

# Journal of Materials Chemistry A

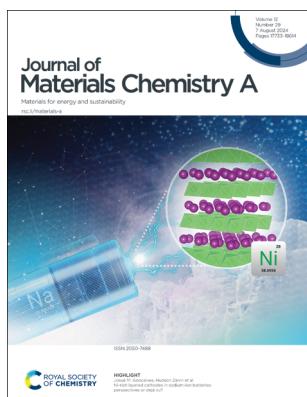
Materials for energy and sustainability

rsc.li/materials-a

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.

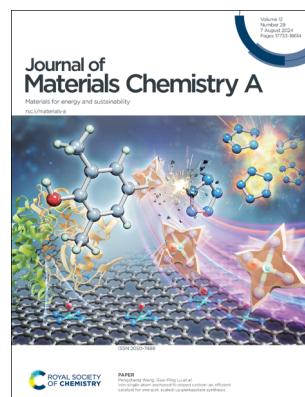
## IN THIS ISSUE

ISSN 2050-7488 CODEN JMCAET 12(29) 17733–18614 (2024)



### Cover

See Josué M. Gonçalves, Hudson Zanin et al., pp. 17756–17770. Image reproduced by permission of Josué M. Gonçalves from *J. Mater. Chem. A*, 2024, 12, 17756.



### Inside cover

See Pengcheng Wang, Guo-Ping Lu et al., pp. 18096–18103. Image reproduced by permission of Guo-Ping Lu from *J. Mater. Chem. A*, 2024, 12, 18096.

## EDITORIAL

17753

### Promoting your work to the materials community: editor top tips for writing an effective research paper

Veronica Augustyn,\* Serena A. Cussen,\* Subrata Kundu,\* Frank E. Osterloh\* and Miriam M. Unterlass\*

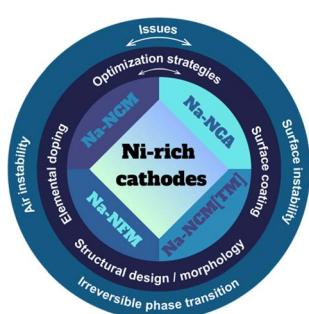


## HIGHLIGHT

17756

### Ni-rich layered cathodes in sodium-ion batteries: perspectives or déjà vu?

Josué M. Gonçalves,\* Gustavo T. M. Silva and Hudson Zanin\*



# Environmental Science: Atmospheres



GOLD  
OPEN  
ACCESS

## Connecting communities and inspiring new ideas

[rsc.li/submittoEA](http://rsc.li/submittoEA)

Fundamental questions  
Elemental answers



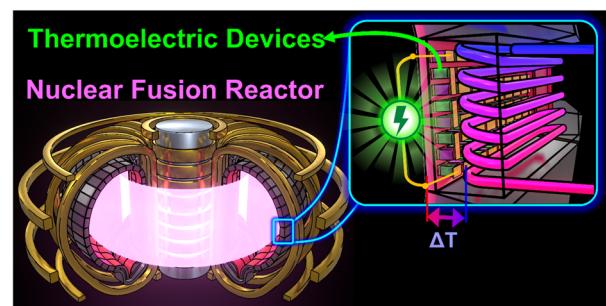
Registered charity number: 207890

## REVIEWS

17771

**Thermoelectrics for nuclear fusion reactors: opportunities and challenges**

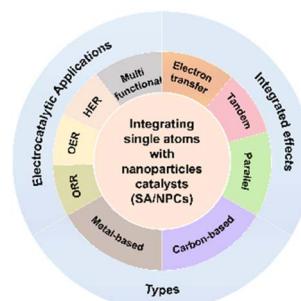
Xian Yi Tan, Hongfei Liu, Jinfeng Dong, Andrew Chun Yong Ngo,\* Ady Suwardi\* and Jing Cao\*



17793

**Integrating single atoms with nanoparticle catalysts for efficient electrochemical energy conversion**

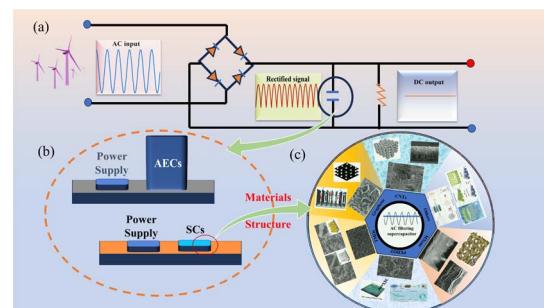
Xiaorong Lin, Lin Zeng\* and Maochun Wu\*



