

# Materials Horizons

rsc.li/materials-horizons

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.

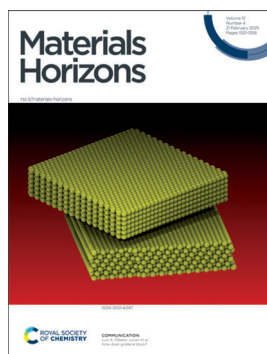
## IN THIS ISSUE

ISSN 251-6347 CODEN MHAOAL 12(4) 1021-1356 (2025)



### Cover

See Janghyuk Moon, Kyu-Young Park, Yong-Tae Kim *et al.*, pp. 1133–1143. Image reproduced by permission of Yong-Tae Kim from *Mater. Horiz.*, 2025, 12, 1133.



### Inside cover

See Luiz A. Ribeiro Junior *et al.*, pp. 1144–1154. Image reproduced by permission of Luiz A. Ribeiro Junior from *Mater. Horiz.*, 2025, 12, 1144.

## EDITORIAL

1031

**Materials Horizons Emerging Investigator Series:**  
Professor Pengfei Cao, Beijing University of Chemical Technology, China

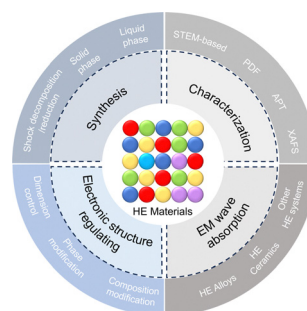


## REVIEWS

1033

**Advancements in high-entropy materials for electromagnetic wave absorption**

Mingyue Yuan, Alan H. Weible, Fatemeh Azadi, Bangxin Li, Jiacheng Cui, Hualiang Lv,\* Renchao Che\* and Xiaoguang Wang\*



# RSC Applied Interfaces

GOLD  
OPEN  
ACCESS

## Interfacial and surface research with an applied focus

### Interdisciplinary and open access



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

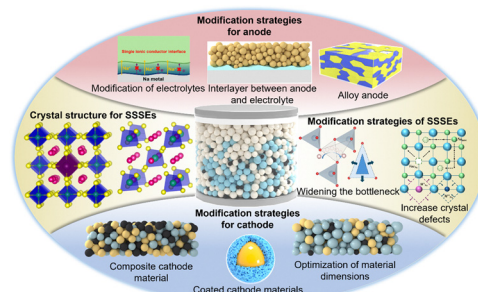
Fundamental questions  
Elemental answers

## REVIEWS

1058

## Sulfide electrolytes for all-solid-state sodium batteries: fundamentals and modification strategies

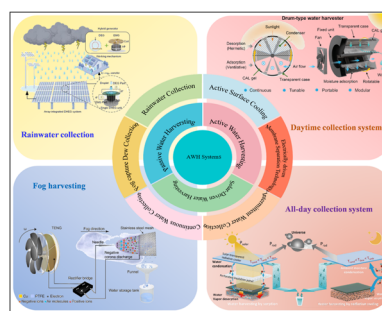
Shoumeng Yang, Yi Tang, Yu Yao, Shengnan He, Zhijun Wu, Yang Yang, Hongge Pan, Xianhong Rui\* and Yan Yu\*



1084

## Recent advances in atmospheric water harvesting technology and its development

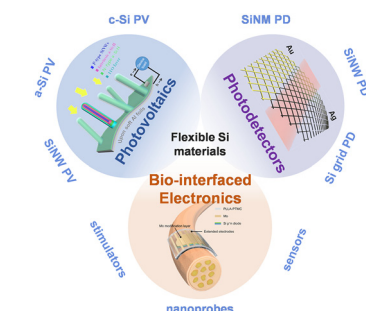
Tianyi Xiang, Shangzhen Xie,\* Guopeng Chen, Congji Zhang and Zhiguang Guo\*



