

# Energy & Environmental Science

rsc.li/ees

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 1754-5706 CODEN EESNBY 18(14) 6843-7314 (2025)



### Cover

See Xueliang Sun, Jian Peng *et al.*, pp. 6874–6898. Image reproduced by permission of Xueliang Sun and Jian Peng from *Energy Environ. Sci.*, 2025, 18, 6874.



### Inside cover

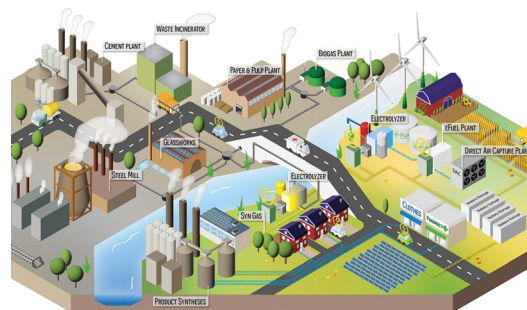
See Erwin Reisner *et al.*, pp. 7023–7033. Image reproduced by permission of Yongpeng Liu from *Energy Environ. Sci.*, 2025, 18, 7023.

## ANALYSIS

6854

### Closing the carbon cycle: challenges and opportunities of CO<sub>2</sub> electrolyser designs in light of cross-industrial CO<sub>2</sub> source-sink matching in the European landscape

Muhammad Tayyab, Maximiliane Dreis, Dennis Blaudszun, Kevinjeorjios Pellumbi, Urbain Nzotcha, Hermann Tempel, Muhammad Qaiser Masood, Henning Weinrich, Sebastian Stießel, Kai Junge Puring, Rüdiger-A. Eichel\* and Ulf-Peter Apfel\*

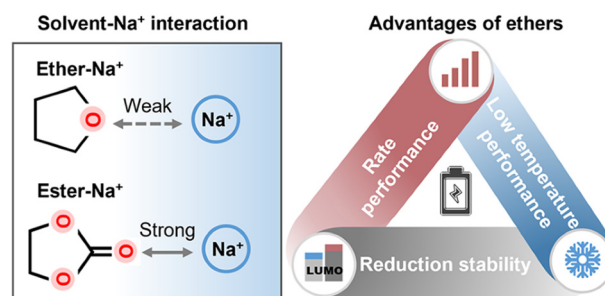


## REVIEWS

6874

### Reviving ether-based electrolytes for sodium-ion batteries

Fangyuan Cheng, Jun Hu, Wen Zhang, Baiyu Guo, Peng Yu, Xueliang Sun\* and Jian Peng\*



# EES Catalysis

GOLD  
OPEN  
ACCESS

## Exceptional research on energy and environmental catalysis

### Open to everyone. Impactful for all

[rsc.li/EESCatalysis](https://rsc.li/EESCatalysis)

Fundamental questions  
Elemental answers

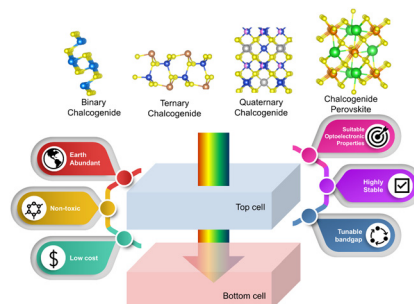


## REVIEWS

6899

## Opportunities and challenges for emerging inorganic chalcogenide–silicon tandem solar cells

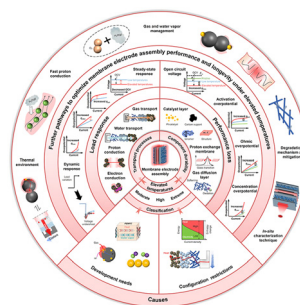
Vijay C. Karade, Mingrui He, Zhaoning Song, Abasi Abudulimu, Yeonwoo Park, Donghoon Song, Yanfa Yan, Jin Hyeok Kim, Randy J. Ellingson, Jae Ho Yun,\* Xiaojing Hao, Seung Wook Shin\* and Mahesh P. Suryawanshi\*



6934

## Challenges in membrane electrode assemblies at elevated temperatures for proton exchange membrane fuel cells: a review

