

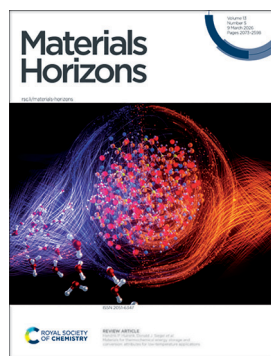
# Materials Horizons

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 2051-6347 CODEN MHAOAL 13(5) 2073-2598 (2026)



### Cover

See Hendrik P. Huinink, Donald J. Siegel *et al.*, pp. 2087–2126. Image reproduced by permission of Donald Siegel from *Mater. Horiz.*, 2026, 13, 2087.



### Inside cover

See Jiu-an Lv *et al.*, pp. 2257–2266. Image reproduced by permission of Jiu-An Lv from *Mater. Horiz.*, 2026, 13, 2257.

## EDITORIAL

2086

**Materials Horizons Emerging Investigator Series:**  
**Dr Gloria Zhang, New Mexico State University, United States**

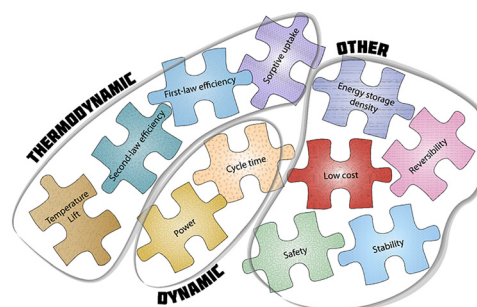


## REVIEWS

2087

**Materials for thermochemical energy storage and conversion: attributes for low-temperature applications**

Steven Kiyabu, Aleksandr Shkatulov, Alauddin Ahmed, Samuel M. Greene, Hendrik P. Huinink\* and Donald J. Siegel\*



**GOLD  
OPEN  
ACCESS**

# EES Batteries

**Exceptional research on  
batteries and energy storage**

**Part of the EES family**



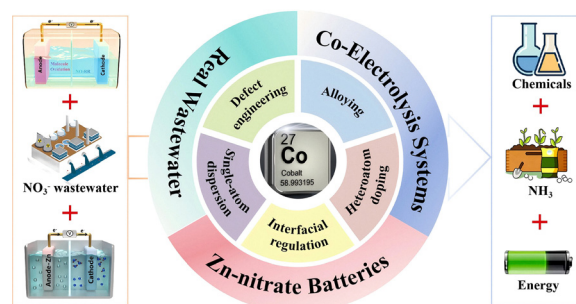
**Join  
in** | Publish with us  
[rsc.li/EESBatteries](https://rsc.li/EESBatteries)

## REVIEWS

2127

### Advances in Co-based electrocatalysts for sustainable ammonia synthesis: mechanisms, design strategies, and emerging applications

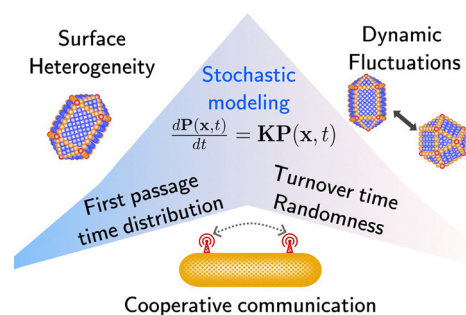
Ruihao Dai and Pengzuo Chen\*



2152

### Stochastic dynamics of nanoparticle catalysis: a discrete-state perspective

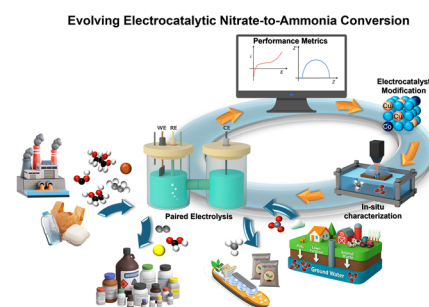
Pankaj Jangid and Srabanti Chaudhury\*



2173

### Evolving electrocatalytic nitrate-to-ammonia conversion on Cu- and Co-based catalyst engineering with paired electrolysis approaches