1106

## Flexible silicon for high-performance photovoltaics, photodetectors and bio-interfaced electronics

Shuyi Wang, Xiaopan Song,\* Jun Xu,\* Junzhuang Wang and Linwei Yu\*

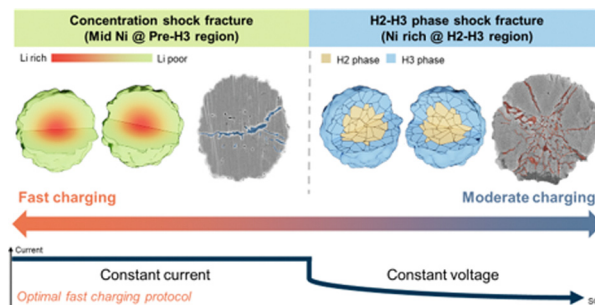


## COMMUNICATIONS

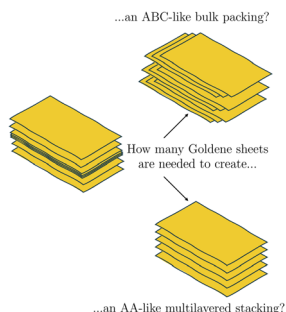
1133

## Understanding mechanical failure behaviours and protocol optimization for fast charging applications in Co-free Ni-based cathodes for lithium-ion batteries

Jaesub Kwon, Jaehyun Kim, Jong-Heon Lim, Kyoung Eun Lee, Seok-Mun Kang, Youngsun Kong, Dong-Hyun Kim, Kyu-Su Kim, Gogwon Choe, Sang-Mun Jung, Docheon Ahn, Yoon-Uk Heo, Janghyuk Moon,\* Kyu-Young Park\* and Yong-Tae Kim\*



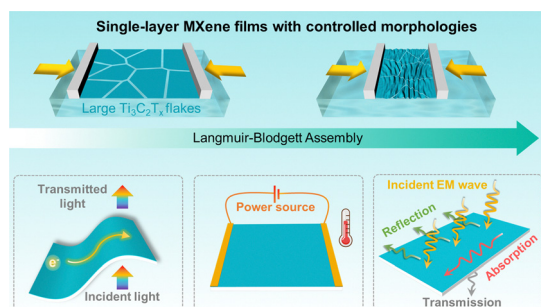
1144



### How does goldene stack?

Marcelo L. Pereira Jr, Emanuel J. A. dos Santos,  
Luiz A. Ribeiro Jr\* and Douglas S. Galvão

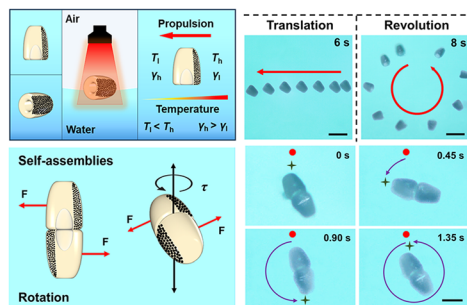
1155



### Multifunctional transparent conductive films via Langmuir–Blodgett assembly of large MXene flakes

Jie Xue, Dan Liu, Chuanbing Li, Zifu Zhu, Yuxuan Sun,  
Xiaobo Gao and Qingbin Zheng\*

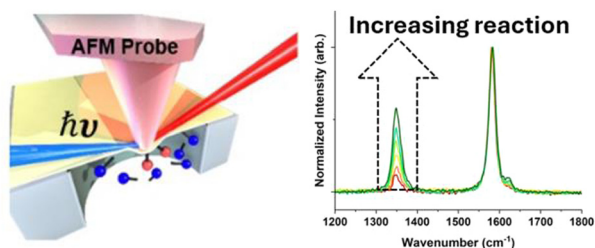
1168



### Programmable assemblies of photothermal anisotropic micromotors for multimodal motion

Wenchang Zhao, Shiyu Wang, Ying Zhou, Yanhong Li,  
Shuxian Tang, Yutong Zheng and Pingan Zhu\*

1179



### Studies of the mechanically induced reactivity of graphene with water using a 2D-materials strain reactor

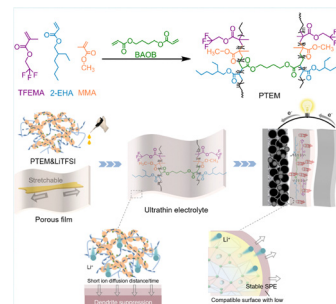
Nathaniel Hawthorne, Edward J. Broker Jr, Yutian Bao,  
Sayan Banerjee, Quentarius Moore, Camille Cardinal,  
Jimmy Ha, Ulisses D. Braga, Andrew M. Rappe and  
James D. Batteas\*



