

# Energy & Environmental Science

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ISSN 1754-5706 CODEN EESNBY 16(9) 3625-4106 (2023)



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### Inside cover

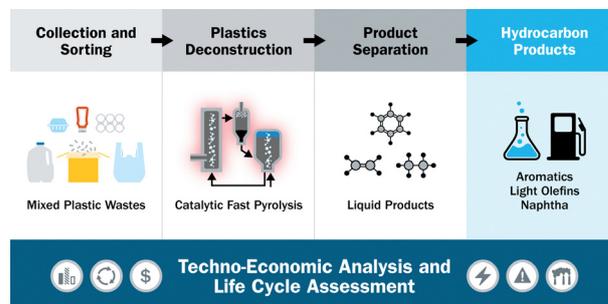
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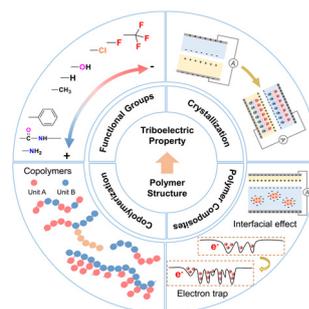


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### Design and synthesis of triboelectric polymers for high performance triboelectric nanogenerators

Xinglin Tao, Xiangyu Chen\* and Zhong Lin Wang\*



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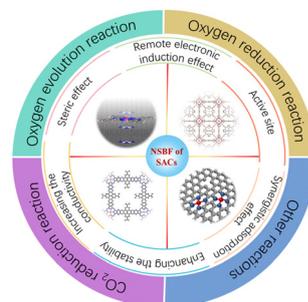


## REVIEWS

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### Regulating nonmetallic species beyond the first coordination shell of single-atom catalysts for high-performance electrocatalysis

Wenpeng Ni, Houjun Chen, Junfeng Zeng, Yan Zhang, Hussein A. Younus, Zhouliangzi Zeng, Minyang Dai, Wei Zhang and Shiguo Zhang\*

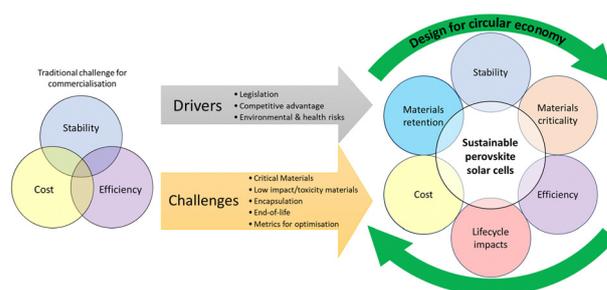


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### Circular economy for perovskite solar cells – drivers, progress and challenges

Rhys G. Charles,\* Alex Doolin, Rodrigo Garcia-Rodríguez, Karen Valadez Villalobos and Matthew L. Davies\*

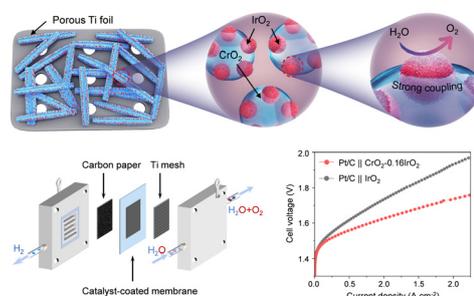


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### A robust chromium–iridium oxide catalyst for high-current–density acidic oxygen evolution in proton exchange membrane electrolyzers

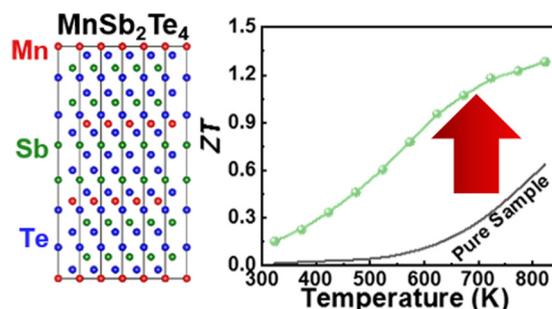
Shiyu Ge, Ruikuan Xie, Bing Huang, Zhiyuan Zhang, Heming Liu, Xin Kang, Shuqi Hu, Shaohai Li, Yuting Luo, Qiangmin Yu,\* Jingwei Wang, Guoliang Chai,\* Lunhui Guan, Hui-Ming Cheng and Bilu Liu\*