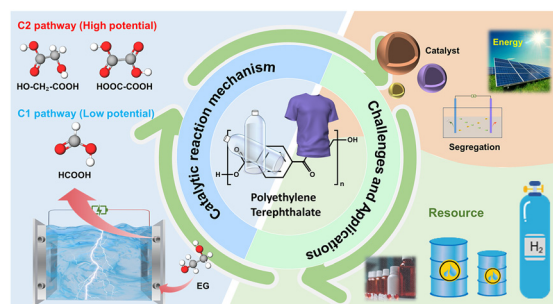
Nabilah Saafie, Noor Ashikin Mohamad, Wei Shan Koh, Xianhai Zeng, Soo Young Kim\* and Wee-Jun Ong\*



2213

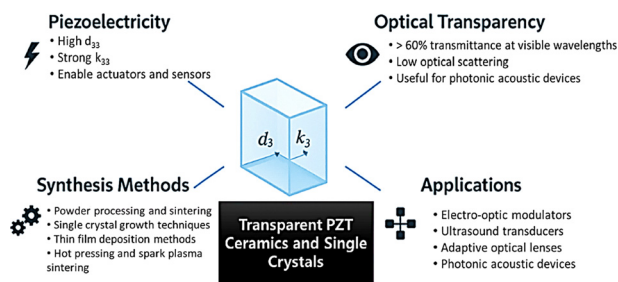
### Electrochemical recovery and regeneration of polyethylene terephthalate materials

Chao Chen, Yi Wang, Jing Tang,\* Qixuan Zhu, Yu Chu, Jiacheng Zhao, Yusuke Yamauchi,\* Guiyin Xu\* and Meifang Zhu



## REVIEWS

2232

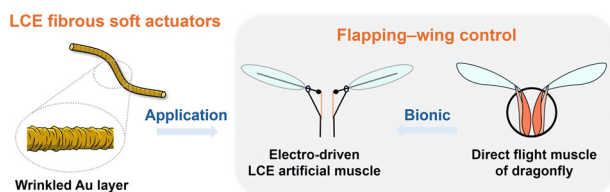


## Light-permissive piezoelectrics: advances in Pb-based transparent ceramics and crystals for next-generation devices

J. Kaarthik and Jongmoon Jang\*

## COMMUNICATIONS

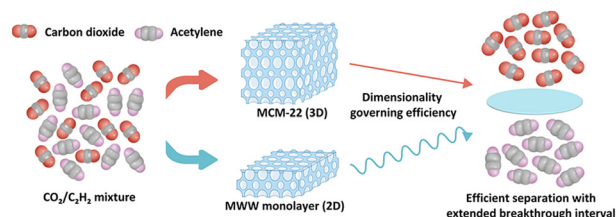
2257



## Electro-driven fibrous soft actuators towards flapping-wing control for insect-scale robots

Ruitong Song, Yangyang Fan, Wenhao Hou, Zhiming Hu, Banghan Liu, Kai Liu and Jiu-an Lv\*

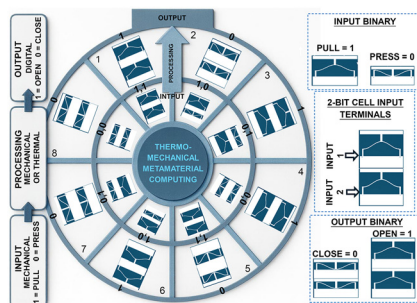
2267



## Structural dimensionality governing CO<sub>2</sub>/C<sub>2</sub>H<sub>2</sub> separation in MWW zeolites

Ang Li, Xiao-Xia Zhang, Yuqi Zhang, Mariya Shamzhy, Xing-Zhe Guo, Wan Yan, Bingwen Li,\* Xuzhi Hu,\* Rongsheng Cai\* and Feng Zhou

