

# Energy & Environmental Science

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## IN THIS ISSUE

ISSN 1754–5706 CODEN EESNBY 17(6) 2071–2358 (2024)



### Cover

See Haolan Xu, Qiang Fu *et al.*, pp. 2088–2099. Image reproduced by permission of Qiang Fu from *Energy Environ. Sci.*, 2024, 17, 2088.



### Inside cover

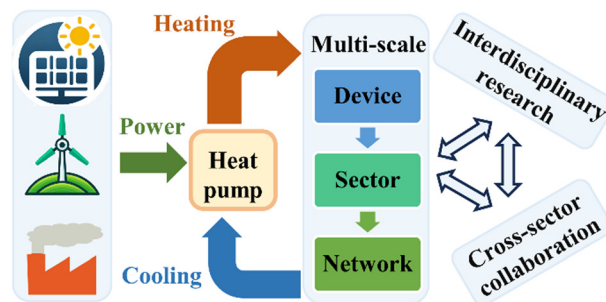
See Roseanne Warren *et al.*, pp. 2117–2128. Image reproduced by permission of Danielle Horlacher from *Energy Environ. Sci.*, 2024, 17, 2117.

## OPINION

2081

### Heat pumps as a sustainable bridge for global heating and cooling at multi-scale

Hongzhi Yan, Marcel Ulrich Ahrens, Edgar Hertwich,\* Trygve Magne Eikevik\* and Ruzhu Wang\*



## PERSPECTIVES

2088

### Updated perspective on solar steam generation application

Casey Onggowarsito, Shudi Mao, Xin Stella Zhang, An Feng, Haolan Xu\* and Qiang Fu\*



# EES Catalysis

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Fundamental questions  
Elemental answers

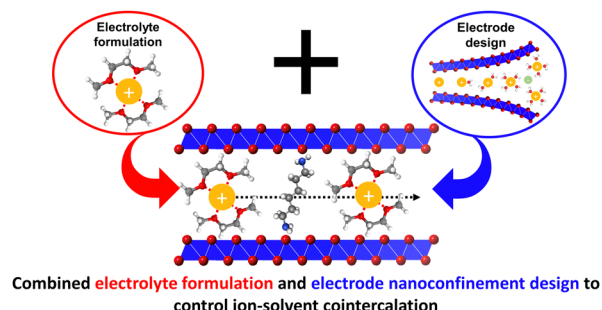


## PERSPECTIVES

2100

## Unifying electrolyte formulation and electrode nanoconfinement design to enable new ion–solvent cointercalation chemistries

Haocheng Guo, Mennatalla Elmanzalawy,  
Prashanth Sivakumar and Simon Fleischmann\*

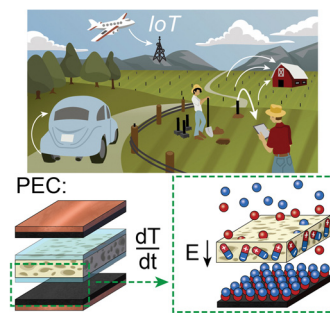


## PAPERS

2117

## Direct conversion of thermal energy to stored electrochemical energy via a self-charging pyroelectrochemical cell

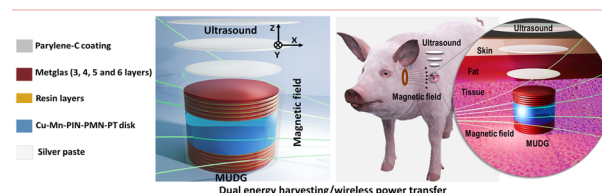
Tim Kowalchik, Fariha Khan, Danielle Horlacher,  
Shad Roundy and Roseanne Warren\*



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## Magnetic field and ultrasound induced simultaneous wireless energy harvesting

