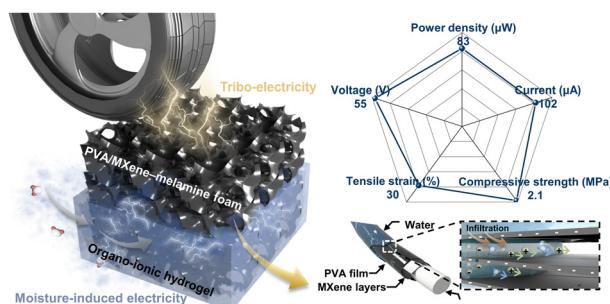
Yangjun Luo, Yanwei Wang, Huijuan Zhang, Youyuan Wang, Jin Wan, Chuanzhen Feng, Lingmei Liu, Zaiping Guo,\* Jian Li and Yu Wang\*



134

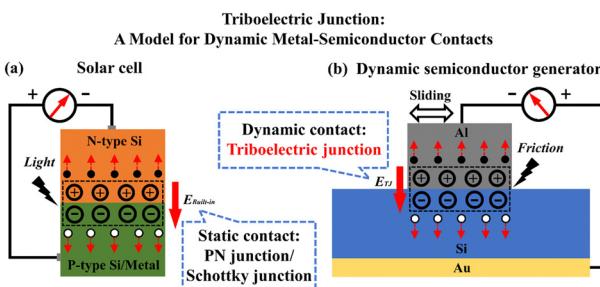
**A deformable complementary moisture and tribo energy harvester**

Gwanho Kim, Jae Won Lee, Kaiying Zhao, Taebin Kim, Woojoong Kim, Jin Woo Oh, Kyuho Lee, Jihye Jang, Guangtao Zan, Jong Woong Park, Seokyeong Lee, Yeonji Kim, Wei Jiang, Shengyou Li and Cheolmin Park\*



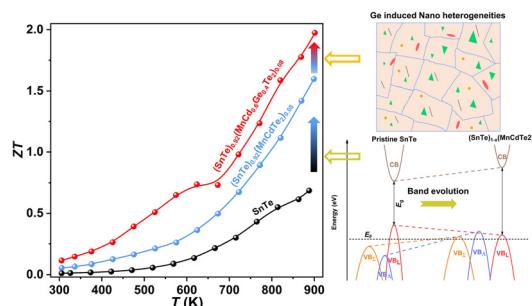
## PAPERS

149

**Triboelectric junction: a model for dynamic metal–semiconductor contacts**

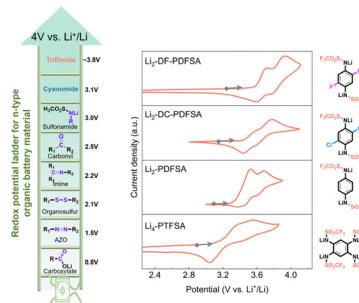
Xiaote Xu, Zhong Lin Wang\* and Zhengbao Yang\*

158

**Rare three-valence-band convergence leading to ultrahigh thermoelectric performance in all-scale hierarchical cubic SnTe**

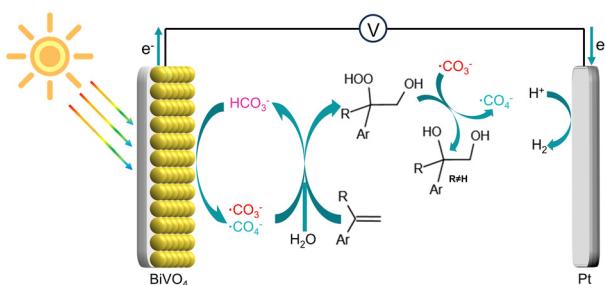
Fan Li, Xin Liu, Shu-Rong Li, Xiao-Fan Zhang, Ni Ma, Xin-Jing Li, Xin-Yun Lin, Ling Chen,\* Haijun Wu\* and Li-Ming Wu\*

173

**Towards the 4 V-class n-type organic lithium-ion positive electrode materials: the case of conjugated triflimides and cyanamides**

Xiaolong Guo, Petru Apostol, Xuan Zhou, Jiande Wang, Xiaodong Lin, Darsi Rambabu, Mengyuan Du, Süleyman Er and Alexandru Vlad\*

183

**HCO<sub>3</sub><sup>-</sup>-mediated highly efficient photoelectrochemical dioxygenation of arylalkenes: triple roles of HCO<sub>3</sub><sup>-</sup>-derived radicals**