2275



## Digital shape-morphing thermo-mechanical metamaterials

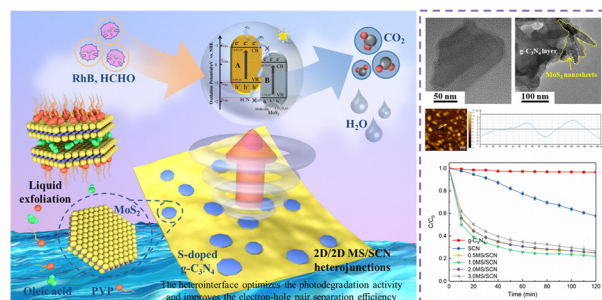
Roshira Premadasa, Zhe Wan, Pouya Almasi, Amir H. Alavi\* and Qianyun Zhang\*



2294

### Construction of hierarchical 2D/2D few-layered MoS<sub>2</sub>/S-doped g-C<sub>3</sub>N<sub>4</sub> heterojunctions for enhanced photocatalytic formaldehyde removal

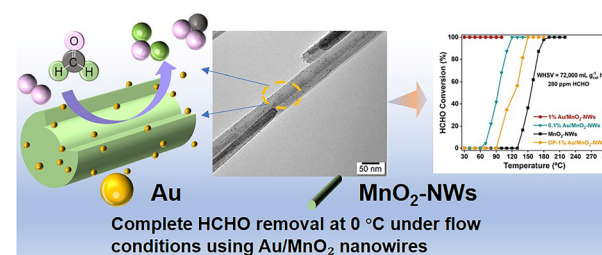
Yihao Duan, Haihua Wang,\* Guiqiang Fei, Yu Wang and Liyu Sun



2310

### Engineering oxygen vacancies in Au/MnO<sub>2</sub> catalysts for complete formaldehyde removal at near-freezing temperatures

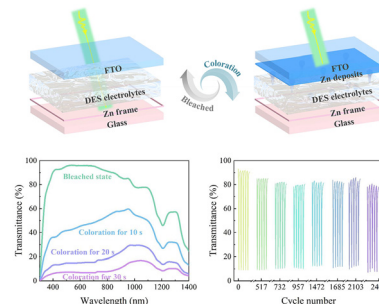
Zhenghuan Yin, Yajun He, Peiyu Huang, Wenjie Ma, Jian Liang, Tianyi Wang, Yuhao Peng, Wei Xiao and Dong Gu\*



2318

### Eutectic electrolyte enables reversible Zn electrodeposition-based electrochromic devices with large optical modulation and robust cycling stability

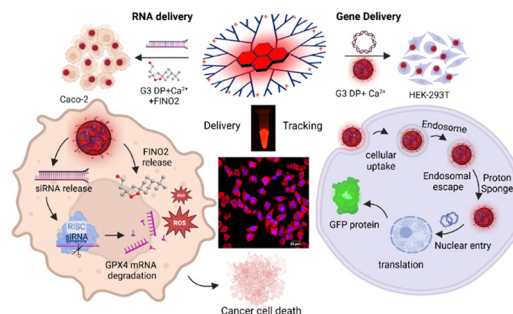
Yu Zhong, Ying Du, Xiaodan Guo, Jinhui Wang and Guofa Cai\*