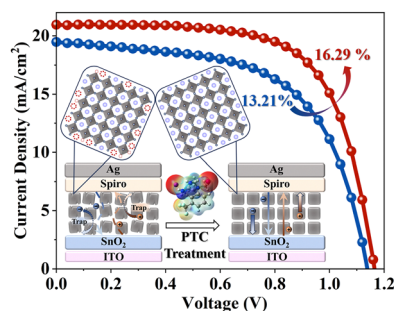
Sumanta Kumar Karan,\* Sujay Hosur, Zeinab Kashani,  
Haoyang Leng, Anitha Vijay, Rammohan Sriramdas,  
Kai Wang, Bed Poudel, Andrew D. Patterson,  
Mehdi Kiani\* and Shashank Priya\*



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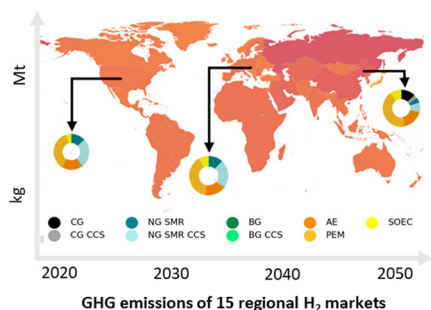
## Renovating the surface matrix of FAPbI<sub>3</sub> perovskite quantum dots via phase-transfer catalysis for 16.29% efficiency solar cells

Mingxu Zhang, Qiyuan Gao, Xinyi Mei, Junming Qiu,  
Rongshan Zhuang, Yong Hua, Zhimei Sun\* and  
Xiaoliang Zhang\*





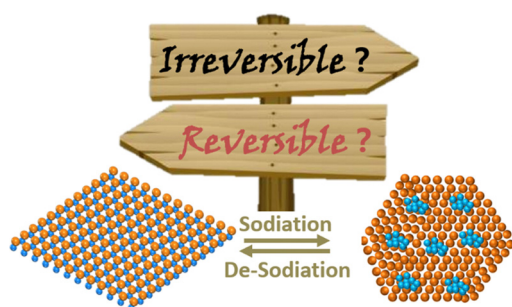
2157



### Future environmental impacts of global hydrogen production

Shijie Wei,\* Romain Sacchi, Arnold Tukker, Sangwon Suh and Bernhard Steubing

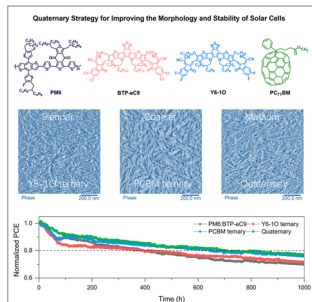
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### Are sodiation/de-sodiation reactions reversible in two-dimensional metallic NbSe<sub>2</sub>?

Zaichun Liu, Rui Wang, Panpan Zhang, Chaochao Dun, Jeffrey J. Urban, Sheng Yang, Tao Wang, Yuan Ma, Yiren Zhong, Jiarui He, Zhi Zhu, Xiaosong Xiong, Weijia Fan, Qi Zhou, Haoyuan Yang, Xin-Bing Cheng, Faxing Wang,\* Ying Huang\* and Yuping Wu\*

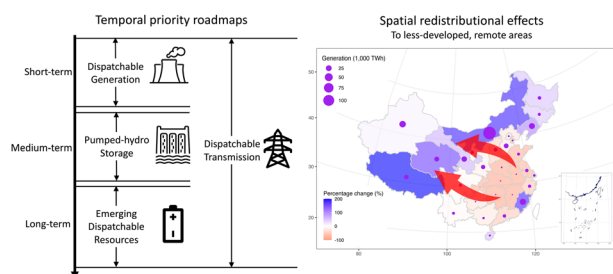
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### A high-efficiency and stable organic solar cell with balanced crystallization kinetics

Weichao Zhang, Yaochang Yue, Rongsheng Yang, Yingyu Zhang, Wenna Du, Guanghao Lu, Jianqi Zhang, Huiqiong Zhou,\* Xuning Zhang\* and Yuan Zhang\*