Jie Yang, Yukun Zhao, Mengyu Duan, Chaoyuan Deng, Yufan Zhang, Yu Lei, Jikun Li, Wenjing Song, Chuncheng Chen\* and Jincai Zhao

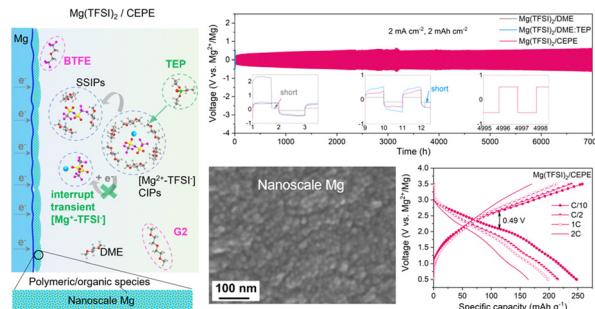


## PAPERS

190

**A weakly ion pairing electrolyte designed for high voltage magnesium batteries**

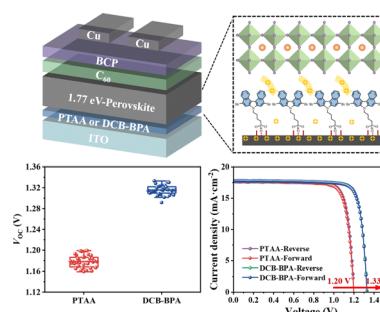
Chang Li, Rishabh D. Guha, Abhinandan Shyamsunder, Kristin A. Persson\* and Linda F. Nazar\*



202

**Achieving a high open-circuit voltage of 1.339 V in 1.77 eV wide-bandgap perovskite solar cells via self-assembled monolayers**

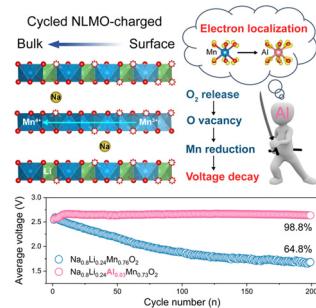
Zongjin Yi, Wanhai Wang, Rui He, Jingwei Zhu, Wenbo Jiao, Yi Luo, Yuliang Xu, Yunfan Wang, Zixin Zeng, Kun Wei, Jinbao Zhang, Sai-Wing Tsang, Cong Chen, Weihua Tang\* and Dewei Zhao\*



210

**Unraveling and suppressing the voltage decay of high-capacity cathode materials for sodium-ion batteries**

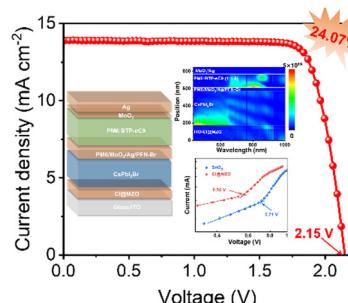
Luoran Sun, Zhonghan Wu, Machuan Hou, Youxuan Ni, Haoxiang Sun, Peixin Jiao, Haixia Li, Wei Zhang, Liang Zhang, Kai Zhang,\* Fangyi Cheng and Jun Chen



219

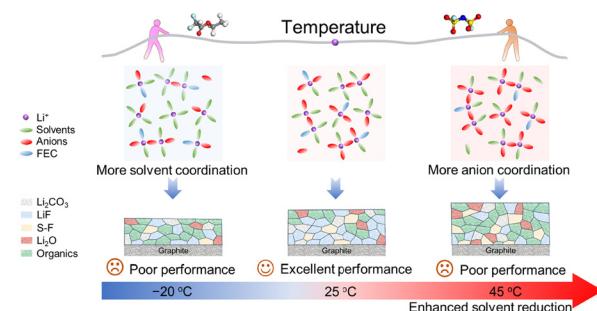
**Synergistic electrical and light management enables efficient monolithic inorganic perovskite/organic tandem solar cells with over 24% efficiency**

Shan Jiang, Ruyue Wang, Minghua Li,\* Runnan Yu, Fuzhi Wang and Zhan'ao Tan\*



## PAPERS

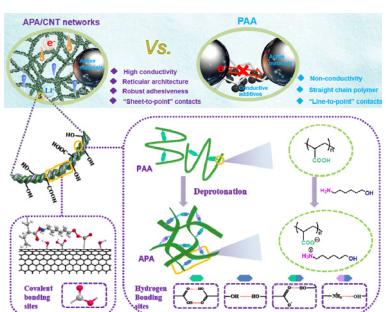
227



## Unraveling the temperature-responsive solvation structure and interfacial chemistry for graphite anodes

Yanbing Mo, Gaopan Liu, Jiawei Chen, Xiao Zhu, Yu Peng, Yonggang Wang, Congxiao Wang, Xiaoli Dong\* and Yongyao Xia\*