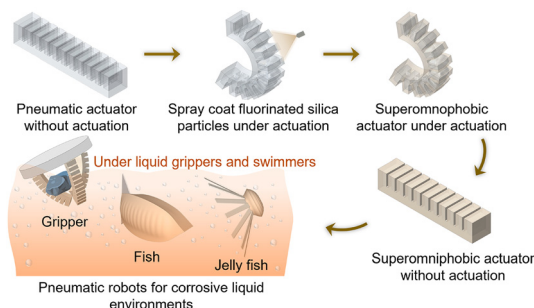
2327

### Dendrimers with a far-red NDI fluorescent core for efficient and traceable gene and RNA delivery

Hariharan Moorthy, Madhu Ramesh, Elumalai Premalatha and Thimmaiah Govindaraju\*



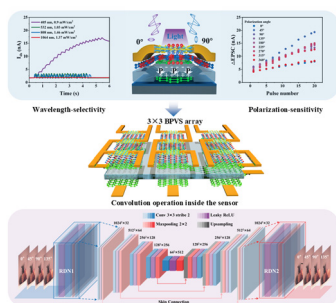
2334



### Enhancing soft robots with chemical shielding for harsh corrosive liquid environments

Haitao Qing, Sravanthi Vallabhuneni, Yinding Chi, Mohammad Javad Zarei, Pouya Sharbati, Haoze Sun, Jie Yin\* and Arun Kumar Kota\*

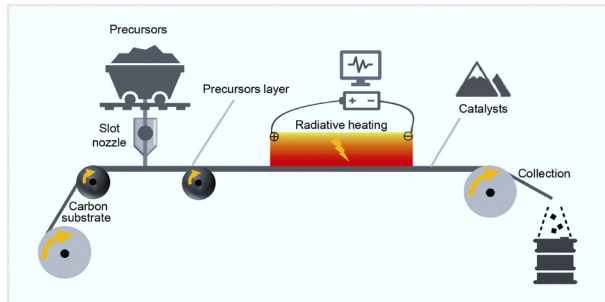
2347



### A desert locust-inspired wavelength-selective polarization vision system using two-dimensional ferroelectric heterostructures

Xiankai Lin, Qian Zhang,\* Wenbo Li, Fang Yi, Shihong Ma, Guitian Qiu, Jianxian Yi, Jiwei Chen, Yingjie Luo, Chunlei Zhang, Guigang Zhou, Ziling Chen and Qijie Liang\*

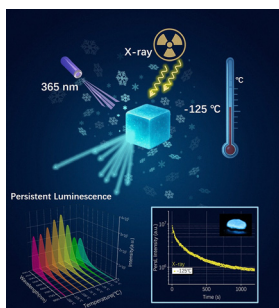
2358



### Scalable and sustainable manufacturing of intermetallic nanocrystals for economical water splitting

Mingjin Cui,\* Haijiao Liu, Ke Chen, Xinwei Shi, Bo Xu, Chenlu Jiang, Dehui Li, Ding Yuan, Yuhai Dou, Chao Wu, Menghao Yang,\* Shixue Dou and Yu Ding\*

2371



### Facilitating cryogenic blue persistent luminescence in a glassy matrix

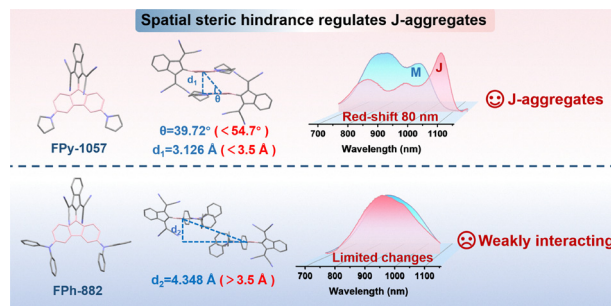
Hengli Zhu, Jiaren Du,\* Weichang Li and Hengwei Lin



2385

### Fine-tuning J-aggregation *via* steric hindrance for high-efficiency NIR-II bioimaging and photothermal therapy

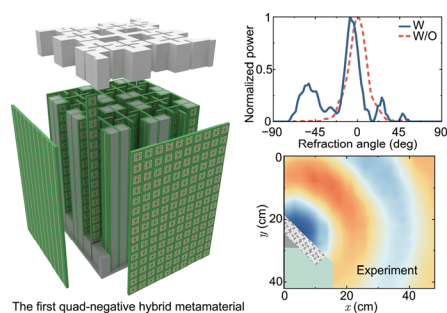
Wen-Li Xia, Xiao-Yun Ran, Yu Zhao, Hong Zhang, Xiao-Qi Yu\* and Kun Li\*



