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Energy & Environmental Science

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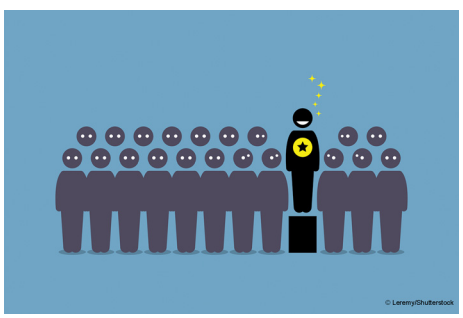
See Yanhong Li, Xiangfeng Duan, Ho Seok Park *et al.*, pp. 5387–5398. Image reproduced by permission of Ho Seok Park from *Energy Environ. Sci.*, 2024, **17**, 5387.

Inside cover
See Jang Yong Lee *et al.*, pp. 5399–5409. Image reproduced by permission of Jang Yong Lee from *Energy Environ. Sci.*, 2024, **17**, 5399.

EDITORIAL

5310

Outstanding Reviewers for *Energy & Environmental Science* in 2023

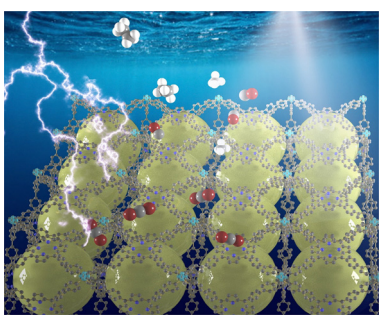


REVIEWS

5311

Porphyrin-based metal–organic frameworks for photo(electro)catalytic CO_2 reduction

Guixiang Ding, Chunxue Li, Lihui Chen and Guangfu Liao*



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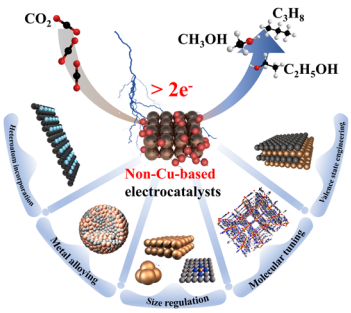
REVIEWS

5336

Revolutionizing electrochemical CO_2 reduction to deeply reduced products on non-Cu-based electrocatalysts

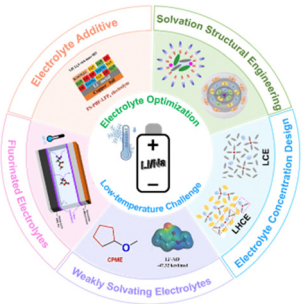
Haoming Yu, Hsiwen Wu, Yuen Leong Chow, Jun Wang* and Jie Zhang*



5365

A comprehensive review on liquid electrolyte design for low-temperature lithium/sodium metal batteries

Zhenxin Huang, Zichun Xiao, Ruoshan Jin, Zhen Li, Chengyong Shu,* Renyi Shi, Xiaowei Wang, Zexun Tang, Wei Tang* and Yuping Wu*



PAPERS

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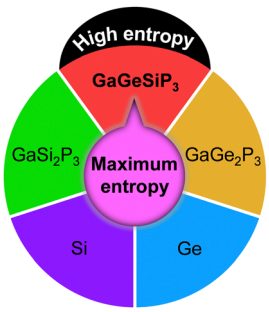
Generic synthesis of high-entropy phosphides for fast and stable Li-ion storage

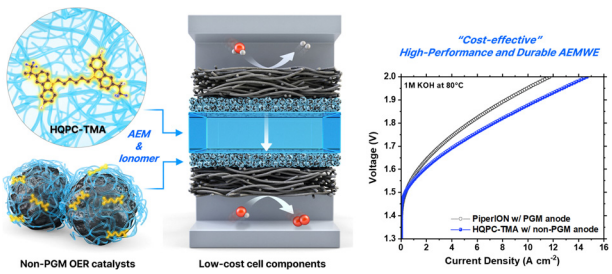
Wenwu Li, Yanhong Li,* Jeng-Han Wang, Shengchi Huang, Anjie Chen, Lufeng Yang, Jie Chen, Lunhua He, Wei Kong Pang, Lar Thomsen, Bruce Cowie, Peixun Xiong, Yucun Zhou, Gun Jang, Dong Hyun Min, Jin Suk Byun, Lei Xu, Jia-Qi Huang, Kwang Chul Roh, Seo Hui Kang, Meilin Liu, Xiangfeng Duan* and Ho Seok Park*