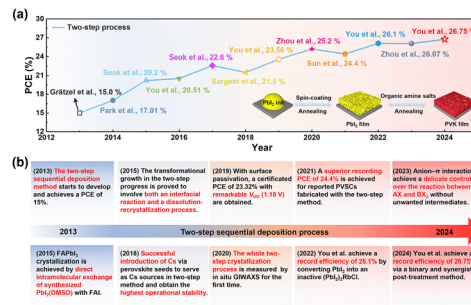
Caizheng Yue, Weibo Zheng,\* Qiuya Wang, Zhendong Wang, Bing Li, Cunman Zhang and Pingwen Ming\*



6983

## Unraveling the reaction dynamics mechanism and thermodynamic pathway of lead iodide and organic cations in the two-step sequential deposition process

Jiacheng He, Wangping Sheng, Kaikai Liu, Qianqian Cai, Yang Zhong, Licheng Tan\* and Yiwang Chen\*

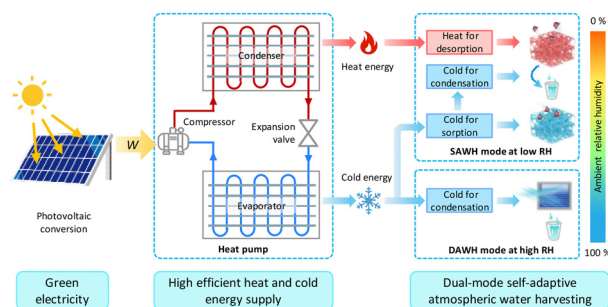


## PERSPECTIVE

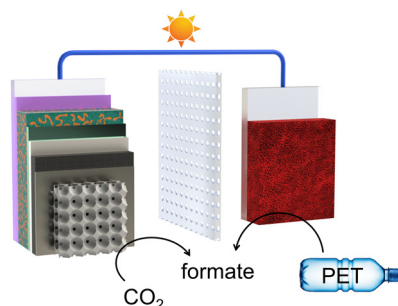
7005

## Designing next-generation all-weather and efficient atmospheric water harvesting powered by solar energy

Pengfei Wang, Jiaying Xu, Zhaoyuan Bai, Ruzhu Wang and Tingxian Li\*



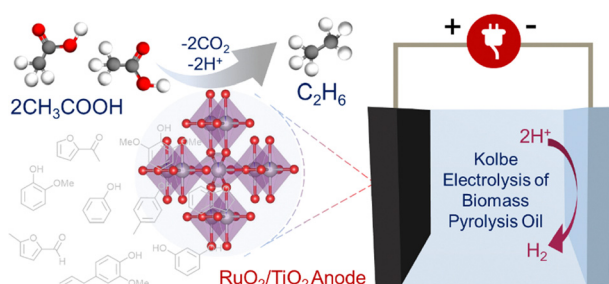
7023



### Photoelectrochemical comproportionation of pre-treated PET plastics and CO<sub>2</sub> to formate

Yongpeng Liu, Celine Wing See Yeung and Erwin Reisner\*

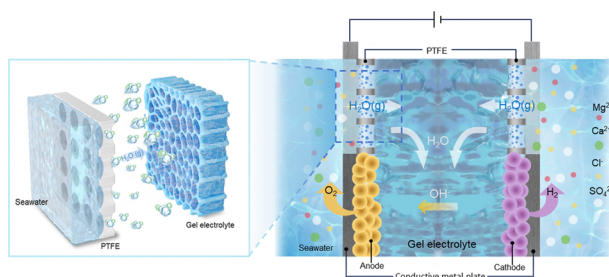
7034



### Low-temperature highly selective Kolbe electrolysis of acetic acid in bio-oil on a stable *in situ* grown RuO<sub>2</sub>/TiO<sub>2</sub> at industrial-level current

Yangxin Jin, Shengqin Liu, Zhe Wang, Qi Zhu, Qingguo Le, Shan Shao, Sam H.-Y. Hsu, Anqing Zheng, Jun Zhao and Jason Chun-Ho Lam\*

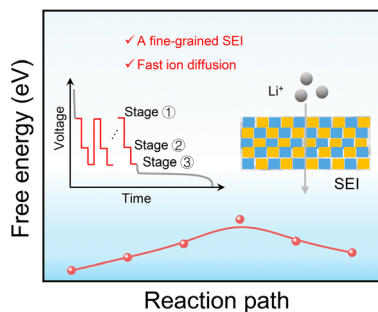
7048



### A gel electrolyte-based direct seawater electrolysis

Wenbin Tang, Zhiyu Zhao,\* Dongsheng Yang, YanHao Liu, Liangyu Zhu, Yue Wu, Cheng Lan, Wenchuan Jiang, Yifan Wu, Tao Liu\* and Heping Xie\*