2398

### Hybrid metamaterials for decoupled electromagnetic-acoustic wave manipulation: achieving four negative constitutive parameters

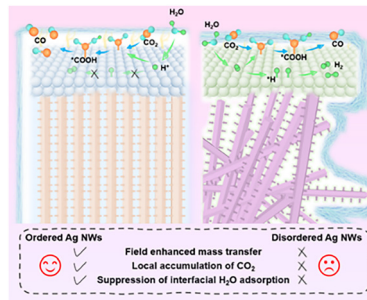
Zhaolun Yu, Tian Gan, Xiaole Wang,\* Chunyu Zhao, Zhenyu Huang and Xudong Luo\*



2409

### Ordering-induced concentration effect: a mass transport boost for CO<sub>2</sub> electroreduction

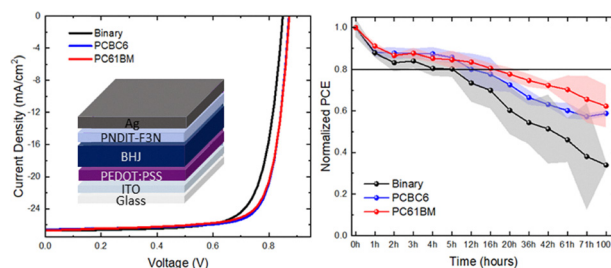
Zejun Han, Mengqian Li, Peipei Li, Wenya Fan, Chengbin Zhang, Haohao Duan, Zhijie Wang, Qingxia Chen\* and Xingchen Jiao\*



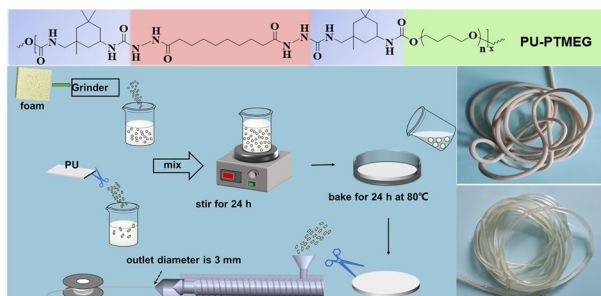
2418

### Fullerene derivative integration controls morphological behaviour and recombination losses in non-fullerene acceptor-based organic solar cells

Apostolos Panagiotopoulos, Kyriakos Almpantidis, Esther Y-H. Hung, Nikolaos Lempesis,\* Weidong Xu, George Perrakis, Sandra Jenatsch, Levon Abelian, Stoichko Dimitrov, Dimitar Kutsarov, Ehsan Rezaee, Benjamin M. Gallant, Vlad Stolojan, Konstantinos Petridis, Samuel D. Stranks, Henry J. Snaith, George Kakavelakis\* and S. Ravi P. Silva\*



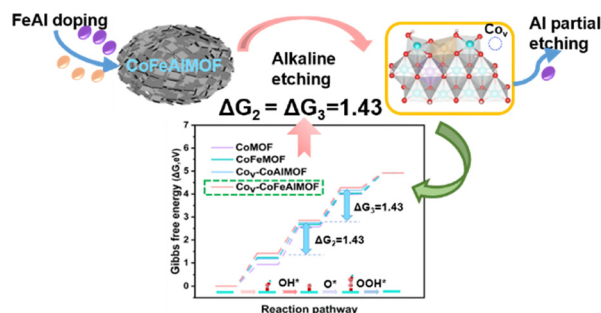
2438



### Mechanically robust polyurethane elastomers enabled by soft-segment-regulated hydrogen bonds and microphase separation for ultrasound imaging medical catheters