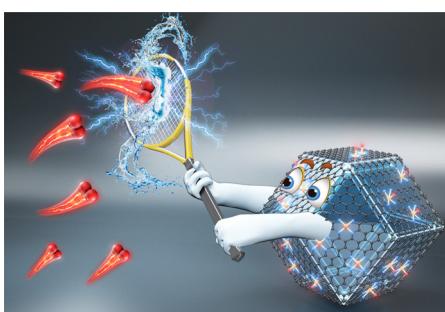
238



## A new universal aqueous conductive binder via esterification reinforced electrostatic/H-bonded self-assembly for high areal capacity and stable lithium-ion batteries

Farong Zhang, Hongyu Xia, Tongye Wei,\* Huaming Li, Mei Yang\* and An-Min Cao\*

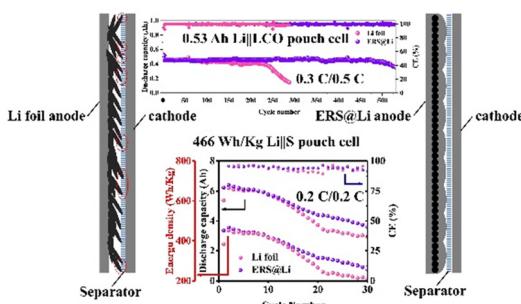
249



## High-coordination Fe–N<sub>4</sub>SP single-atom catalysts via the multi-shell synergistic effect for the enhanced oxygen reduction reaction of rechargeable Zn–air battery cathodes

Jiaqi Liu, Weibin Chen, Shuang Yuan,\* Tie Liu and Qiang Wang\*

260



## Green mechanochemical Li foil surface reconstruction toward long-life Li–metal pouch cells

Kecheng Long, Shaozhen Huang, Han Wang, Anbang Wang, Yuejiao Chen, Zhijian Liu, Yu Zhang, Zhibin Wu, Weikun Wang\* and Libao Chen\*

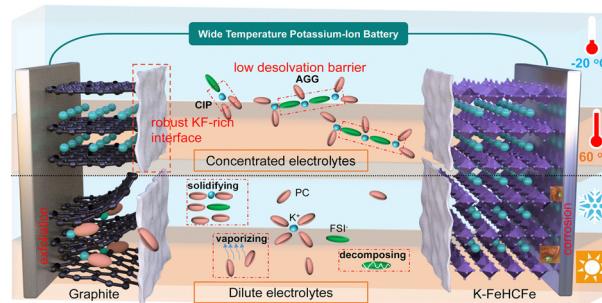


## PAPERS

274

## Rejuvenating propylene carbonate-based electrolytes by regulating the coordinated structure toward all-climate potassium-ion batteries

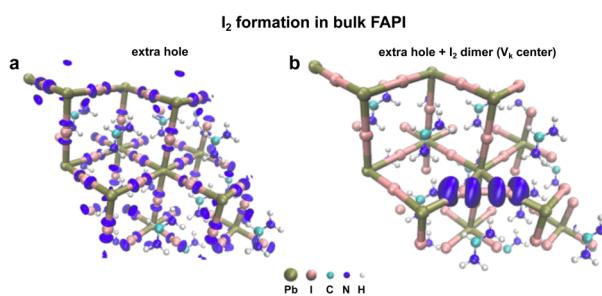
Zixing Wang, Kang Luo, Jian-Fang Wu, Peng Gao, Kexuan Wang, Shi Chen, Jian Tu, Xiulin Fan and Jilei Liu\*



284

## Understanding and decoupling the role of wavelength and defects in light-induced degradation of metal-halide perovskites