7060



### Tailoring a multilayer fine-grained solid electrolyte interphase by pulse electrochemical activation maneuver for stable Si/C anodes

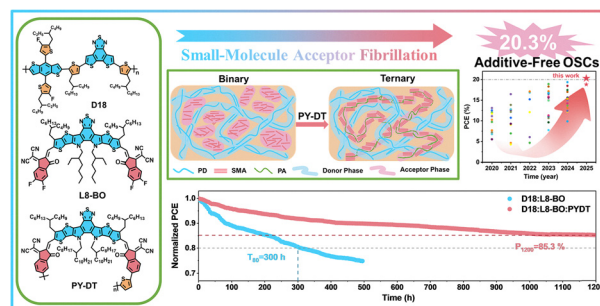
Changhaoyue Xu, Peng Jing, Pengfei Xia, Ye Jia, Jianan Peng, Qiujie He, Qingqing Liu, Zimo Song, Xuemei Zhang, Fanglin Wu, Xianyu Liu, Kaipeng Wu, Yun Zhang\* and Wenlong Cai\*



7071

### Constructing continuous acceptor fibrillar networks and achieving uniform phase separation via polymer-assisted morphology control for 20.3% efficiency additive-free organic solar cells

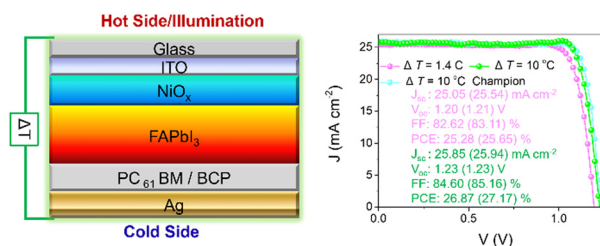
Fengbo Sun, Jingnan Wu, Bo Cheng, Lixuan Kan, Feng Hua, Wei Sun, Hao Wang, Yumiao Huo, Sixuan Chen, Xinxin Xia, Xiaoyan Du, Feng Liu, Ergang Wang, Xia Guo,\* Yongfang Li and Maojie Zhang\*



7082

### Synergistic cooperation between photovoltaic and thermoelectric effects in solar cells

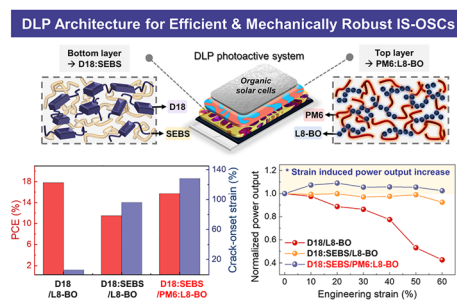
Ping Fu, Dong Yang, Yihua Chen, Ruixue Lu, Md Azimul Haque, Yucheng Liu, Yaoyao Han, Hui Li, Ruotian Chen, Jieqiong Liu, Wei Qin, Luis Huerta Hernandez, Fengtao Fan, Kaifeng Wu, Derya Baran, Huanping Zhou and Can Li\*



7089

### Dual-layered percolative networks of photoactive materials and elastomers for highly-stretchable, efficient organic photovoltaics with strain-induced power enhancement up to 60% strain

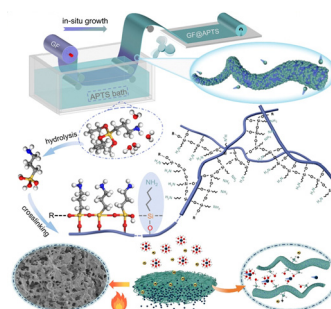
Jin-Woo Lee, Jongmin Oh, Won Jung Kang, Eun Sung Oh, Seungbok Lee, Inwoo Lee, Jimin Park, Jung-Yong Lee, Taek-Soo Kim\* and Bumjoon J. Kim\*



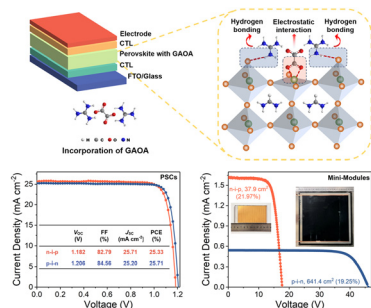
7103

### Interfacial ionic and thermal regulation for highly reversible and ultra-reliable zinc-ion batteries

Mengcheng Huang, Yaojie Lei, Yajun Hu, Wei-Hong Lai, Yun-Xiao Wang, Chunyu Liu, Shengli Zhai\* and Guoxiu Wang\*