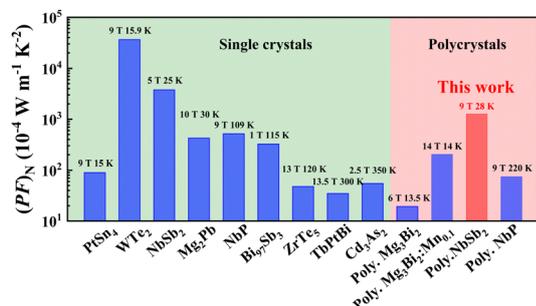
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### Microstructural iterative reconstruction toward excellent thermoelectric performance in MnTe

Yiyuan Luo, Jinghan Wang, Jianmin Yang, Dasha Mao, Juan Cui, Baohai Jia, Xusheng Liu, Kornelius Nielsch, Xiao Xu\* and Jiaqing He\*



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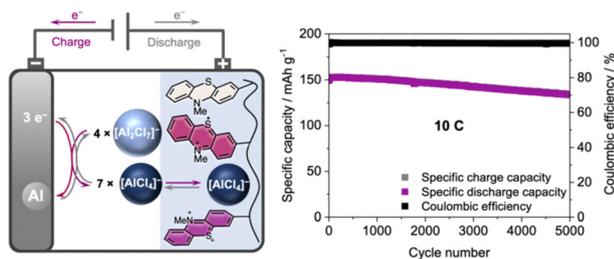


### A giant Nernst power factor and figure-of-merit in polycrystalline NbSb<sub>2</sub> for Ettingshausen refrigeration

Peng Li, Pengfei Qiu,\* Jie Xiao, Tingting Deng, Lidong Chen and Xun Shi\*

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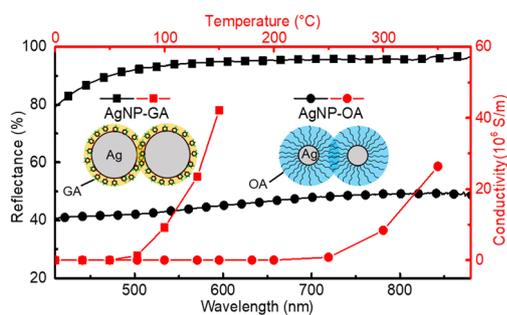
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### On a high-capacity aluminium battery with a two-electron phenothiazine redox polymer as a positive electrode

Gauthier Studer, Alexei Schmidt, Jan Büttner, Maximilian Schmidt, Anna Fischer, Ingo Krossing\* and Birgit Esser\*

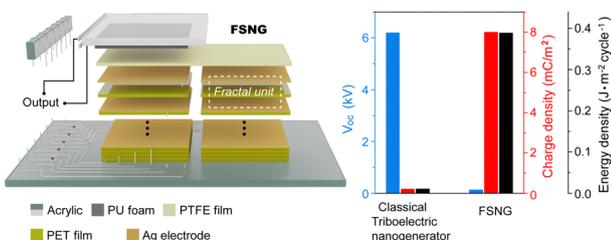
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### A bottom-up understanding of the ligand-dominated formation of metallic nanoparticle electrodes with high broadband reflectance for enabling fully solution-processed large-area organic solar cells

Jiawei Zheng, Xinjun He, Yuniu Zhang, Benzhen Lyu, Jinwook Kim, Shiang Li, Xinhui Lu, Haibin Su\* and Wallace C. H. Choy\*

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### Collecting the space-distributed Maxwell's displacement current for ultrahigh electrical density of TENG through a 3D fractal structure design

