

# Materials Horizons

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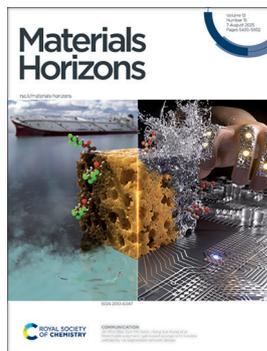
## IN THIS ISSUE

ISSN 2051-6347 CODEN MHAOAL 12(15) 5435–5932 (2025)



### Cover

See Honglong Hu, Zhi-Gang Zheng *et al.*, pp. 5654–5665. Image reproduced by permission of Zhi-Gang Zheng from *Mater. Horiz.*, 2025, 12, 5654.



### Inside cover

See Jin Woo Bae, Eun-Ho Sohn, Hong Suk Kang *et al.*, pp. 5666–5676. Image reproduced by permission of Hyebhin Yoon from *Mater. Horiz.*, 2025, 12, 5666.

## EDITORIALS

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**Materials Horizons Emerging Investigator Series:**  
Professor Lu Han, Ocean University of China, China



5449

**Humility and grit: how can PhD students deal with eco-inadequacy?**

Christian Müller,\* Helen Moffett\* and Frida Ben-Ami\*



# RSC Applied Interfaces

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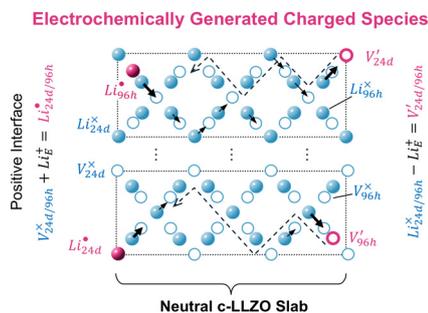
Fundamental questions  
Elemental answers

## OPINION

5453

Is the single-ion conductor cubic  $\text{Li}_7\text{La}_3\text{Zr}_2\text{O}_{12}$  a binary ionic electrolyte?

Peng Bai

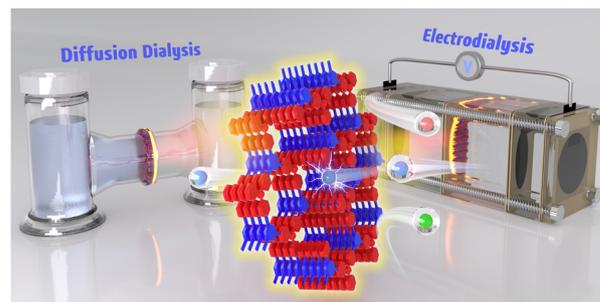


## REVIEWS

5459

## Covalent organic framework membranes for lithium extraction: facilitated ion transport strategies to enhance selectivity

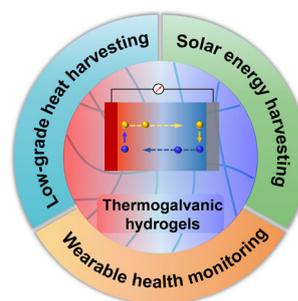
Da Lei, Yongjie Zhu, Lan-Lan Lou\* and Zhong Liu\*



5473

## Thermogalvanic hydrogels for low-grade heat harvesting and health monitoring

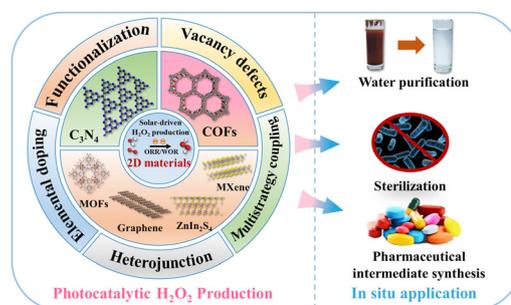
Lili Liu, Xin Guo, Ding Zhang\* and Rujun Ma\*



5492

Recent advances in photocatalytic  $\text{H}_2\text{O}_2$  production: modification strategies of 2D materials and *in situ* application of  $\text{H}_2\text{O}_2$ 

Guangyuan Chen, Chenyang Lin, Fangchong Han, Haotian Zhang, Shijian Zhou, Fu Yang, Yan Kong\* and Edison Huixiang Ang\*