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### The role of dispatchability in China's power system decarbonization

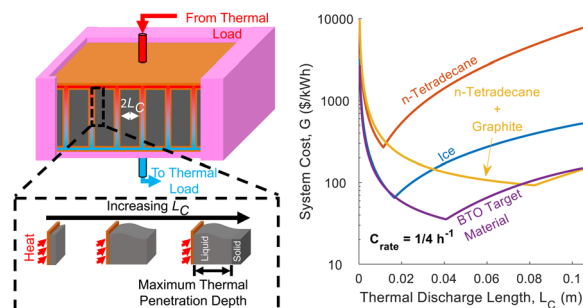
Mingquan Li,\* Rui Shan, Ahmed Abdulla, Edgar Virguez and Shuo Gao



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## Thermal battery cost scaling analysis: minimizing the cost per kW h

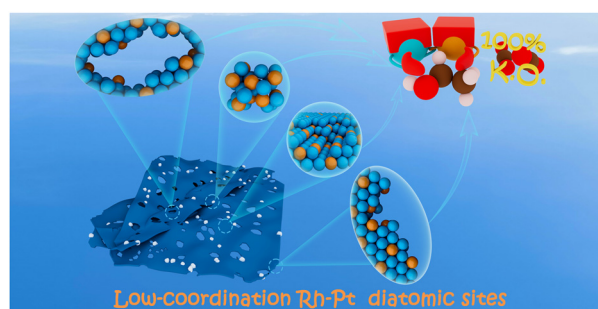
Jordan D. Kocher, Jason Woods, Adewale Odukumaiya, Allison Mahvi and Shannon K. Yee\*



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## Engineering low-coordination atoms on RhPt bimetallic for 12-electron ethanol electrooxidation

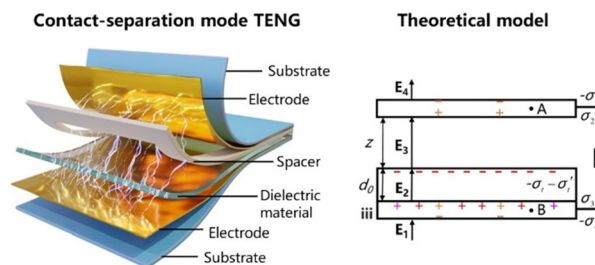
Bin Sun, Wei Zhong, Xuan Ai, Chong Zhang, Fu-Min Li\* and Yu Chen\*



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## Theoretical modeling of contact-separation mode triboelectric nanogenerators from initial charge distribution

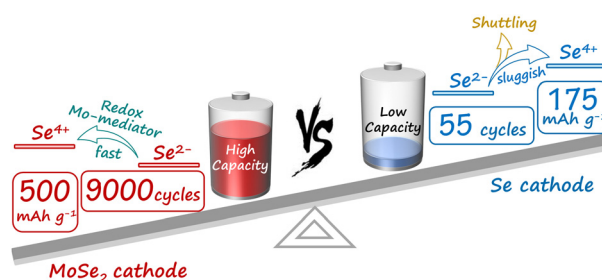
Hongfa Zhao, Hao Wang, Hongyong Yu, Qinghao Xu, Xiaosa Li, Jing Guo, Jiajia Shao, Zhong Lin Wang,\* Minyi Xu\* and Wenbo Ding\*



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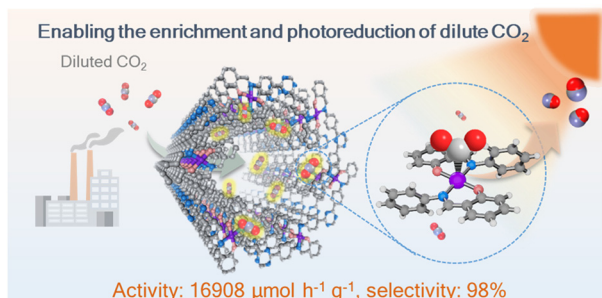
## Redox Mo-chloro-species-coupled Se oxidation conversion in low-corrosion ionic liquids for fast-kinetics and durable Zn batteries