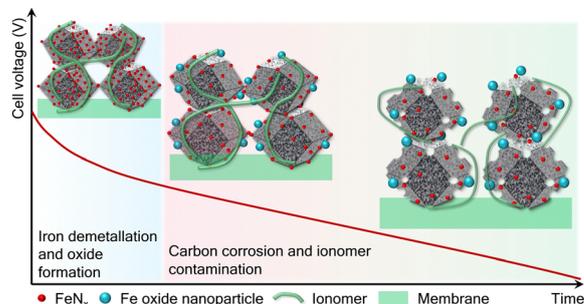
Li Ang Zhang, Shuhai Liu, Juan Wen, Xiaoqing Huo, Bolang Cheng, Zhiyi Wu, Longfei Wang,\* Yong Qin\* and Zhong Lin Wang\*



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### Operando deconvolution of the degradation mechanisms of iron–nitrogen–carbon catalysts in proton exchange membrane fuel cells

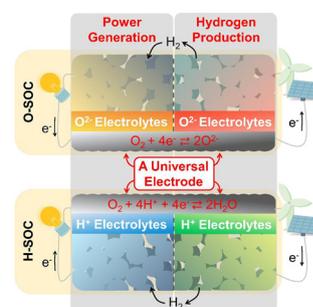
Shiyang Liu, Quentin Meyer, Chen Jia, Shuhao Wang, Chengli Rong, Yan Nie and Chuan Zhao\*



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### An universal oxygen electrode for reversible solid oxide electrochemical cells at reduced temperatures

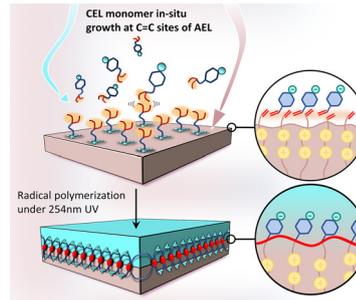
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### A chemically interlocked bipolar membrane achieving stable water dissociation for high output ammonia electro-synthesis

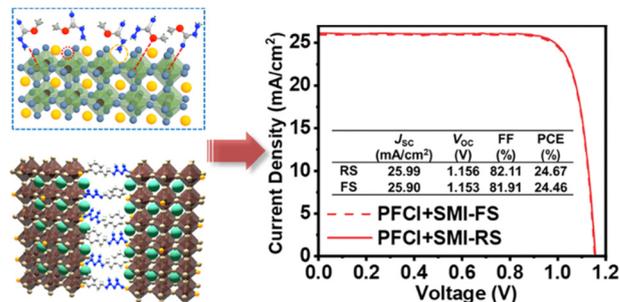
Ziang Xu, Yiwen Liao, Maobin Pang, Lei Wan, Qin Xu, Yihan Zhen and Baoguo Wang\*



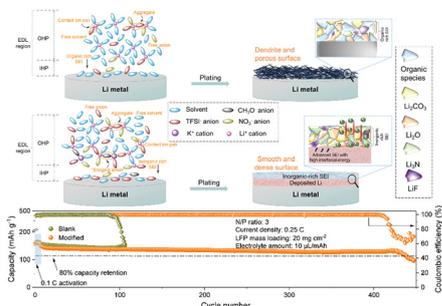
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### Crystallization manipulation and holistic defect passivation toward stable and efficient inverted perovskite solar cells

Cong Zhang, Haiyun Li, Cheng Gong, Qixin Zhuang, Jiangzhao Chen\* and Zhigang Zang\*



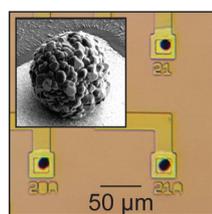
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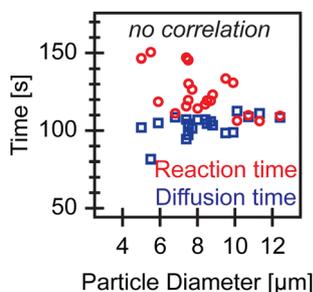
### Prolonging the cycling lifetime of lithium metal batteries with a monolithic and inorganic-rich solid electrolyte interphase

Jinlin Yang,\* Menghao Li, Zejun Sun, Xu Lian, Yanan Wang, Yuxiang Niu, Chonglai Jiang, Yani Luo, Yuan Liu, Zhangliu Tian, Yu Long, Kun Zhang, Pengcheng Yu, Jia Zhang, Zeheng Wang, Gang Wu,\* Meng Gu\* and Wei Chen\*