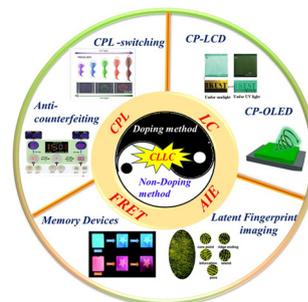


## REVIEWS

5627

## Advances in chiral luminescent liquid crystals (CLLCs): from molecular design to applications

Parthasarathy Gayathri, Sheng-Qi Qiu\* and Zhen-Qiang Yu\*

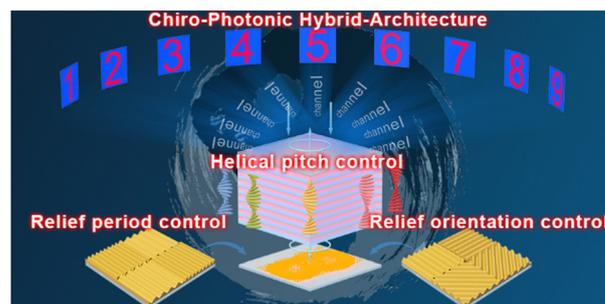


## COMMUNICATIONS

5654

## Orthogonal three-dimensional manipulation of a chiro-photonic hybrid-architecture enabling high-order information encryption

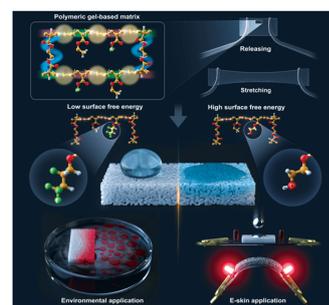
Xuan Liu, Peizhi Sun, Yifei Wang, Conglong Yuan, Honglong Hu\* and Zhi-Gang Zheng\*



5666

## Stretchable polymeric-gel-based sponge with tunable wettability via segmented network design

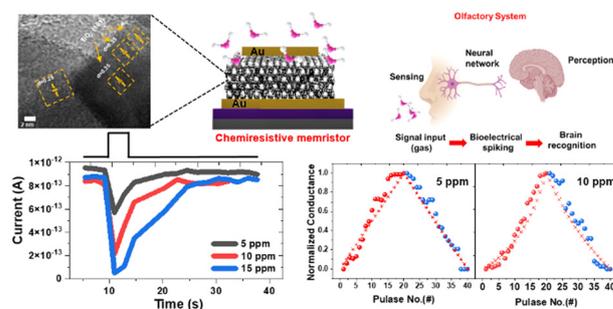
Hyebin Yoon, Ju Hyeon Kim, Jongmin Q. Kim, Jin Woo Bae,\* Eun-Ho Sohn\* and Hong Suk Kang\*



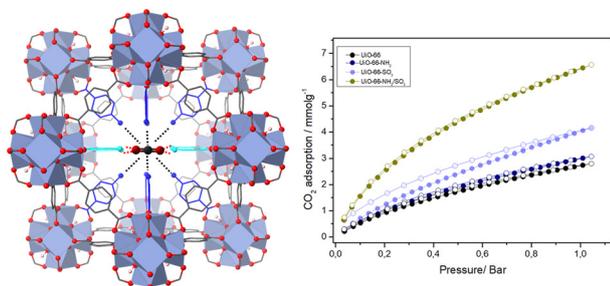
5677

## Chemically configurable analogue memristors, via the chemiresistive response of oxidized MXene

Somnath S. Kundale, Muhammad Abubakr, Jihye Park, Fernando Ordonez Morales, I Ketut Gary Devara, Windy Ayu Lestari, Riya Chatterjee, Sang Yong Nam\* and Jun Hong Park\*



5689



### Multivariate modulation of Zr<sub>6</sub> UiO-66 for enhanced cooperative CO<sub>2</sub> adsorption through defect multi-functionalisation

Carmen Rosales-Martínez, Sousa Javan Nikkhah, Marcileia Zanatta, Juan Carlos Martínez, Matthias Vandichel\* and Isabel Abánades Lázaro\*