Bo Wang, Yongchao Tang,\* Jianping Yan, Yufei Zhang, Minghui Ye, Zhipeng Wen, Wencheng Du, Xiaoqing Liu and Cheng Chao Li\*



## PAPERS

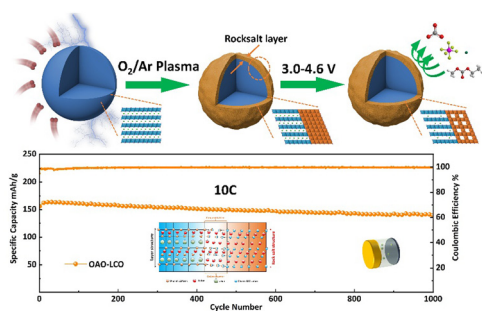
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### Molecular modulation of nickel–salophen organic frameworks enables the selective photoreduction of CO<sub>2</sub> at varying concentrations

Xiaohan Yu, Mingzi Sun, Tianran Yan, Lin Jia, Mingyu Chu, Liang Zhang, Wei Huang,\* Bolong Huang\* and Yanguang Li\*

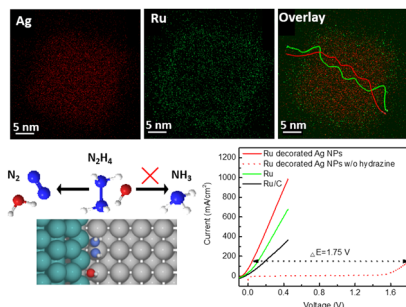
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### A pre-fatigue training strategy to stabilize LiCoO<sub>2</sub> at high voltage

Siyuan Qi, Yujia Guan, Junjun Wang, Rui Xia, Lei Zhang,\* Jinghao Li, Congli Sun,\* Qinyou An and Kangning Zhao\*

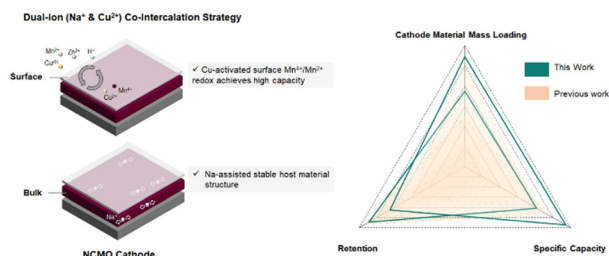
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### Ag–Ru interface for highly efficient hydrazine assisted water electrolysis

Xiaoyang Fu, Dongfang Cheng, Ao Zhang, Jingxuan Zhou, Sibbo Wang, Xun Zhao, Jun Chen, Philippe Sautet,\* Yu Huang\* and Xiangfeng Duan\*

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### Co-intercalation strategy for simultaneously boosting two-electron conversion and bulk stabilization of Mn-based cathodes in aqueous zinc-ion batteries

Xuan Gao, Chen Shen, Haobo Dong, Yuhang Dai, Peie Jiang, Ivan P. Parkin, Hongbin Zhang, Claire J. Carmalt\* and Guanjie He\*

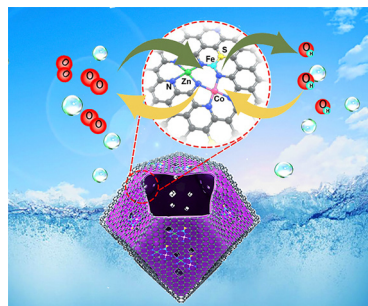


## PAPERS

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### An asymmetrically coordinated ZnCoFe hetero-trimetallic atom catalyst enhances the electrocatalytic oxygen reaction