5399

High-performance and durable anion-exchange membrane water electrolysers with high-molecular-weight polycarbazole-based anion-conducting polymer

Sungjun Kim, Seok Hwan Yang, Sang-Hun Shin, Hye Jin Cho, Jung Kyu Jang, Tae Hoon Kim, Seong-Geun Oh, Tae-Ho Kim, HyukSu Han and Jang Yong Lee*



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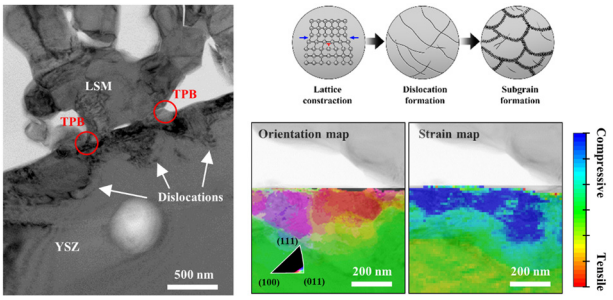
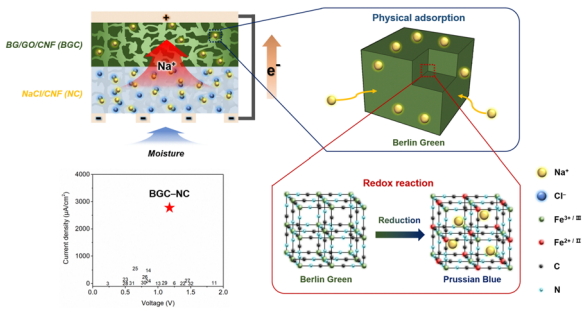


Unveiling the high-temperature degradation mechanism of solid oxide electrolysis cells through direct imaging of nanoscale interfacial phenomena

Haneul Choi, Jisu Shin, Changho Yeon, Sun-Young Park, Shin-Tae Bae, Ji Wan Kim, Jong-Ho Lee, Jin-Woo Park, Chan-Woo Lee, Kyung Joong Yoon* and Hye Jung Chang*

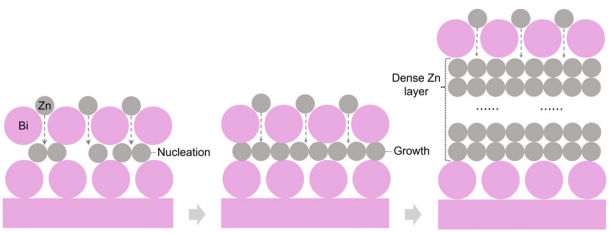
5421



Synergistic effect of a Berlin green framework for highly efficient moisture-electric energy transformation

Minjae Song, Daewoong Kim, Hyewon Lee, Hyunsoo Han and Sangmin Jeon*

5429



Sustainable interface regulation enabled by a bismuth solid-state surfactant effect for Zn-free anodes

Chen Wang, Bo Chen, Tan Wang, Gabriel Vinicius De Oliveira Silva, Zhi Xu, Guo-Xing Miao,* Yunhui Huang* and Jing Fu*

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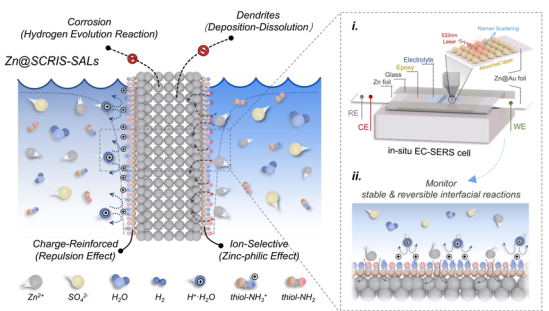

Surface charge-reinforced and ion-selective layers for stable metal zinc anode chemistry

Zhiquan Wei, Shixun Wang, Dedi Li, Shuo Yang, Songde Guo, Guangmeng Qu, Yihan Yang and Hongfei Li*