1189

### Construction of an ultrathin multi-functional polymer electrolyte for safe and stable all-solid-state batteries

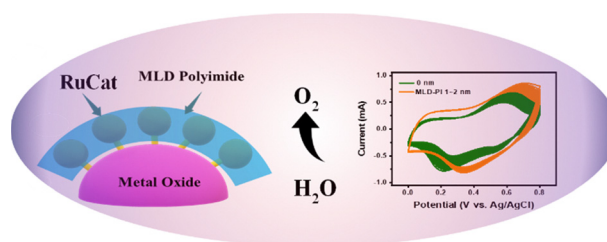
Youjia Zhang, Tianhui Cheng, Shilun Gao,\* Hang Ding, Zhenxi Li, Lin Li, Dandan Yang, Huabin Yang\* and Peng-Fei Cao\*



1200

### Stabilizing molecular catalysts on metal oxide surfaces using molecular layer deposition for efficient water oxidation

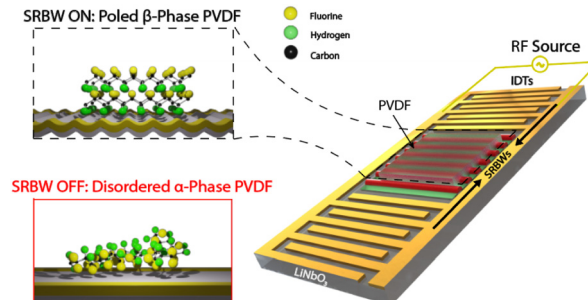
Hong Wang, Jian Li, Ke Liu, Lei Lei,\* Xun Chen\* and Degao Wang\*



1207

### Piezo-to-piezo (P2P) conversion: simultaneous $\beta$ -phase crystallization and poling of ultrathin, transparent and freestanding homopolymer PVDF films via MHz-order nanoelectromechanical vibration

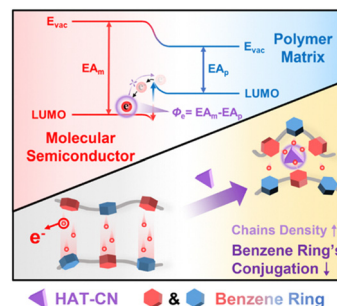
Robert Komljenovic, Peter C. Sherrell, Eirini Goudeli, Amgad R. Rezk\* and Leslie Y. Yeo



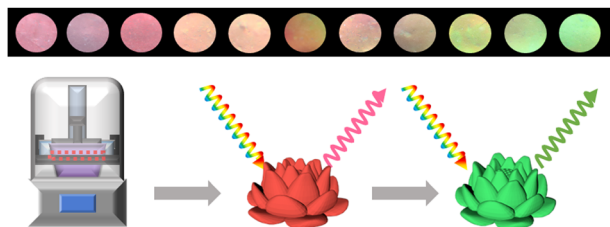
1223

### Outstanding high-temperature capacitive performance in all-organic dielectrics enabled by synergistic optimization of molecular traps and aggregation structures

Bo Peng, Pengbo Wang, Hang Luo,\* Guanghu He, Haoran Xie, Yuan Liu, Sheng Chen, Xiaona Li, Yuting Wan and Ru Guo\*



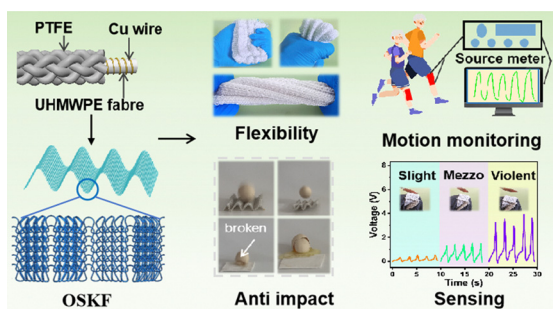
1234



### A high-resolution 3D radiochromic hydrogel photonic crystal dosimeter for clinical radiotherapy

Zhihao Wang, Xianmei Chen, Tingting Wang,\*  
Mingshuo Tang, Zhiwei He, Yunlong Wang\* and Jun Ma\*

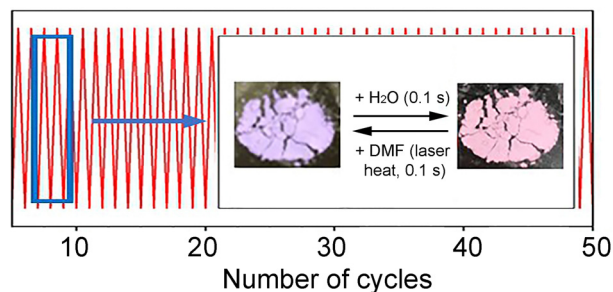
1246



### Full-fiber triboelectric nanogenerators with knitted origami structures for high impact resistance intelligent protection fabric