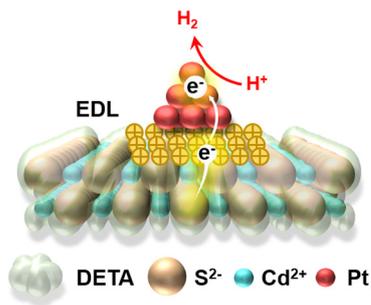
5694



### Directing CO<sub>2</sub> electroreduction to ethanol via delicate geometrical modification of copper-based alloys

Xiao Ma, Gong Zhang, Jie Du, Xiaoyun Lin, Shiyu Zhen, Dongfang Cheng, Chaoxi Wang, Xin Chang, Shican Wu, Xiangcheng Shi, Lyudmila Moskaleva, Peng Zhang, Zhi-Jian Zhao\* and Jintong Gong\*

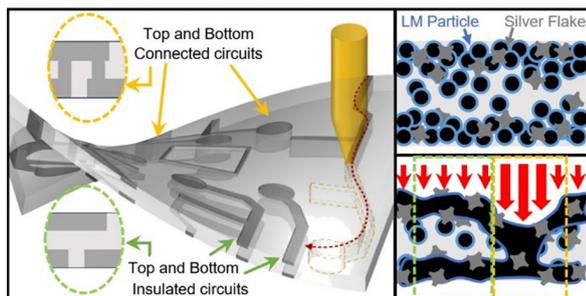
5702



### Structural amine-induced interfacial electrical double layers for efficient photocatalytic H<sub>2</sub> evolution

Jing Deng, Xinyu Xu, Bo Su, Minghui Liu,\* Xiahui Lin, Wandong Xing,\* Xue Feng Lu, Zhian Lan, Guigang Zhang and Sibao Wang\*

5710



### Reconfigurable double-sided smart textile circuit with liquid metal

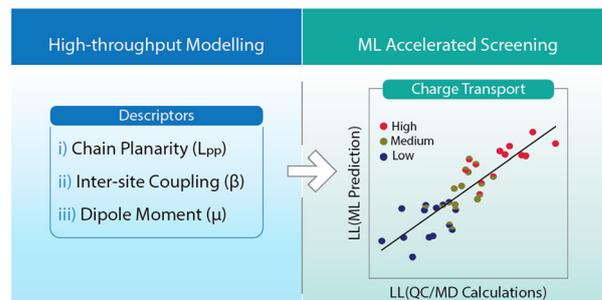
Chanho Jeong, Ki Yoon Kwon, Di Wu, Yibo Fu, Yeong-sinn Ye, Sang Gil Lee, Beomchan Kang, Lining Yao, Tae-il Kim\* and Carmel Majidi\*



5723

### Mapping the structure–function landscape of semiconducting polymers

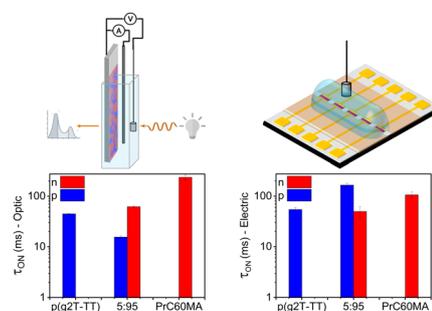
Hesam Makki,\* Colm Burke, Christian B. Nielsen and Alessandro Troisi\*



5733

### Synergistic effects in ambipolar blends of mixed ionic–electronic conductors

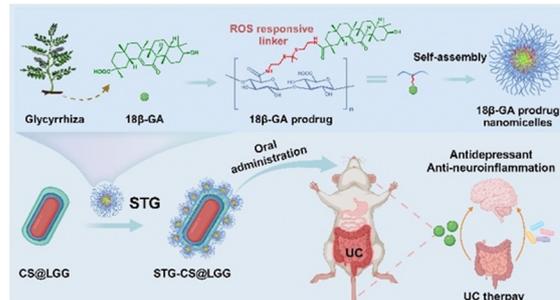
Eyal Stein, Sasha Simotko, Yogesh Yadav, Priscila Cavassin, Iain McCulloch, Natalie Banerji and Gitti L. Frey\*



5749

### Reactive oxygen species-responsive prodrug nanomicelle-functionalized *Lactobacillus rhamnosus* probiotics for amplified therapy of ulcerative colitis