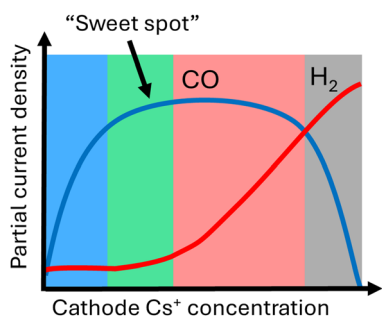
7114



## Intermolecular interactions triggered crystallization phase transition regulation for efficient and stable perovskite photovoltaics

Haodan Guo, Yang Wang,\* Kun Zhang, Mingquan Tao, Lutong Guo, Xiwen Zhang, Zhaofei Song, Jinxu Wen, Tian Hou, Yuelong Huang\* and Yanlin Song\*

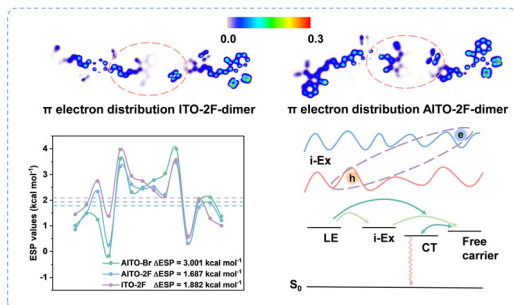
7124



## Flooding revisited: electrolyte management ensures robust electrochemical CO<sub>2</sub> reduction

Péter Gyenes, Angelika A. Samu, Dorottya Hursán, Viktor Józó, Andrea Serfőző, Balázs Endrődi and Csaba Janáky\*

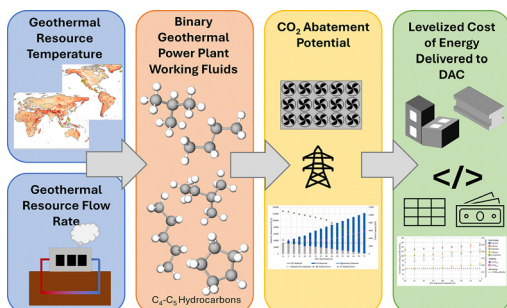
7136



## Suppressing electrostatic potential fluctuations to achieve high-efficiency organic photovoltaic cells for laser wireless energy transfer

Yang Xiao, Yong Cui,\* Haoyu Yuan, Jingwen Wang, Zhihao Chen, GuanLin Wang, Wei Fu, Zhen Fu, Yafei Wang, Tao Zhang, Yue Yu, Runnan Yu, Guangzheng Zuo, Maojie Zhang, Xiaotao Hao and Jianhui Hou\*

7146



## Advancing geothermal energy utilization opportunities: potential and strategies for integrating direct air capture

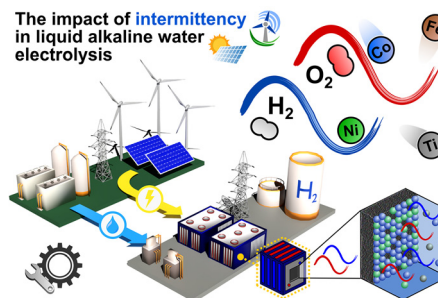
Maxwell Pisciotta, Hélène Pilorgé, Likhwa Ndlovu, Madeleine Siegel, Joe Huyett, Todd Bandhauer, Peter Psarras and Jennifer Wilcox\*



7170

### Insights into catalyst degradation during alkaline water electrolysis under variable operation

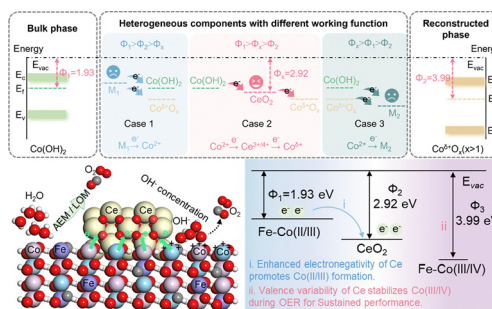
Raul A. Marquez, Jay T. Bender, Ashton M. Aleman, Emma Kalokowski, Thuy Vy Le, Chloe L. Williamson, Morten Linding Frederiksen, Kenta Kawashima, Chikaodili E. Chukwunke, Andrei Dolocan, Delia J. Milliron, Joaquin Resasco, Thomas F. Jaramillo and C. Buddie Mullins\*