17817

**Recent progress on the materials and structure of supercapacitors for AC line filtering applications**

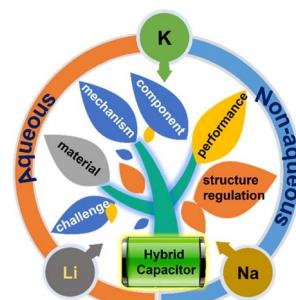
Xiaodong Ma, Junwei Sha, Biao Chen, Chunsheng Shi, Liying Ma, Hao Wang,\* Naiqin Zhao and Jianli Kang\*



17835

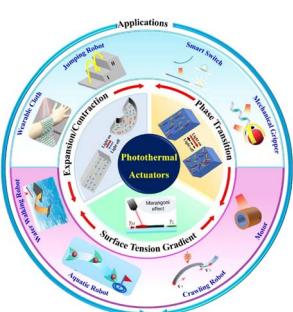
**Recent advances in aqueous and non-aqueous alkali metal hybrid ion capacitors**

Ziyang Jia, Shunkang Hou, Jun Peng, Xiongwei Wu, Wei Tang, Wei Sun, Shuguang Lv, Xinhai Yuan,\* Lili Liu and Yuping Wu\*



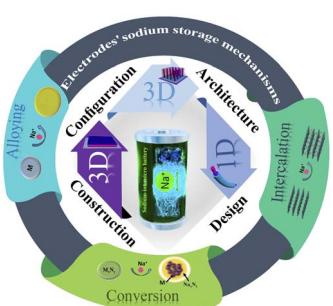
## REVIEWS

17896

**Design and mechanism of photothermal soft actuators and their applications**

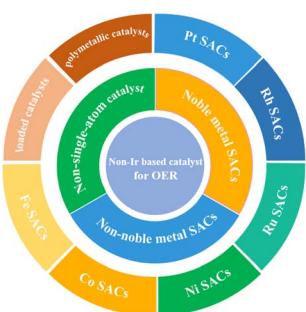
Rajaram S. Sutar, Sanjay S. Latthe, Xinnna Wu, Kazuya Nakata, Ruimin Xing, Shanhui Liu\* and Akira Fujishima

17923

**Unveiling the recent advances in micro-electrode materials and configurations for sodium-ion micro-batteries**

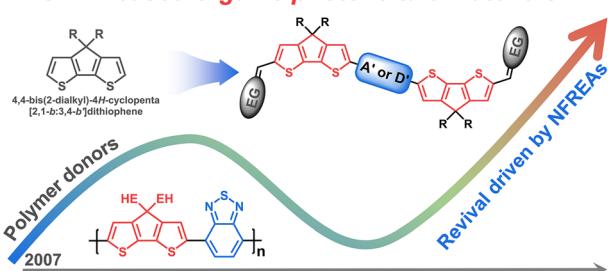
Mina Moghadami, Abouzar Massoudi\* and Mahya Nangir

17958

**Non-Ir based catalysts for the electrocatalytic oxygen evolution reaction: progress and challenges**

Lin Lin, Kai Wei, Xian Wang,\* Wei Ma, Chunlei Bian and Junjie Ge\*

17973

**CPDT-based organic photovoltaic materials****The revival of 4H-cyclopenta[2,1-b:3,4-b']dithiophene (CPDT) driven by low-cost and high-performance nonfused-ring electron acceptors**

Xiaobin Gu, Xin Zhang\* and Hui Huang\*

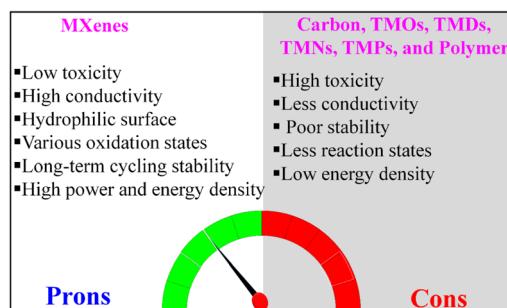


## REVIEWS

17992

**Advancements in 2D MXene-based supercapacitor electrodes: synthesis, mechanisms, electronic structure engineering, flexible wearable energy storage for real-world applications, and future prospects**