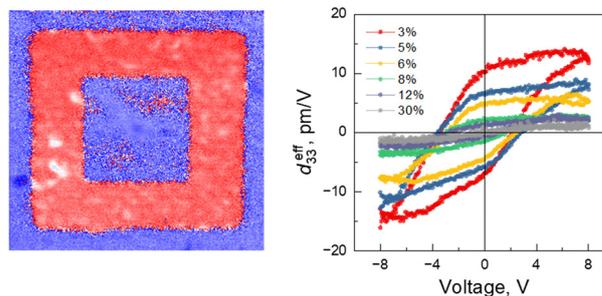
Xinyue Zhang, Shuyun Liu, Rui Xin, Wenxiu Hu, Qiqi Zhang, Qian Lu\* and Lu Han\*



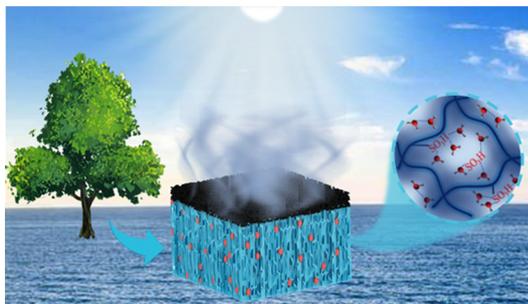
5762

### Humidity-driven modulation of ferroelectricity in hafnia–zirconia membranes

Haoze Zhang, Yufan Shen, Pankaj Sharma, Lei Wang, Dawei Zhang, Kousuke Ooe, Shunsuke Kobayashi, Yuichi Shimakawa, Daisuke Kan\* and Jan Seidel\*



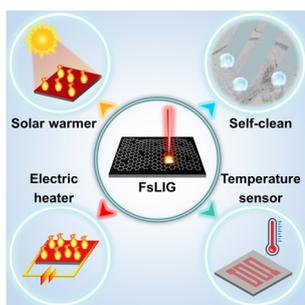
5771



### Natural wood with optimal capillary water content and evaporation enthalpy for efficient interfacial solar steam generation

Maosong Tian, Junbo Chen, Jingfu Tian, Zhihao Liang and Yuanpeng Xie\*

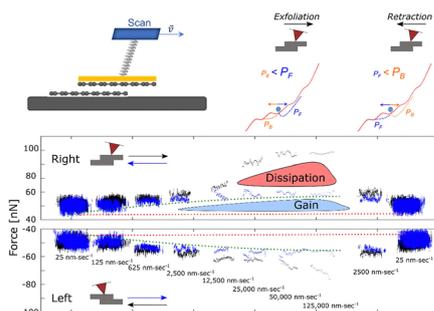
5780



### In situ construction of multifunctional femtosecond laser-induced graphene on arbitrary substrates

Lingxiao Wang, Kai Yin,\* Xun Li, Xiaolong Liu, Jianqiang Xiao, Jiaqing Pei and Xinghao Song

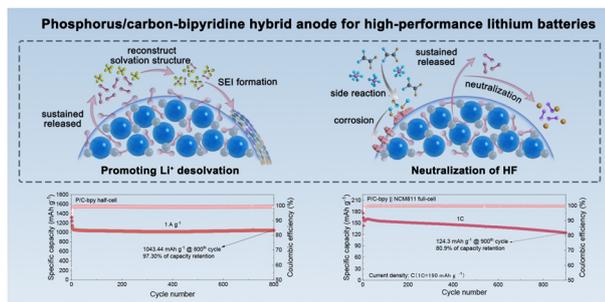
5791



### Mesoscale superlubric Brownian machine based on 2D graphitic interfaces

Keren Stein, Gautham Vijayan, Ron Bessler and Elad Koren\*

5800



### Enhancing stable and high-rate lithium ion storage through multifunctional molecular release in a phosphorus/carbon-bipyridine hybrid anode

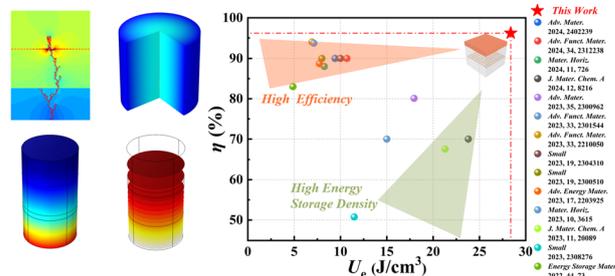
Gengchang Lai, Zhilin Huo, Haoyu Wang, Zihui Liu, Zunbin Duan, Xiaoxiao Feng, Xiaoyi Zhang, Xin Fan, Xingchen He,\* Xue-Feng Yu and Jiahong Wang\*