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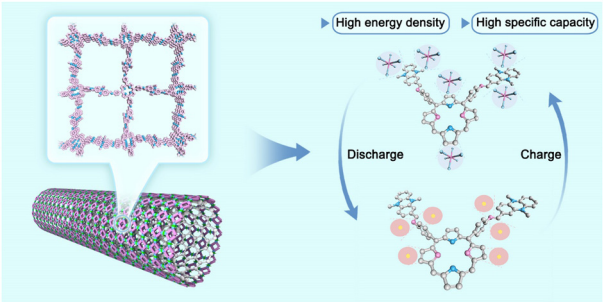
A bipolar-type covalent organic framework on carbon nanotubes with enhanced density of redox-active sites for high-performance lithium-ion batteries

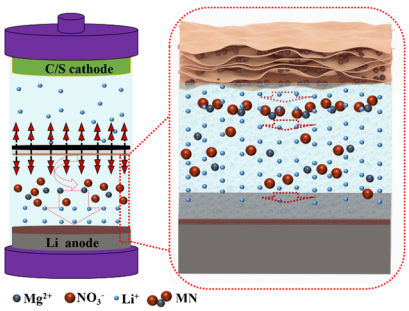
Qingmei Xu, Zhixin Liu, Yucheng Jin, Xiya Yang, Tingting Sun,* Tianyu Zheng, Ning Li, Yuhui Wang, Tongxuan Li, Kang Wang and Jianzhuang Jiang*



5461

Sustainable release of $Mg(NO_3)_2$ from a separator boosts the electrochemical performance of lithium metal as an anode for secondary batteries

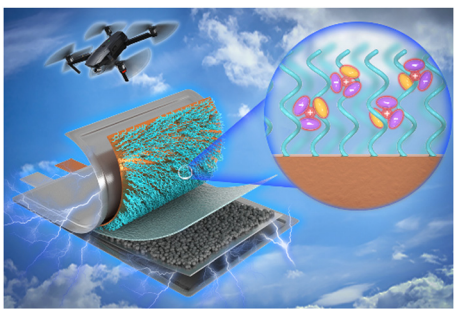
Shuang Xia, Zhifeng Lin, Bohao Peng, Xuelong Yuan, Jingzhen Du, Xinhai Yuan, Lili Liu,* Lijun Fu, Rudolf Holze and Yuping Wu*



5468

Customization nanoscale interfacial solvation structure for low-temperature lithium metal batteries

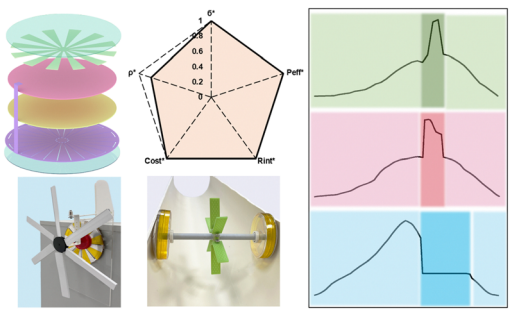
Nan Li, Kun Gao, Ke Fan, Li Ma, Zihao Li, Baoluo He, Chao Shen, Qian Ye,* Keyu Xie* and Haitao Huang*



5480

From garish to practical: synergetic effects of short-circuiting and charge-trapping for high-entropy energy harvesting

Jihong Shi, Xiangyang Zhang, Weilu Li, Xiangkun Bo, Jasim M. Almardi, Zehua Peng, Wen Jung Li, Zhong Lin Wang* and Walid A. Daoud*



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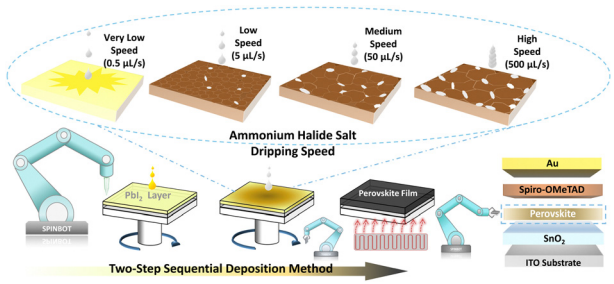

Precise control of process parameters for <23% efficiency perovskite solar cells in ambient air using an automated device acceleration platform

Jiyun Zhang,* Jianchang Wu, Anastasia Barabash, Tian Du, Shudi Qiu, Vincent M. Le Corre, Yicheng Zhao, Kaicheng Zhang, Frederik Schmitt, Zijian Peng, Jingjing Tian, Chaohui Li, Chao Liu, Thomas Heumueller, Larry Lüer, Jens A. Hauch and Christoph J. Brabec*