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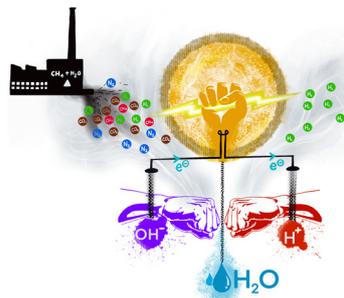
Single-particle electrochemistry of battery cathodes



### Direct measurements of size-independent lithium diffusion and reaction times in individual polycrystalline battery particles

Jinhong Min, Lindsay M. Gubow, Riley J. Hargrave, Jason B. Siegel and Yiyang Li\*

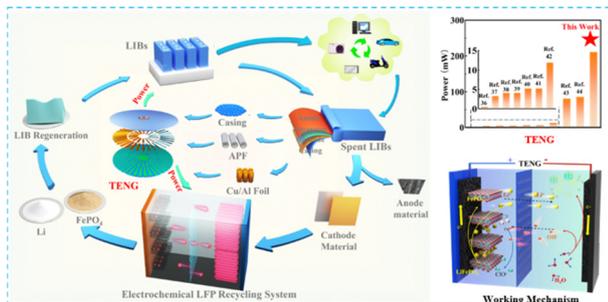
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### A spontaneous hydrogen fuel purifier under truly ambient weather conditions

Ritwik Mondal, Ravikumar Thimmappa, Bhojkumar Nayak, Anweshi Dewan, Mruthyunjayachari Chattanahalli Devendrachari, Qingsong Chen, Zhenhai Wen\* and Musthafa Ottakam Thotiyi\*

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### Self-powered recycling of spent lithium iron phosphate batteries via triboelectric nanogenerator

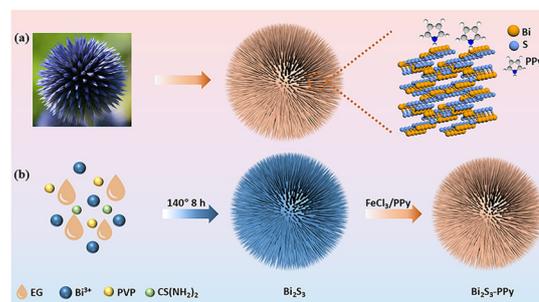
Baofeng Zhang, Lixia He, Jing Wang, Yuebo Liu, Xu Xue, Shengnan He, Chuguo Zhang, Zhihao Zhao, Linglin Zhou, Jie Wang\* and Zhong Lin Wang



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### Bio-inspired engineering of $\text{Bi}_2\text{S}_3$ -PPy composite for the efficient electrocatalytic reduction of carbon dioxide

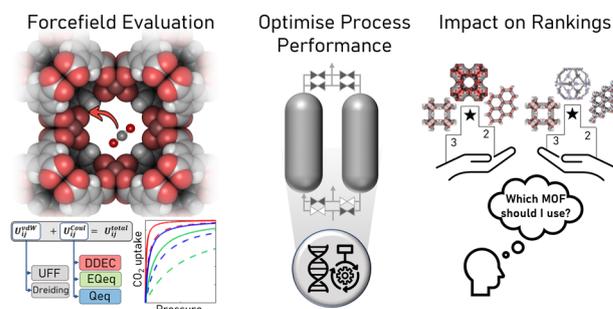
Chengjin Li, Zhengzheng Liu, Xiaoxia Zhou,\*  
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Gengfeng Zheng\* and Hangrong Chen\*



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### A process-level perspective of the impact of molecular force fields on the computational screening of MOFs for carbon capture

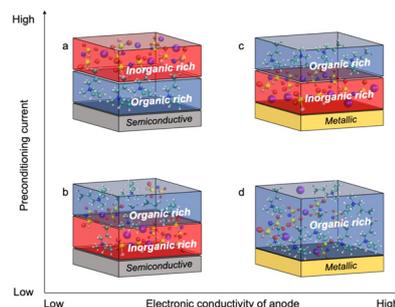
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Binquan Luan, Mathias Steiner and Lev Sarkisov