5811

### Ultrahigh energy storage density and efficiency in facile dual-layered PVDF/PEI-based nanocomposites via an electrical/thermal synergistic effect

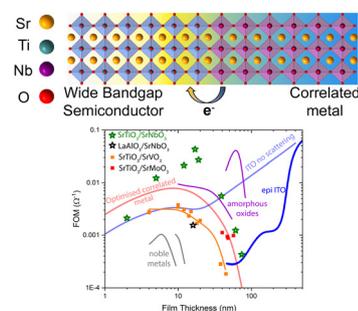
Yanlong Ma, Ying Lin,\* Yongjing Zhang, Yongzhen Ma, Binglong Zheng, Zhener Dang, Qibin Yuan\* and Haibo Yang\*



5820

### Enhanced performance in transparent conducting materials at the interface of a wide band gap semiconductor and a correlated metal

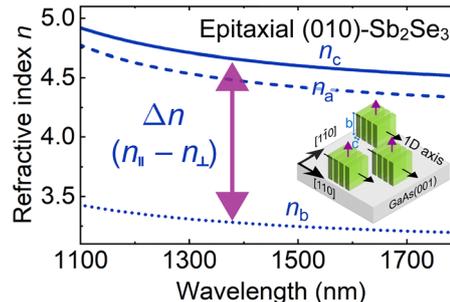
Jessica L. Stoner, Maria Batuk, Troy D. Manning, Matthew S. Dyer, Joke Hadermann, Matthew J. Rosseinsky\* and Jonathan Alaria\*



5829

### Heteroepitaxial growth of highly anisotropic Sb₂Se₃ films on GaAs

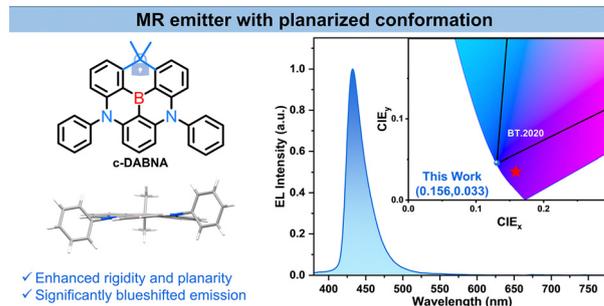
Kelly Xiao, Virat Tara, Pooja D. Reddy, Jarod E. Meyer, Alec M. Skipper, Rui Chen, Leland J. Nordin, Arka Majumdar and Kunal Mukherjee\*



5839

### Geometric control of multi-resonance backbone DABNA for narrowband deep-blue electroluminescence

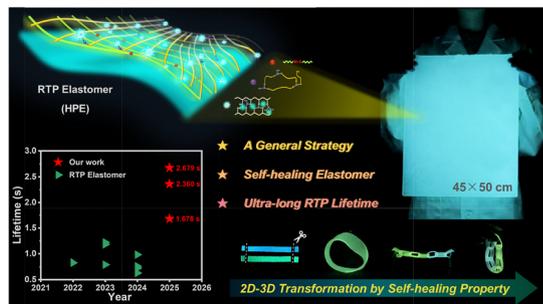
Hao Wu, Yi-Zhong Shi,\* Mo-Yuan Li, Xiao-Chun Fan, Hui Wang, Tong-Yuan Zhang, Jia Yu,\* Kai Wang\* and Xiao-Hong Zhang\*



✓ Enhanced rigidity and planarity  
✓ Significantly blueshifted emission



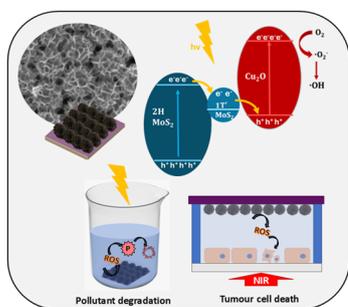
5846



## A general strategy for self-healing elastomers with ultralong room-temperature phosphorescence

Nan Li, Shiyu Gu, Qi Wu\* and Jinrong Wu\*

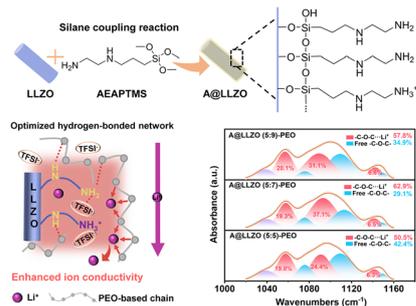
5855



## 2D MoS<sub>2</sub>/Cu<sub>2</sub>O on 3D mesoporous silica as visible-NIR nanophotocatalysts for environmental and biomedical applications