Yanlong Luo, Qingchuang Lu, Jianye Lu, Zuqian Chen, Chichao Li, Zhenyang Luo, Wu Cai, Cheng-Hui Li, Zhengdong Fei,\* Qingbo Lu\* and Yao Liu\*

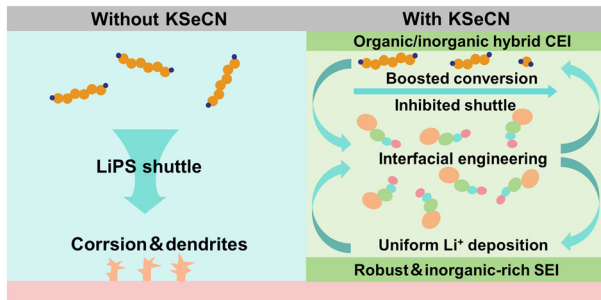
2451



### Approaching the Sabatier optimum via a triple-defect synergistic strategy for enhanced oxygen evolution reaction

Danni Yang, Jingjing Wu, Tao Li, Linfeng Yi, Riyue Ge, Ziqi Sun, Hua Kun Liu, Shi Xue Dou, Ding Yuan and Yuhai Dou\*

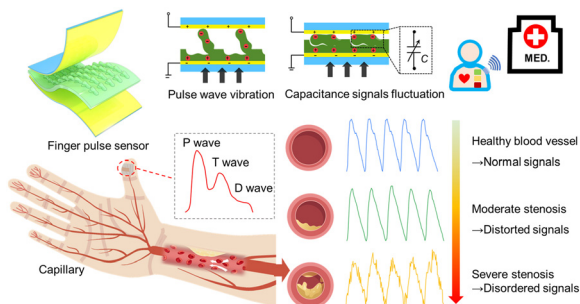
2460



### Synergistic interphase regulation with a KSeCN bifunctional additive for stable and high-performance lithium-sulfur batteries

Junpeng Rao, Yuxuan Feng, Tong Yu, Ru Xiao, Yaozu Wang, Dean Shi, Feng Li\* and Zhenhua Sun\*

2469



### Iontronic pressure sensor with a wide linearity range for "plug-and-play" fingertip pulse recording and statistical cardiovascular monitoring

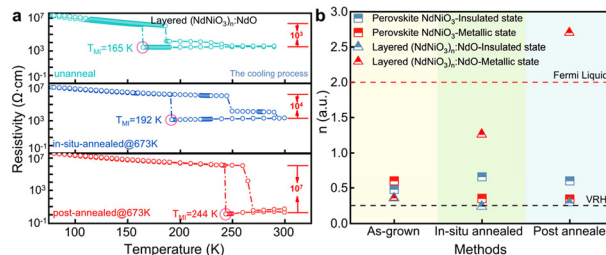
Lingyu Zhao,\* Minkun Cai, Siqi Lu, Gang Li, Xinyi Zheng and Jidong Shi\*



2479

### Oxygen-intercalated Ruddlesden–Popper nickelate: giant resistive switching and emergent multi-electronic phase control

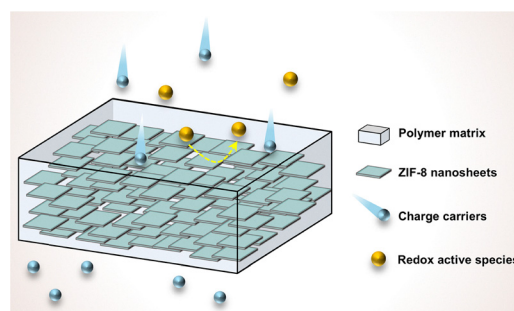
Yufei Yao, Yanan Zhao,\* Ping Li, Jie Zou, Zhilu Ye, Xuhui Zhu, Guannan Yang, Shishun Zhao, Guohua Dong, Bin Peng, Qian Li, Zhixin Guo\* and Ming Liu\*