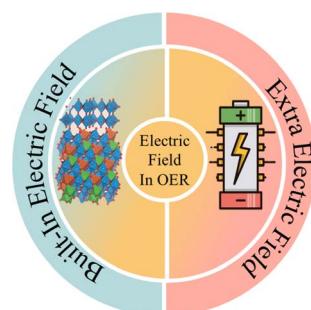
Sujit Anil Kadam,\* Komal Prakash Kadam and Nihar R. Pradhan\*



18047

**Built-in electric fields and extra electric fields in the oxygen evolution reaction**

Zihang Feng, Fangyin Lu, Qiming Hu, Jiangyuan Qiu, Xuefei Lei, Biao Wang, Rui Guo, Ye Tian, Xuanwen Liu,\* and Junhua You\*

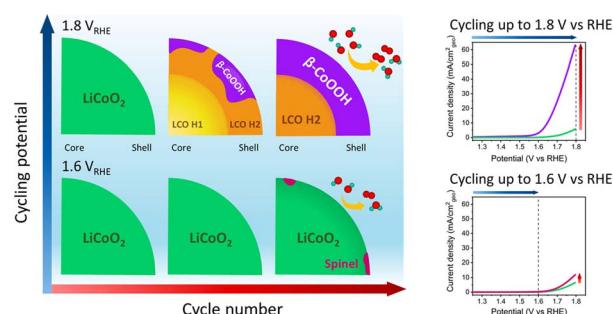


## COMMUNICATIONS

18071

**Potential-driven restructuring of lithium cobalt oxide yields an enhanced active phase for the oxygen evolution reaction**

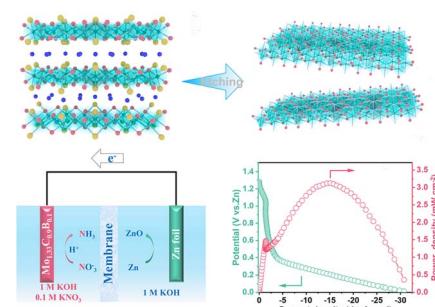
Alexander A. Ryabin, Subin Choi, Yumin Heo, Sebastian Kunze, Dmitry V. Pelegov\* and Jongwoo Lim\*



18082

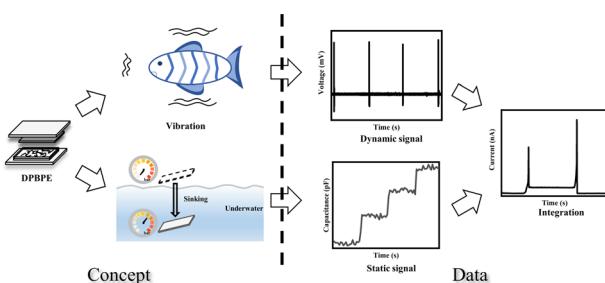
**MAX-derived B-doped Mo<sub>1.33</sub>C MXene for ambient electrocatalytic conversion of nitrate to ammonia**

Jianjia Mu, Da Wang, Sheny Zhou, Xianli Jia, Xuan-Wen Gao,\* Zhaomeng Liu and Wen-Bin Luo\*



## COMMUNICATIONS

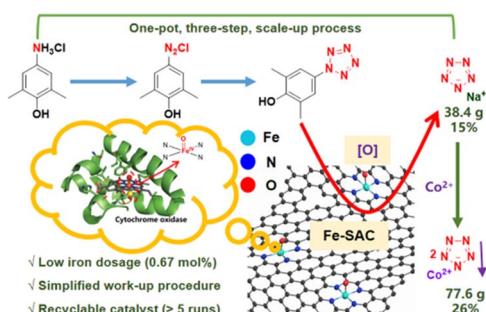
18089

**Synchronous monitoring of underwater dynamic/static pressure based on piezoelectric/capacitive polyester elastomer/carbon nanotube composites**

Yuxing Tang, Qing Dang, Wei Zhang, Haiquan Guo, Hong Pan, Yong Xiang, Bin Liao\* and Xiaoran Hu\*