Gubakhanim Shahnazarova, Jessica C. Ramirez, Nour Al Hoda Al Bast, Jordi Fraxedas, Aritz Lafuente, Cristina Vaca, Marianna Sledzinska, Valentin Novikov, Carme Nogues, Josep Nogues, Albert Serra, Borja Sepulveda\* and Maria J. Esplandiú\*

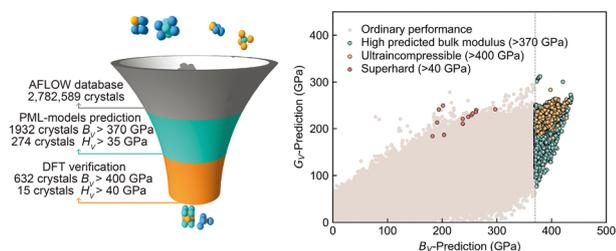
5872



## Precise regulation of hydrogen bond networks for rapid ion transport in PEO-based composite solid electrolytes

Fei Wang, Kai Chen, Xiaoxiao Li, Yan Fang, Mingjia Lu, Chao Zhang, Yue-E Miao\* and Tianxi Liu\*

5882



## Accelerated discovery of ultraincompressible, superhard materials *via* physics-enhanced active learning

Xiaoang Yuan, Bo Zhu, Chunbo Zhang, Qifan Zheng, Enlai Gao\* and Qian Shao\*

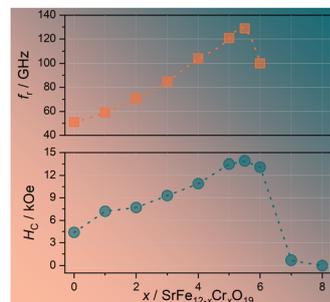


## COMMUNICATIONS

5893

### Submicron particles of Cr-substituted strontium hexaferrite: anomalous X-ray diffraction studies, hard magnetic properties, millimeter-wave absorption, and research prospects

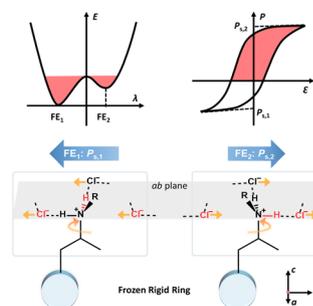
Evgeny A. Gorbachev,\* Vasily A. Lebedev, Ekaterina S. Kozlyakova, Liudmila N. Alyabyeva, Antonio Cervellino, Ilya V. Roslyakov, Iana S. Soboleva, Alexey V. Sobolev and Lev A. Trusov\*



5908

### Complex phase transition and asymmetric ferroelectricity of homochiral secondary ammonium salts

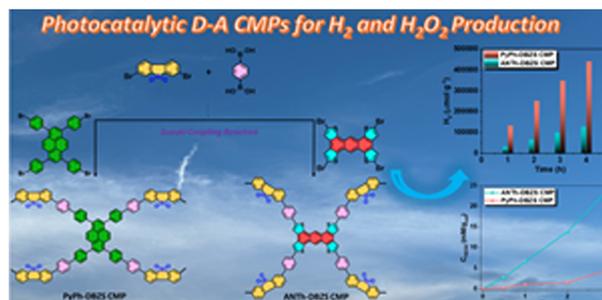
Jie Bie, Dai-Bei Yang, Wei Fa\* and Shuang Chen\*



5917

### Molecular engineering of donor–acceptor-type conjugated microporous polymers for dual effective photocatalytic production of hydrogen and hydrogen peroxide

Mohamed Gamal Mohamed,\* Islam M. A. Mekhmer, Ahmed F. H. Selim, Andreas Katsamitros, Dimitrios Tasis,\* Abdul Basit, Ho-Hsiu Chou\* and Shiao-Wei Kuo\*



## CORRECTION

5929

### Correction: Is the single-ion conductor cubic $\text{Li}_7\text{La}_3\text{Zr}_2\text{O}_{12}$ a binary ionic electrolyte?

Peng Bai