Guilin Wu, Minjie Xu, Mengdie Lei, Mingmin Liao,  
Yongyue Luo, Yiwei OuYang,\* Jize Liu\* and  
Guangming Cai\*

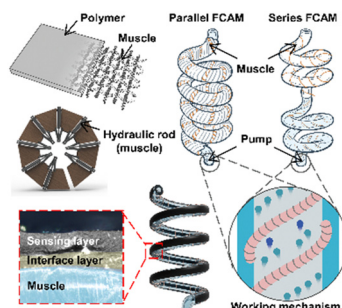
1255



### A light-driven ultrafast sensor based on biocompatible solvatochromic metal-organic frameworks

Maria Timofeeva, Yuliya Kenzhebayeva, Nikita Burzak,  
Agnia Bazhenova, Artem Lunev, Alexander S. Novikov,  
Andrey B. Bondarenko, Sergei A. Shipilovskikh,\*  
Vyacheslav A. Dyachuk\* and Valentin A. Milichko\*

1262



### Integrated thermal management-sensing-actuation functional artificial muscles

Lufeng Wang, Shiju Yang, Lixue Yang, Yang Guo,  
Yiyao Zhang, Xiong Li, Hongzhi Wang, Liping Zhu,\*  
Meifang Zhu and Jiuke Mu\*

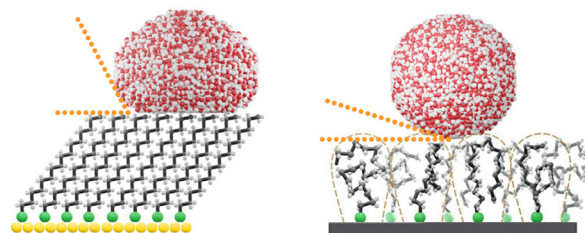


## COMMUNICATIONS

1274

### Functionalization of monolithic MOF thin films with hydrocarbon chains to achieve superhydrophobic surfaces with tunable water adhesion strength

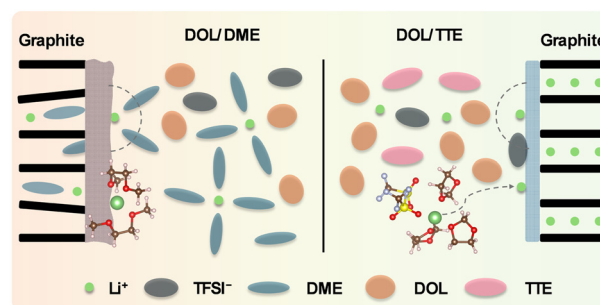
Evgenia Bogdanova, Modan Liu, Patrick Hodapp, Angana Borbora, Wolfgang Wenzel, Stefan Bräse, André Jung, Zheqin Dong, Pavel A. Levkin, Uttam Manna,\* Tawheed Hashem\* and Christof Wöll\*



1282

### Long-life graphite–lithium sulfide full cells enabled through a solvent Co-intercalation-free electrolyte design

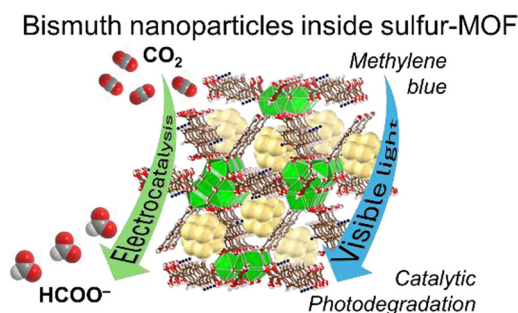
Tianxing Lai, Amruth Bhargav, Seth Reed and Arumugam Manthiram\*