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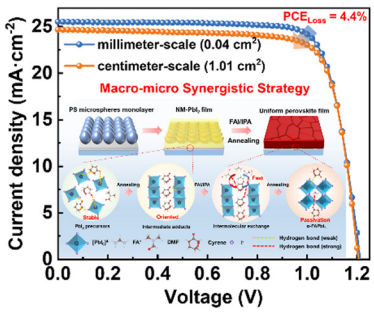
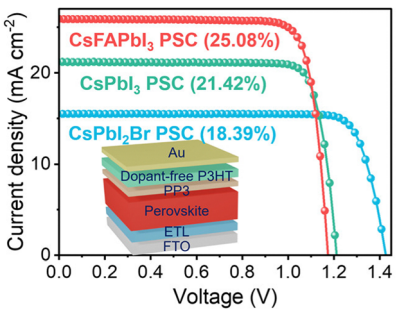


Macro–micro coordination optimization of lead iodide reactivity toward millimeter-to-centimeter-scale perovskite solar cells with minimal efficiency loss

Yang Zhong, Zhipeng Liu, Xiao Luo, Gengling Liu, Xueying Wang, Jiacheng He, Wangping Sheng, Dejian Yu, Chao Liang, Licheng Tan* and Yiwang Chen*

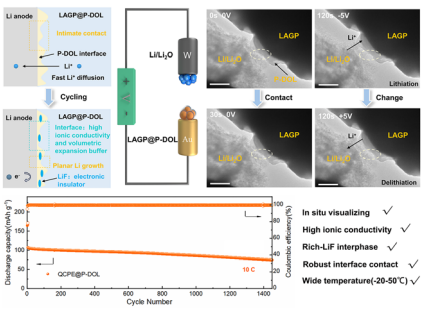
5513



Molecularly tailored perovskite/poly-(3-hexylthiophene) interfaces for high-performance solar cells

Ming-Hua Li, Xinbo Ma, Jiaju Fu, Shuo Wang, Jinpeng Wu, Run Long* and Jin-Song Hu*

5521



Stabilizing the LAGP/Li interface and *in situ* visualizing the interfacial structure evolution for high-performance solid-state lithium metal batteries

Jin Li, Junjie Chen, Xiaosa Xu, Jing Sun,* Baoling Huang* and Tianshou Zhao*

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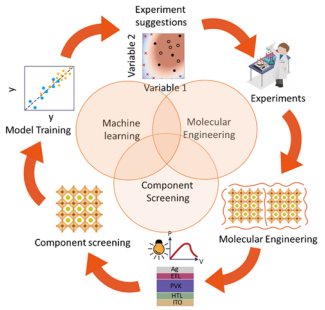
5532

Combining component screening, machine learning and molecular engineering for the design of high-performance inverted perovskite solar cells

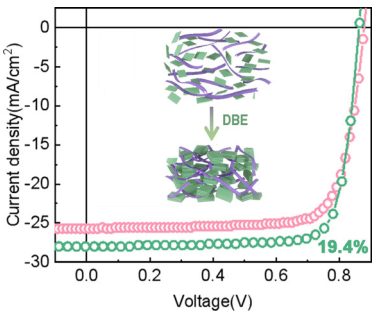
Boxue Zhang, Huaibiao Zeng, Haomiao Yin, Daming Zheng, Zhongquan Wan, Chunyang Jia, Thijs Stuyver,* Junsheng Luo* and Thierry Pauporté*



5542

Ameliorated trap density and energetic disorder *via* a strengthened intermolecular interaction strategy to construct efficient non-halogenated organic solar cells

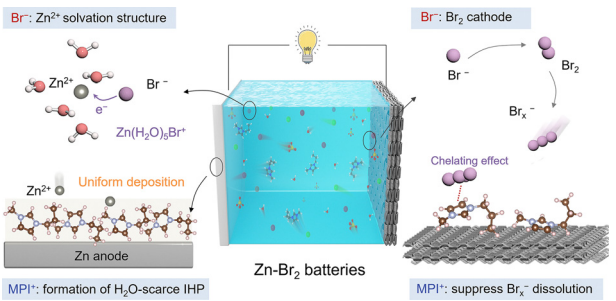
Shenzheng Gao, Yimin Zhang, Seonghun Jeong, Xinjie Zhou, Hao Xu, Shanlei Xu, Daqiang Chen, Wenzhu Liu, Changduk Yang,* Sheng Meng,* Weiguo Zhu and Xin Song*