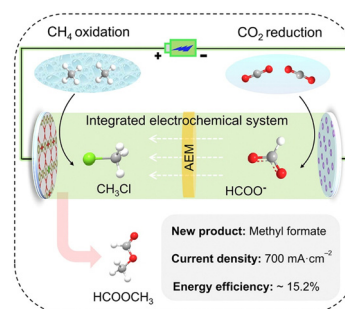
Changli Chen, Jing Chai, Mengru Sun, Tianqi Guo,\*  
Jie Lin, Yurong Zhou, Zhiyi Sun, Fang Zhang,  
Liang Zhang,\* Wenxing Chen\* and Yujing Li\*



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### Coupling of electrocatalytic CO<sub>2</sub> reduction and CH<sub>4</sub> oxidation for efficient methyl formate electrosynthesis

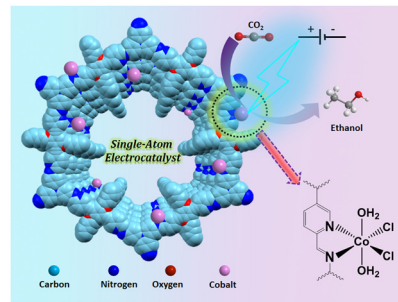
Quan Zhang, Yangshen Chen, Shuai Yan, Ximeng Lv,  
Chao Yang, Min Kuang\* and Gengfeng Zheng\*



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### Atomically dispersed Co<sup>2+</sup> in a redox-active COF for electrochemical CO<sub>2</sub> reduction to ethanol: unravelling mechanistic insight through *operando* studies

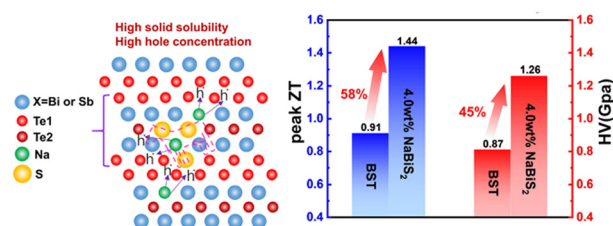
Ashish Singh, Soumitra Barman, Faruk Ahamed Rahimi,  
Anupam Dey, Rohan Jena, Ravi Kumar, Nijita Mathew,  
Dibyendu Bhattacharyya and Tapas Kumar Maji\*



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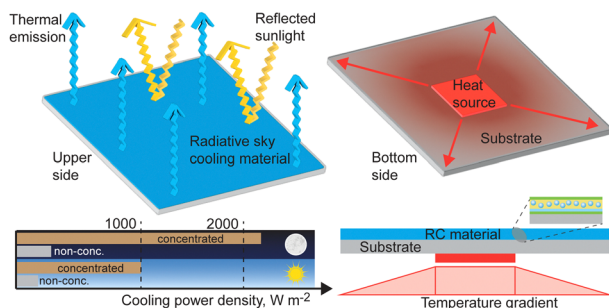
### Highly effective solid solution towards high thermoelectric and mechanical performance in Bi–Sb–Te alloys via Trojan doping

Yong-Cai Shi, Jianmin Yang, Yu Wang, Zu-Gang Li,  
Tian-Yu Zhong, Zhen-Hua Ge,\* Jing Feng\* and  
Jiaqing He\*



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### Radiative sky cooling thermal concentration with cooling power exceeding one kW per square meter

Primož Poredoš, He Shan, Chenxi Wang, Zhihui Chen, Zhao Shao, Fangfang Deng, Haoran Liu, Jiaqi Yu and Ruzhu Wang\*

## CORRECTION

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### Correction: Mimicking ion and water management in poultry breeding for highly reversible zinc ion batteries

Shengli Zhai, Wanrong Song, Keren Jiang, Xuehai Tan, Wen Yao Zhang, Yang Yang, Weifeng Chen, Ning Chen, Hongbo Zeng, Hui Li and Zhi Li\*