7188

### Dynamic trade-off of electronic structures to activate and stabilize lattice oxygen via a $\text{Ce}^{\delta+}$ -O/Co-Fe hydroxide interface for industrial level water oxidation

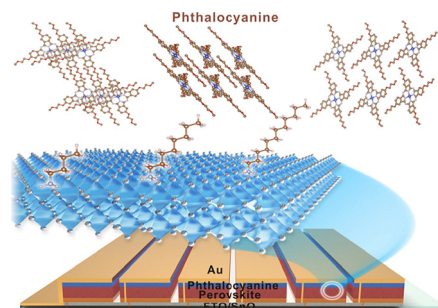
Zhimin Li, Jianhong Yi,\* Yu Tang,\* Zhengfu Zhang, Chengping Li, Rui Bao and Jinsong Wang\*



7203

### Interfacial engineering of dopant-free phthalocyanine hole transporters for >22% efficiency perovskite solar modules

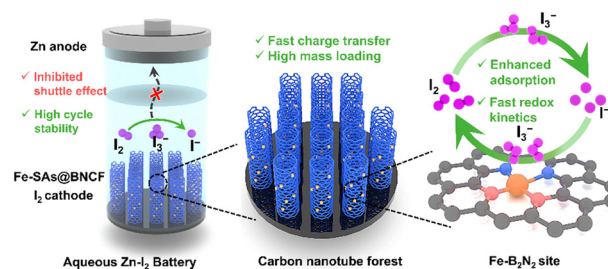
Zhen-Yang Suo, Xijiao Mu, Chong Chen, Guo-Bin Xiao and Jing Cao\*



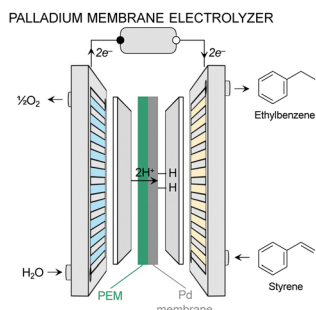
7213

### Nano-carbon supported B/N-coordinated Fe single atoms with a tuned electronic structure for long lifespan zinc-iodine batteries

Yong Li, Aoyang Zhu, Guodong Peng, Jun He, Hongqiang Li, Dedong Jia, Guanjie He,\* Jieshan Qiu\* and Xiaojun He\*



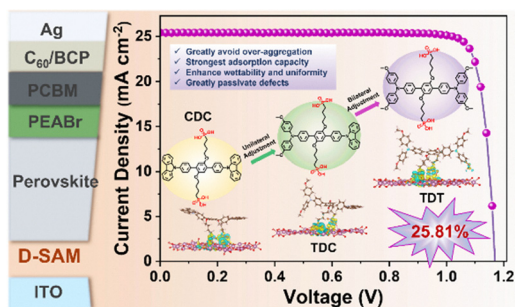
7223



### Electrolytic hydrogenation at 100 mA cm<sup>-2</sup> and 1.6 volts

Yunzhou Wen, Mia D. Stankovic, Arijit Singha Hazari, Marvin L. Frisch, Siwei Ma and Curtis P. Berlinguette\*

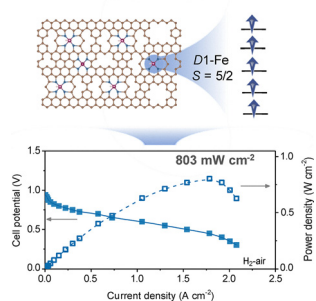
7231



### A spatial structure regulation strategy modulated the solubility and compactness of novel face-on oriented bisphosphonate-anchored SAMs for efficient inverted perovskite solar cells

Weixu Duan, Kai Chen,\* Bingxue Pi, Shaojian Li, Zedong Lin, Cong Liu,\* Yuehua Pan, Haiqian Ling, Desheng Li, Liwei Zhou, Tao Liu,\* Fan Wu, Xiangwen Guo, Bingsuo Zou and Xiaotian Hu\*