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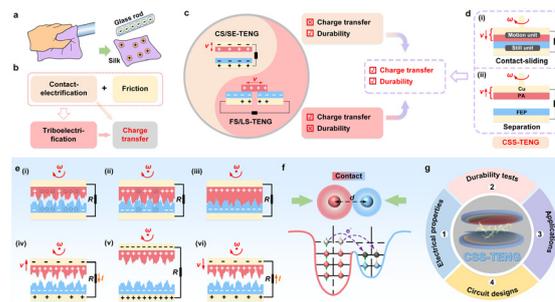
Dmitrii A. Rakov,\* Ju Sun, Pavel V. Cherepanov,  
Khrysllyn Arano, Patrick C. Howlett, Alexandr N. Simonov,  
Fangfang Chen\* and Maria Forsyth\*



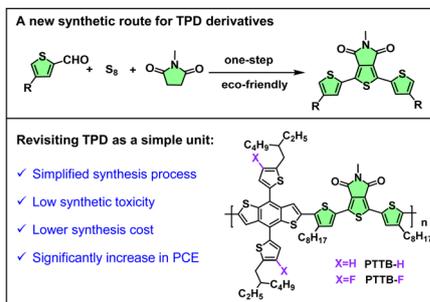
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### Contact-sliding-separation mode triboelectric nanogenerator

Yang Yu, Qi Gao, Xiaosong Zhang, Da Zhao, Xiao Xia,  
Jianlong Wang, Hengyu Li,\* Zhong Lin Wang\* and  
Tinghai Cheng\*



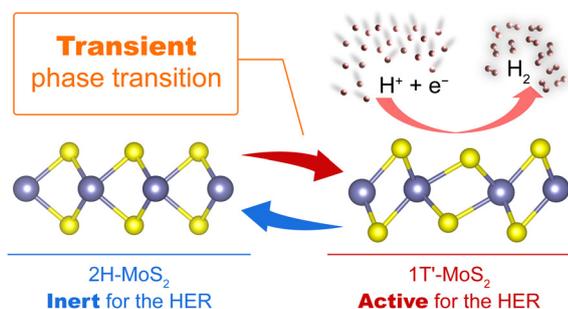
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### A facile synthetic approach based on thieno[3,4-c]pyrrole-4,6-dione to construct polymer donors for highly efficient organic solar cells

Lin-Yong Xu, Yuan Gao, Wei Wang, Yiming Shao, Mingxia Chen, Xinrong Yang, Yuang Fu, Meimei Zhang, Xinhui Lu, Rui Sun and Jie Min\*

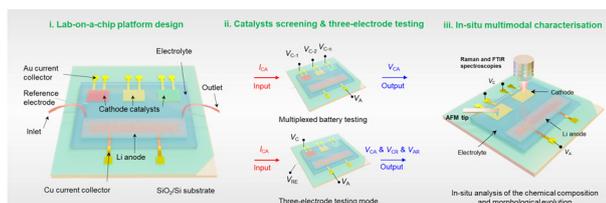
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### Transient phase transition during the hydrogen evolution reaction

Yinghe Zhao,\* Haobo Li, Ruoyu Yang, Shuxian Xie, Teng Liu, Pengyu Li, Youwen Liu, Huiqiao Li, Fa Yang\* and Tianyou Zhai\*

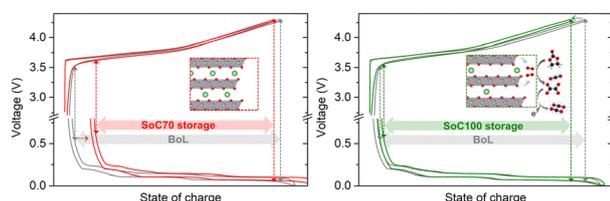
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### Developing highly reversible Li-CO<sub>2</sub> batteries: from on-chip exploration to practical application

Manman Wang, Kai Yang,\* Yuchen Ji, Xiaobin Liao, Guangpeng Zhang, Mateus G. Masteghin, Nianhua Peng, Filipe Richheimer, Huanxin Li, Jianan Wang, Xinhua Liu, Shichun Yang, Enrico Petrucco, Paul Shearing, Fernando A. Castro, S. Ravi P. Silva, Yan Zhao, Feng Pan\* and Yunlong Zhao\*