5552

Fully exploited imidazolium bromide for simultaneous resolution of cathode and anode challenges in zinc–bromine batteries

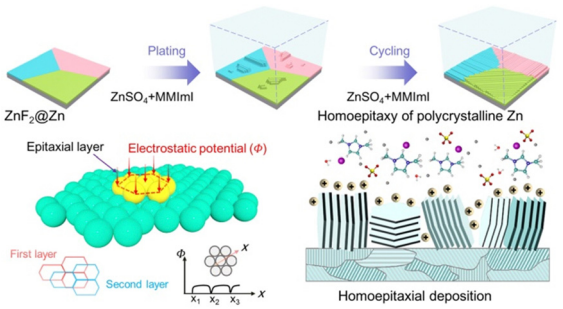
Linyu Hu, Chunlong Dai, Yudong Zhu, Xu Hou, Zhimeng Liu, Xin Geng, Hailong Wang, Jing Chen, Nuo Sun, Qinlang Rong, Yuhao Zhu, Xin He* and Yuanjing Lin*



5563

Facet-governed Zn homoepitaxy *via* lattice potential regulation

Xianzhong Yang, Yan Lu, Zhetong Liu, Haoqing Ji, Ziyan Chen, Jun Peng, Yiwen Su, Yuhan Zou, Chao Wu, Shixue Dou, Peng Gao,* Zaiping Guo* and Jingyu Sun*



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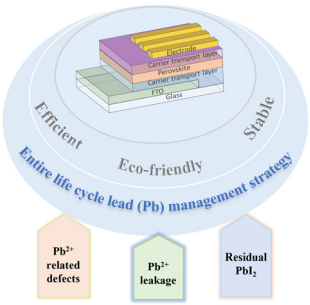
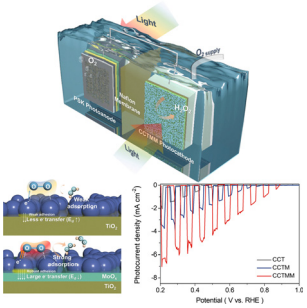


Lead (Pb) management in the entire life cycle of highly efficient and stable perovskite solar cells

Kai Liu, Tianxiang Hu, Zenghua Cai, Fengcai Liu, Saqib Rafique, Xiaoguo Li, Liangliang Deng, Chongyuan Li, Yanyan Wang, Qiang Guo, Xiaofei Yue, Jiao Wang, Yingguo Yang, Chunxiao Cong, Shiyou Chen, Jia Zhang, Anran Yu* and Yiqiang Zhan*

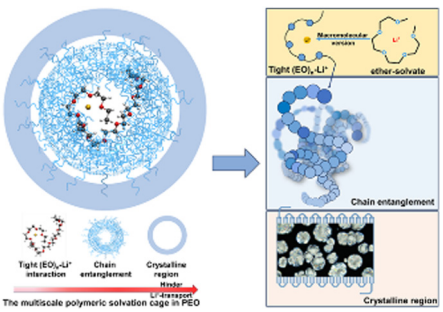
5588



Unassisted photoelectrochemical hydrogen peroxide production over MoO_x-supported Mo on a Cu_3BiS_3 photocathode

Subin Moon, Young Sun Park, Hyungsoo Lee, Wooyong Jeong, Eunji Kwon, Jeongyoub Lee, Juwon Yun, Soobin Lee, Jun Hwan Kim, Seungho Yu and Jooho Moon*

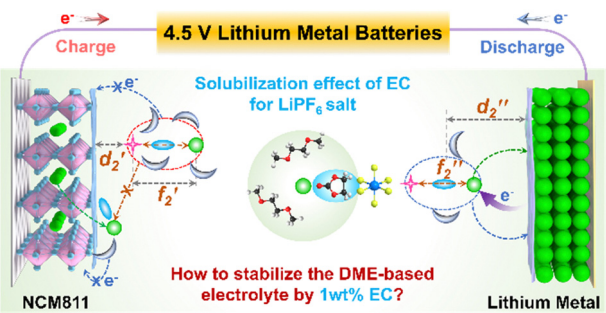
5601



The deconstruction of a polymeric solvation cage: a critical promotion strategy for PEO-based all-solid polymer electrolytes