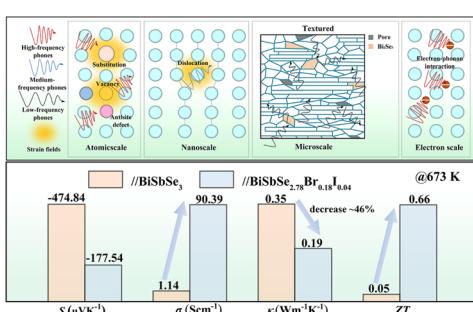
## PAPERS

18096

**Iron single-atom anchored N-doped carbon: an efficient catalyst for one-pot, scaled-up pentazolate synthesis**

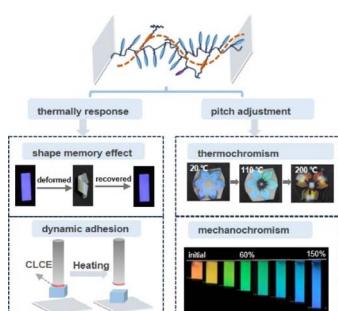
Pengbo Wang, Xiaopeng Zhang, Shuaijie Jiang, Zheting Dong, Ruyi Lu, Yuangang Xu, Pengcheng Wang\* and Guo-Ping Lu\*

18104

**Synergistic optimization of the thermoelectric performance of  $\text{BiSbSe}_3$  using doping and multi-scale defect engineering**

Xiaowei Shi, Zhen Tian, Quanwei Jiang, Yu Yan, Huijun Kang,\* Enyu Guo, Zongning Chen and Tongmin Wang\*

18117

**High-strength thermochromic and mechanochromic liquid-crystal elastomers with responsive shape memory and dynamic adhesion**

Lu Li, Xi Yin, Yu-Xi Zhao, Ling-Ying Shi,\* Ke-Ke Yang\* and Yu-Zhong Wang

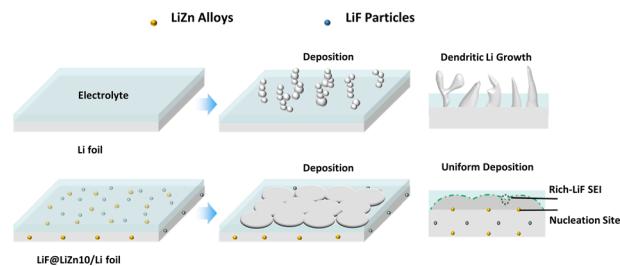


## PAPERS

18127

## Advancing anode-less lithium metal batteries: $ZnF_2$ modification and *in situ* structural regulation for enhanced performance

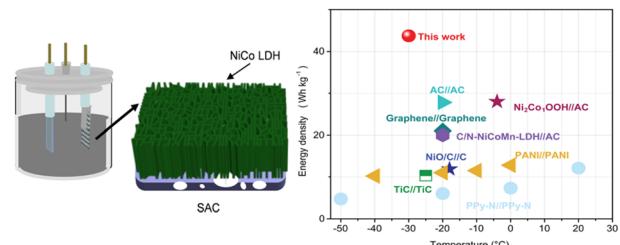
Jing Tao, Can Zhang, Xueyang Li, Xinlong Chen, Chenzhen Ji, Wang Wan\* and Chao Wang\*



18137

## Bitopologically structured composite materials for low temperature energy storage

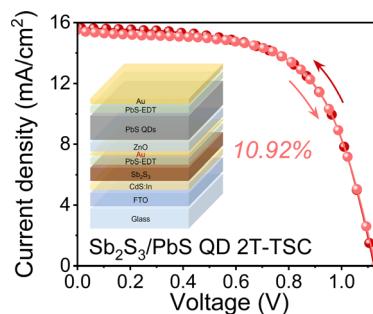
Yu Wang, Xin Chen, Bo Cui, Cuiping Guo, Yao Li, Qinglei Liu, Hui Pan\* and Di Zhang\*



18148

## All-inorganic $Sb_2S_3$ -based two-terminal tandem solar cells enable over 10.9% efficiency employing a concise interconnection layer

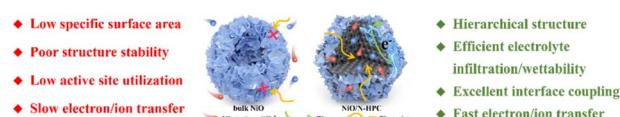
Shiwu Chen, Xinzha Zhao, Guohuan Shen, An Ke, Bohang Liu, Hsien-Yi Hsu, Chao Chen, Peizhi Yang, Jiang Tang and Haisheng Song\*