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### Paradoxical role of structural degradation of nickel-rich layered oxides in capacity retention upon storage of lithium-ion batteries

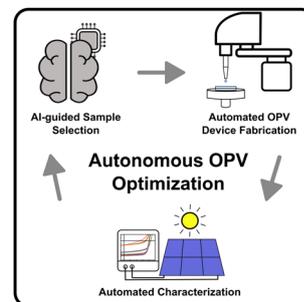
Hyejeong Hyun, Hyojung Yoon, Subin Choi, Juri Kim, So Young Kim, Tom Regier, Zachary Arthur, SeokKoo Kim and Jongwoo Lim\*



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### Autonomous optimization of an organic solar cell in a 4-dimensional parameter space

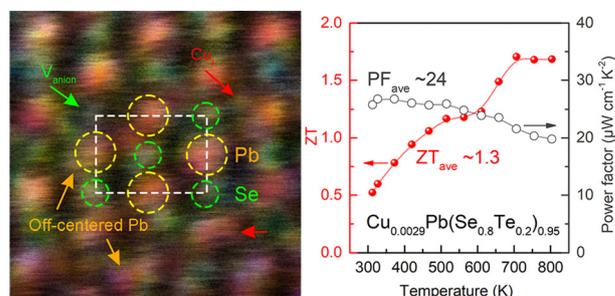
Tobias Osterrieder,\* Frederik Schmitt, Larry Lürer,\*  
Jerrit Wagner, Thomas Heumüller, Jens Hauch and  
Christoph J. Brabec\*



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### Engineering an atomic-level crystal lattice and electronic band structure for an extraordinarily high average thermoelectric figure of merit in n-type PbSe

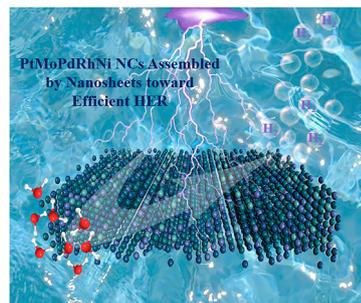
Bangzhi Ge, Hyungseok Lee, Jino Im, Youngsu Choi,  
Shin-Yeong Kim, Ji Yeong Lee, Sung-Pyo Cho,  
Yung-Eun Sung, Kwang-Yong Choi, Chongjian Zhou,\*  
Zhongqi Shi\* and In Chung\*



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### High-entropy alloy nanocrystal assembled by nanosheets with d–d electron interaction for hydrogen evolution reaction

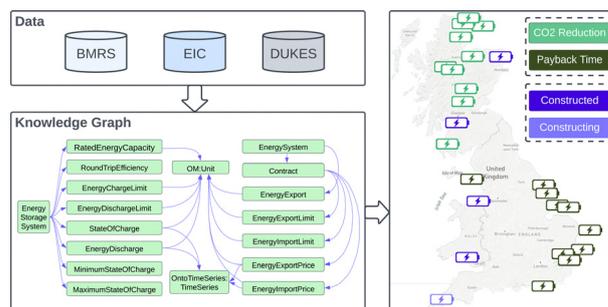
Min Wei, Yuyan Sun, Junyu Zhang, Fei Ai, Shibo Xi\* and  
Jike Wang\*



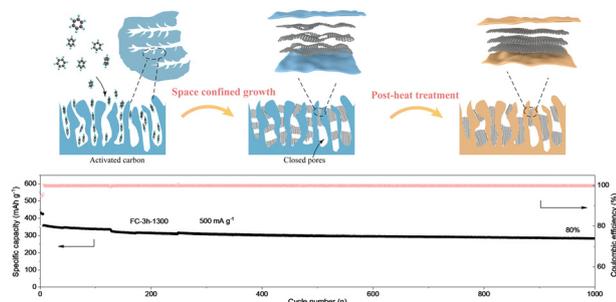
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### British wind farm ESS attachments: curtailment reduction vs. price arbitrage

John Atherton, Jethro Akroyd, Feroz Farazi,  
Sebastian Mosbach, Mei Qi Lim and Markus Kraft\*