Ruiyang Li, Haiming Hua, Xueying Yang, Jianling Tian, Qichen Chen, Rongwei Huang, Xue Li, Peng Zhang* and Jinbao Zhao*

5613



Trace ethylene carbonate-mediated low-concentration ether-based electrolytes for high-voltage lithium metal batteries

Yinghua Chen, Zheng Ma, Yuqi Wang, Pushpendra Kumar, Fei Zhao, Tao Cai, Zhen Cao, Luigi Cavallo, Haoran Cheng, Qian Li and Jun Ming*

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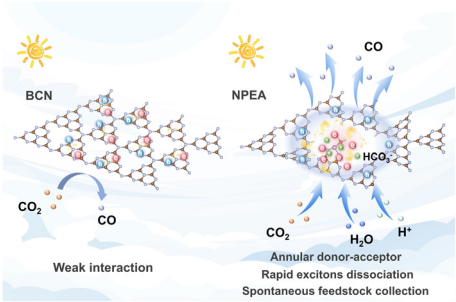
5627

Engineering an annular donor–acceptor reaction chamber with spontaneous feedstock collection for boosting CO_2 photoreduction

Zhanpeng Zhou, Hao Zeng, Chengyang Feng,* Ling Li, Rongdi Tang, Wenbo Li, Ying Huang* and Yaocheng Deng*



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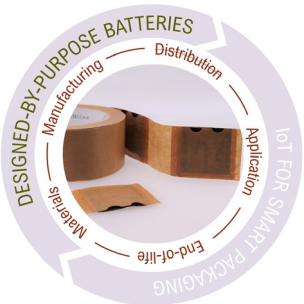
Designed-by-purpose power sources: a cardboard primary battery for smart packaging

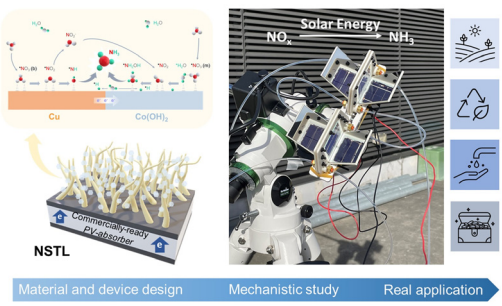
Marina Navarro-Segarra,* Omar A. Ibrahim, Iñigo Martin-Fernandez, Carles Tortosa, Joseba M. Ormaetxea, Manuel Baumann, Marcel Weil and Juan Pablo Esquivel*



5653

Nanostructured hybrid catalysts empower the artificial leaf for solar-driven ammonia production from nitrate

Chen Han, Caixia Li, Jodie A. Yuwono, Ziheng Liu, Kaiwen Sun, Kai Wang, Guojun He, Jialiang Huang, Priyank V. Kumar, Jitraporn Vongsvivut, Jialin Cong, Hamid Mehrvarz, Zhaojun Han, Xunyu Lu, Jian Pan,* Xiaojing Hao* and Rose Amal*



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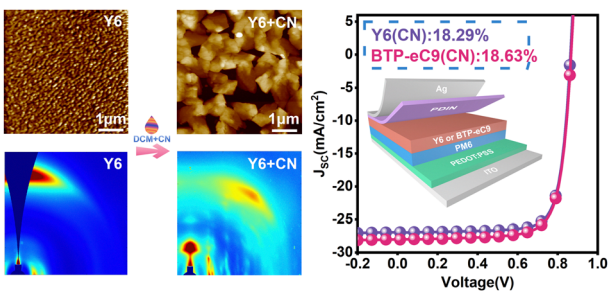
Room-temperature-modulated polymorphism of nonfullerene acceptors enables efficient bilayer organic solar cells

Zhenmin Zhao, Sein Chung, Young Yong Kim, Minyoung Jeong, Xin Li, Jingjing Zhao, Chaofeng Zhu, Safakath Karuthedath, Yufei Zhong, Kilwon Cho and Zhipeng Kan*