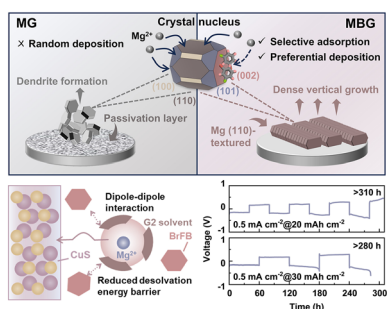
7245



### Selective synthesis of dense high-spin D1 active sites *via* engineered less-graphitized carbon environments

Xuan Luo, Jia-Bao Nie, Huang Liang, Yu-Yang Li, You-Heng Wang, Qi-Kang Que, Jean-Pol Dodelet\* and Yu-Cheng Wang\*

7254



### Customizing vertical electrodeposition orientation and interfacial solvation to endow magnesium metal anodes with ultrahigh areal capacity

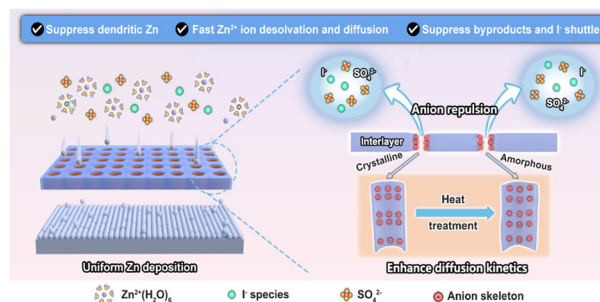
Guyue Li, Liu Cao, Meng Lei, Keyi Chen and Chilin Li\*



7267

## Amorphous anion skeletons induce rapid and cation-selective ion flux towards stable aqueous zinc–iodine batteries

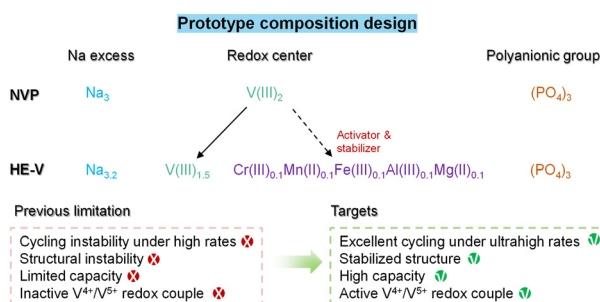
Zhenjing Jiang, Zijuan Du, Kailin Luo, Yanfei Zhang, Hang Yang, Wei Zhang, Ruwei Chen, Jie Chen, Zhe Cui, Fuhuan Cui, Rui Pan, Guoju Zhang, Shuangying Lei, Litao Sun, Kuibo Yin\* and Guanjie He\*



7278

## Configurational entropy-tailored NASICON cathode redox chemistry for capacity-dense and ultralong cyclability

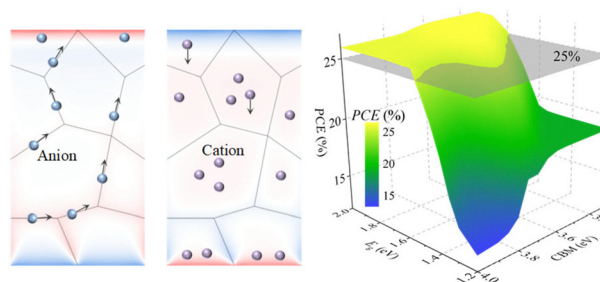
Wei Zhang,\* Liang He, Jiantao Li, Ruohan Yu, Zhenming Xu, Yulun Wu, Haotian Qu, Qi Zhang, Jianwei Li, Xian Wu, Qingjin Fu, Yanqing Lai,\* Guangmin Zhou,\* Guanjie He\* and Ivan P. Parkin



7291

## Multi-physics mechanisms and regulation of perovskite grain boundaries: insights into carrier dynamics, ion migration, thermodynamics, and thermal stress

Luolei Shi, Xirui Liu, Yuqi Zhang, Yining Bao, Tianshu Ma, Linling Qin, Guoyang Cao,\* Changlei Wang, Chuanxiao Xiao,\* Xiaofeng Li\* and Zhenhai Yang\*



7302

## Highly efficient all-small-molecule organic solar cells with excellent operational stability and blend-thickness tolerance

Yuan Gao, Lin-Yong Xu, Xingyu Chen, Biao Xiao,\* Wei Gao, Jianlong Xia, Rui Sun\* and Jie Min\*