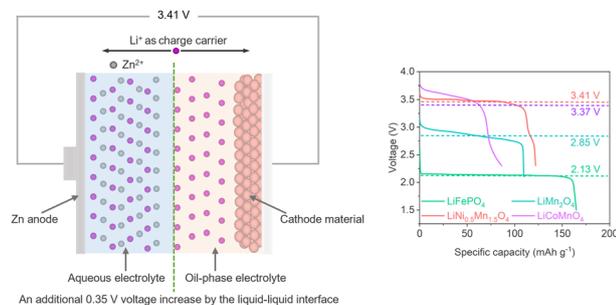
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### Filling carbon: a microstructure-engineered hard carbon for efficient alkali metal ion storage

Xiaoyang Chen, Nurbiye Sawut, Kean Chen, Hui Li, Jun Zhang, Zhe Wang, Mei Yang, Guo Tang, Xinping Ai, Hanxi Yang, Yongjin Fang\* and Yuliang Cao\*

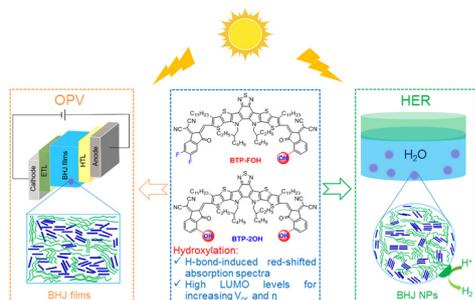
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### An immiscible phase-separation electrolyte and interface ion transfer electrochemistry enable zinc/lithium hybrid batteries with a 3.5 V-class operating voltage

Ao Chen, Yaqin Zhang, Qing Li, Guojing Liang, Shuo Yang, Zhaodong Huang, Qi Yang, Hong Hu, Xinliang Li, Ze Chen, Jun Fan\* and Chunyi Zhi\*

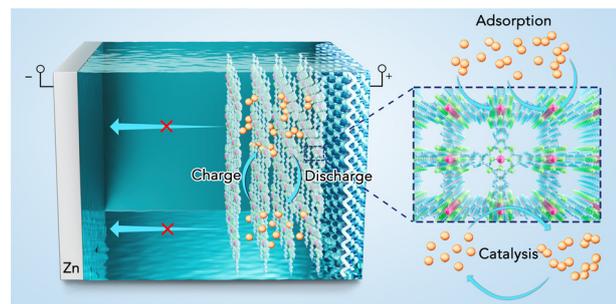
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### Hydroxylated organic semiconductors for efficient photovoltaics and photocatalytic hydrogen evolution

Xuan Liu, Yue Zhao, Yongfeng Ni, Fang Shi, Xin Guo\* and Can Li\*

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### Boosting aqueous non-flow zinc-bromine batteries with a two-dimensional metal-organic framework host: an adsorption-catalysis approach

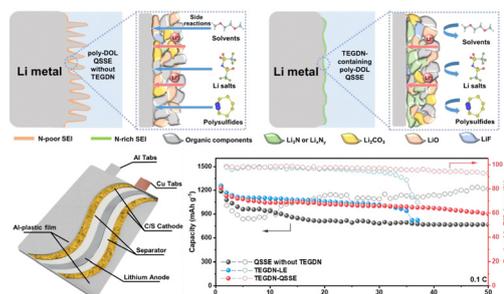
Hua Wei, Guangmeng Qu, Xiangyong Zhang, Baohui Ren, Shizhen Li, Jingjing Jiang, Yihan Yang, Jintong Yang, Lingzhi Zhao, Hongfei Li,\* Chunyi Zhi\* and Zhuoxin Liu\*



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### Towards durable practical lithium–metal batteries: advancing the feasibility of poly-DOL-based quasi-solid-state electrolytes *via* a novel nitrate-based additive

Zilong Wang, Yuhao Wang, Longyun Shen, Zhaoqing Jin, Ho Mei Law, Anbang Wang, Weikun Wang\* and Francesco Ciucci\*



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### Delaminated MBene sheets beyond usual 2D transition metal materials for securing Pt single atoms to boost hydrogen evolution

Seok Ju Park, Thanh Hai Nguyen, Duy Thanh Tran,\* Van An Dinh, Joong Hee Lee\* and Nam Hoon Kim\*