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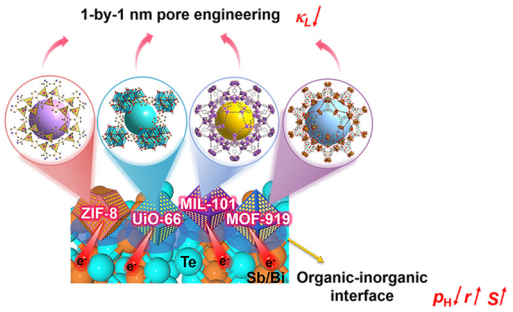
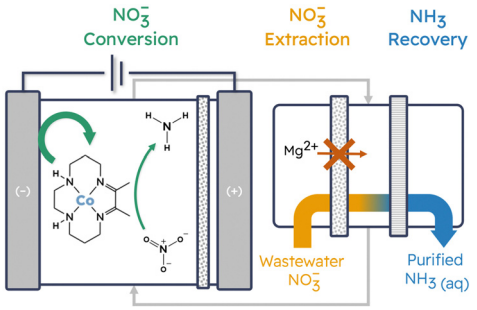


Thermally stable inorganic $Bi_{0.4}Sb_{1.6}Te_3$/metal–organic framework (MOF) composites with 1-by-1 nm pore engineering towards mid-temperature thermoelectrics

Wanjia Zhang, Bassem A. Al-Maythalony, Fengxian Gao, Fanshi Wu, Wei Zhao, Pengfei Xu, Wenhua Zhang, Cailing Chen, Zhan Shi, Xiyang Wang,* Yue Lou* and Biao Xu*

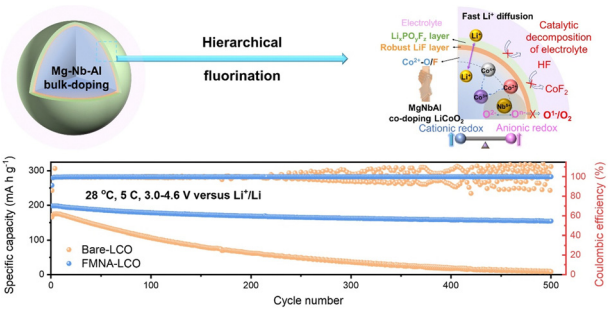
5691



Engineering a molecular electrocatalytic system for energy-efficient ammonia production from wastewater nitrate

Dean M. Miller, Matthew J. Liu, Kristen Abels, Anna Kogler, Kindle S. Williams and William A. Tarpeh*

5706



A surface-to-bulk tuning deep delithiation strategy for 5C fast-charging 4.6 V $LiCoO_2$

Zhihong Bi, Zonglin Yi, Anping Zhang, Cong Dong, Gongrui Wang, Lijing Xie, Shihao Liao, Hanqing Liu, Chengmeng Chen* and Zhong-Shuai Wu*

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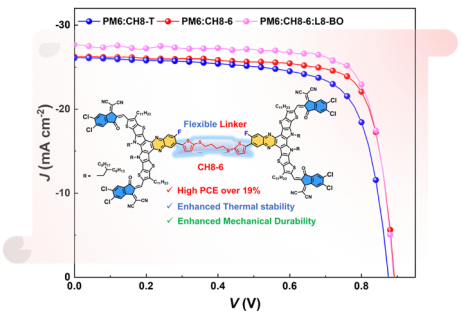

Rational design of flexible-linked 3D dimeric acceptors for stable organic solar cells demonstrating 19.2% efficiency

Zhe Zhang, Shaohui Yuan, Tianqi Chen, Jia Wang, Yuan-Qiu-Qiang Yi, Bin Zhao, Miaomiao Li, Zhaoyang Yao, Chenxi Li, Xiangjian Wan, Guankui Long, Bin Kan* and Yongsheng Chen*

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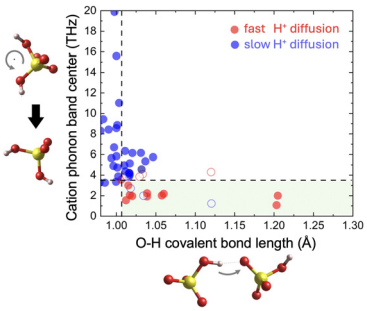
Uncovering fast solid-acid proton conductors based on dynamics of polyanion groups and proton bonding strength

Pjotrs Žguns, Konstantin Klyukin, Louis S. Wang, Grace Xiong, Ju Li, Sossina M. Haile and Bilge Yildiz*



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