2489

### Oriented membranes with in-plane aligned nanosheets for high-energy-efficiency zinc-based flow batteries

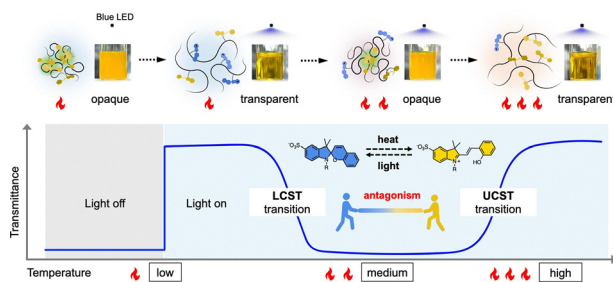
Yuqin Huang, Zhaoyang Wei,\* Zhizhang Yuan\* and Xianfeng Li\*



2498

### Reentrant phase transition *via* light–heat antagonism in a single polymer system

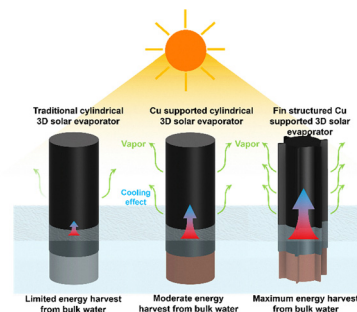
Zhaomiao Chu and Chuang Li\*



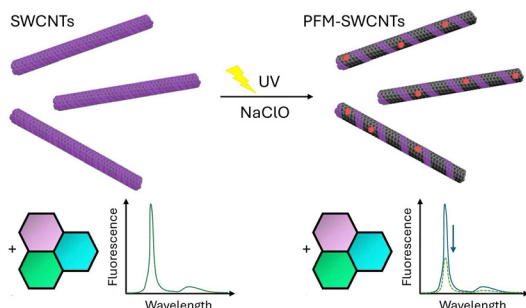
2509

### A 3D printed Cu evaporator support for record-high interfacial solar evaporation

Deyu Wang, Yiming Bu, Xuan Wu, Gary Owens and Haolan Xu\*



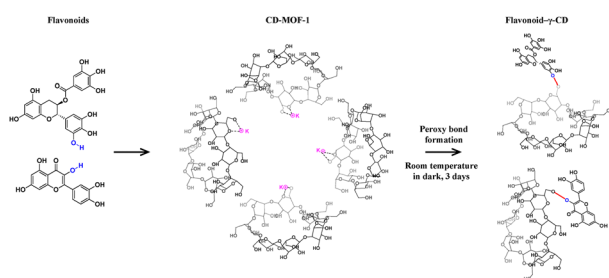
2520



### Post-functionalization modification as a modular strategy for size-selective fluorescence response of single-walled carbon nanotubes to polycyclic aromatic hydrocarbons

Srestha Basu, Dominik Just, Adi Hendler-Neumark, David Janas and Gili Bisker\*

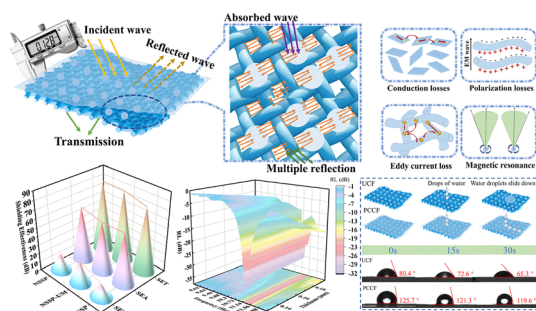
2537



### Selective spontaneous reaction of flavonoids in CD-MOF-1

Danyu Lv, Huanyu Xu, Wen Chen, Zhong Han,\* Hecheng Meng,\* Jieli Wu,\* Xin-An Zeng\* and Yongguang Guan\*