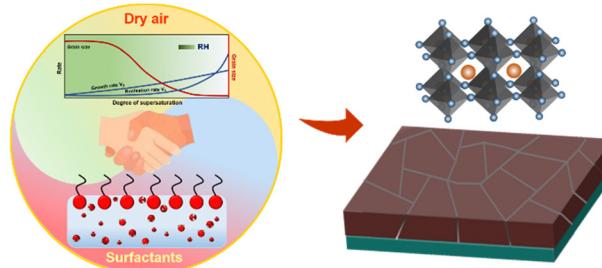
Jeremy Hieulle, Anurag Krishna, Ariadni Boziki, Jean-Nicolas Audinot, Muhammad Uzair Farooq, Joana Ferreira Machado, Marko Mladenović, Himanshu Phirke, Ajay Singh, Tom Wirtz, Alexandre Tkatchenko, Michael Graetzel, Anders Hagfeldt and Alex Redinger\*



296

## The synergistic effect of dry air and surfactants enables water to be a promising green solvent for stable and efficient perovskite solar cells

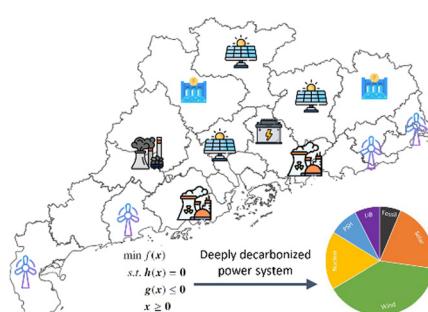
Yanrui Zhang, Lixia Ren, Peng Zhai,\* Jingjing Xin, Jiarong Wu, Qi Zhang, Xin Chen, Kui Zhao, Lu Zhang and Shengzhong (Frank) Liu\*



307

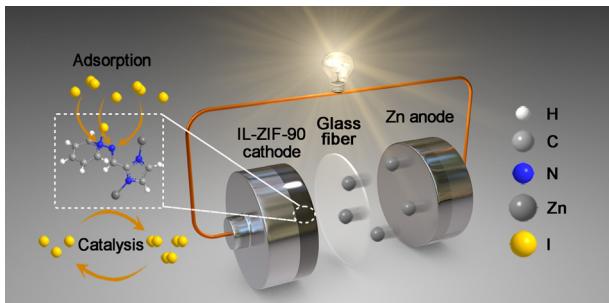
## Low-carbon transition pathways of power systems for Guangdong–Hongkong–Macau region in China

Zuming Liu,\* Mingquan Li, Edgar Virguez and Xiaomin Xie\*



## PAPERS

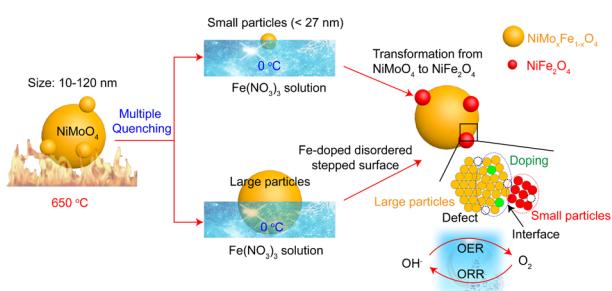
323



### Synergistic effects of Lewis acid–base and Coulombic interactions for high-performance Zn–I<sub>2</sub> batteries

Jiafeng He, Yongbiao Mu, Buke Wu, Fuhai Wu, Ruixi Liao, Hongfei Li, Tianshou Zhao\* and Lin Zeng\*

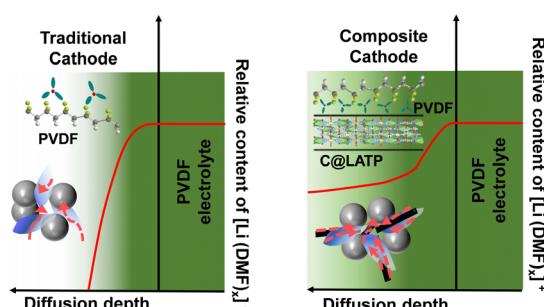
332



### Heterostructured metal oxides realized by quenching-induced structural transformation

Changchun Ye, Zhenghui Pan,\* Qinghua Zhang, Fang Yin, Yanan Wang, Yifei Li, Guangxu Chen, Jia Li,\* Yongcai Qiu,\* Geoffrey I. N. Waterhouse, Lin Gu,\* Zhang Lin and Lin Guo\*

344



### Achieving a high loading of cathode in PVDF-based solid-state battery

Yang Liu, Xufei An, Ke Yang, Jiabin Ma, Jinshuo Mi, Danfeng Zhang, Xing Cheng, Yuhang Li, Yuetao Ma, Ming Liu,\* Feiyu Kang and Yan-Bing He\*