1290

### Incarcerating bismuth nanoparticles into a thiol-laced metal–organic framework for electro and photocatalysis

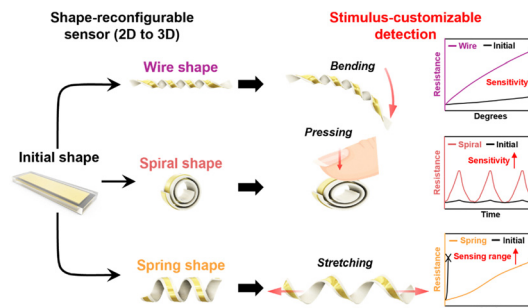
Parijat Borah,\* Natalie McLeod, Nipun Kumar Gupta, Reuben J. Yeo, Tanmay Ghosh, Zainul Aabdin, Lidao Li, Prajna Bhatt, Yuhan Liu, Robert Palgrave, Yee-Fun Lim, Zhengtao Xu\* and Albertus Denny Handoko\*



1303

### A shape-reconfigurable electronic composite for stimulus customizable detection via neutral plane shifting

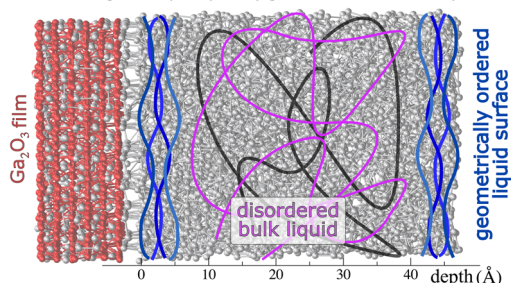
Dohyeon Gong, Yeonwook Roh, Jae-Hyun Lee, Suhyeon Hwang, Changwan Kim, Kyungbin Ji, Gibeom Kwon, Inryeol Back, Dongwook Shin, Daseul Lim, Insic Hong, Doohoe Lee, Je-Sung Koh,\* Daeshik Kang\* and Seungyong Han\*



## COMMUNICATIONS

1314

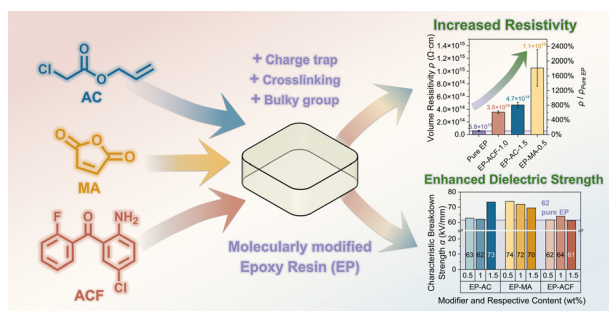
Machine learning techniques quantify geometric order at the liquid surface.



## Discerning order from chaos: characterising the surface structure of liquid gallium

Krista G. Steenbergen, Stephanie Lambie and Nicola Gaston\*

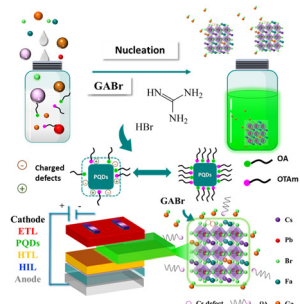
1323



## Optimizing dielectric, mechanical, and thermal properties of epoxy resin through molecular design for multifunctional performance

Yuheng Deng, Yen Wen Wong, Letitia Kai Yue Teh, Qi Wang, Weifeng Sun, Wen Kwang Chern, Joo Tien Oh and Zhong Chen\*

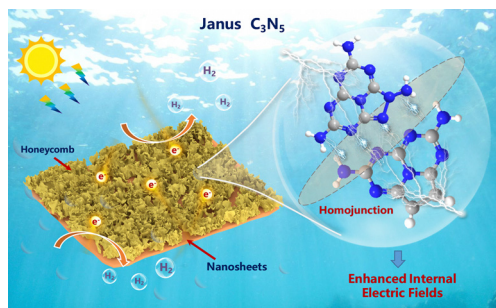
1334



## Room-temperature synthesis of triple-cation green perovskite quantum dots for optoelectronic applications

Jean-Sébastien Bénas, Fang-Cheng Liang, Yu-Hang Huang, Fu-Chieh Liu, Chun-Hsien Ou, Ryosuke Oikawa, Ryota Kobayashi, Shoki Mizoguchi, Yuna Igarashi, Takayuki Chiba,\* Junji Kido\* and Chi-Ching Kuo\*

1346

Harnessing Janus structures: enhanced internal electric fields in  $C_3N_5$  for improved  $H_2$  photocatalysis

Jianwei Yuan, Su Li, Zhaofei Dang, Sixia Liu, Fu Yang, Dongguang Wang, Hengcong Tao,\* Shuying Gao\* and Edison Huixiang Ang\*