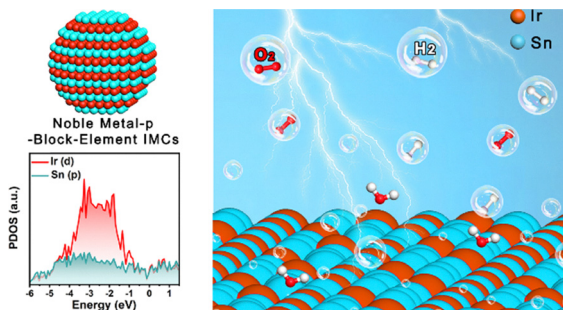
2545



### Fabrication of ultrathin flexible microwave shielding absorbers based on OA- $\gamma$ -Fe<sub>2</sub>O<sub>3</sub>/GO synergistic superstructures

Meiyan Liu, Xiuchen Wang,\* Yajing Wang, Bobo Shi, Jiaxin Feng and Zhe Liu\*

2558



### Noble metal-p-block-element intermetallics with d-p orbital hybridization for highly efficient electrocatalysis

Caihong He, Chaoqun Ma, Qinbai Yun, Jing Xia,\* Sumei Han, Huaifang Zhang, Xiao Ma, Fukai Feng, Gang Lin, Jianing Song, Bin Li, Lijie Zhu,\* An-Liang Wang, Xiangmin Meng, Wenbin Cao and Qipeng Lu\*

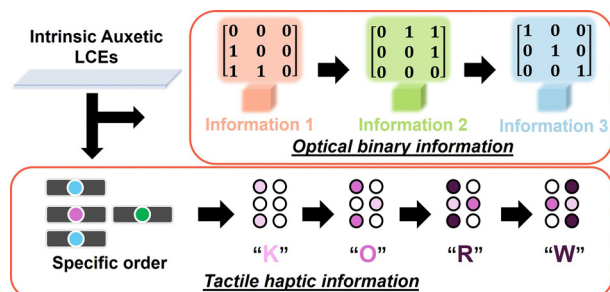


## COMMUNICATIONS

2568

**Multidimensional, multilevel information storage and encryption in auxetic liquid crystal elastomers**

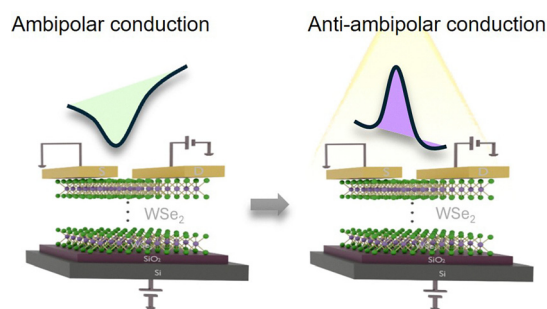
Zhenming Wang, Thomas Raistrick, Ming Cheng, Emily J. Cooper, Matthew Reynolds, Mengjia Cen, Helen F. Gleeson\* and Yan Jun Liu\*



2583

**Ambipolar to anti-ambipolar light-induced transition in WSe<sub>2</sub>-based FETs**

Kimberly Intonti,\* Adolfo Mazzotti, Aniello Pelella, Filippo Giubileo, Nadia Martucciello, Stephen O’Sullivan, Vilas Patil, Paul K. Hurley, Lida Ansari, Farzan Gity and Antonio Di Bartolomeo\*



## CORRECTION

2595

**Correction: Highly-efficient and scalable TrioN (3N0C) synaptic cell for analog process-in-memory**

Junyoung Choi, Byoungwoo Lee, Jinho Byun, Hyejin Kim, Seungkun Kim, Junyong Lee, Hyunjeong Kwak, Jeonghoon Son and Seyoung Kim\*