18157

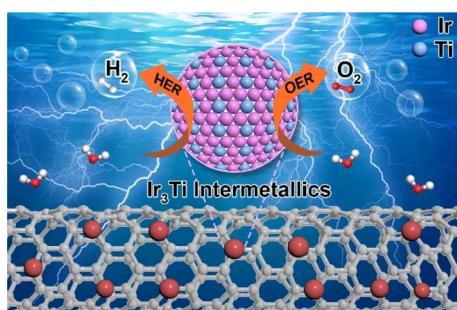
## Ultrathin NiO nanosheets anchored to a nitrogen-doped dodecahedral carbon framework for aqueous potassium-ion hybrid capacitors

Tianlu Wang, Wei Zong, Jieru Yang, Leiqian Zhang, Jian Meng, Jiale Ge, Guozheng Yang, Jianguo Ren, Peng He, Elke Debroye, Jean-François Gohy, Tianxi Liu\* and Feili Lai\*



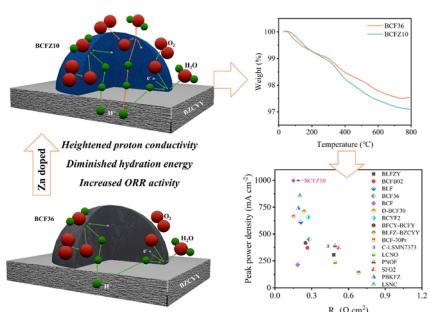
## PAPERS

18167

**Atomically ordered  $\text{Ir}_3\text{Ti}$  intermetallics for pH-universal overall water splitting**

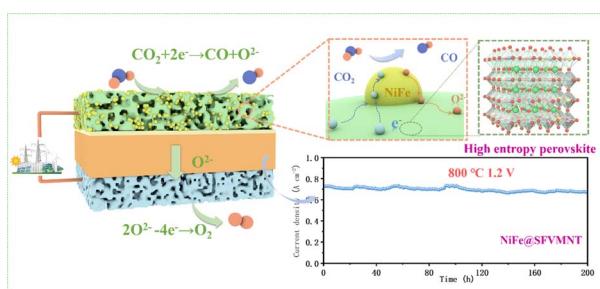
Jianing Song, Caihong He, Chaoqun Ma, Jing Xia, Fukai Feng, Xiao Ma, Sumei Han, Huafang Zhang, Yuanqiang Yang, Banggao Li, Qipeng Lu,\* Wenbin Cao\* and Lijie Zhu\*

18175

**Balancing the triple conductivity of zinc-doped cathodes for proton-conducting solid oxide fuel cells**

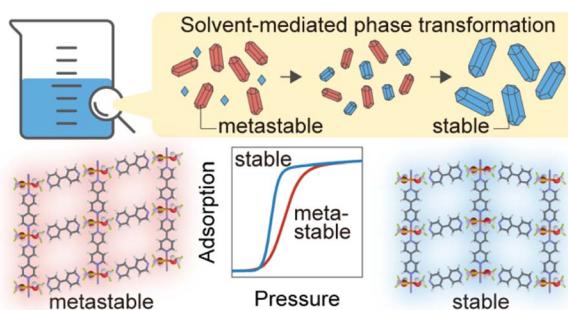
Xiangbo Deng, Mingming Zhang, Yang Gao, Min Fu, Qian Wang, Yuxuan Zhu and Zetian Tao\*

18182

**Probing metal/high-entropy perovskite heterointerfaces for efficient and sustainable  $\text{CO}_2$  electroreduction**

Yan Zhu, Nan Zhang, Wenyu Zhang, Yansheng Gong, Rui Wang, Huanwen Wang, Jun Jin, Ling Zhao and Beibei He\*

18193

**Controlling the steepness of gate-opening behavior on elastic layer-structured metal-organic framework-11 via solvent-mediated phase transformation**

Shotaro Hiraide,\* Keisuke Nishimoto and Satoshi Watanabe\*

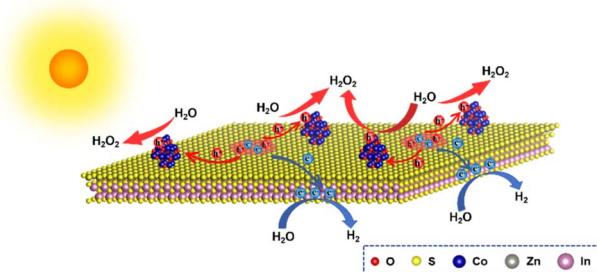


## PAPERS

18204

**Achieving long-lived photogenerated holes in  $\text{ZnIn}_2\text{S}_4$  loaded with  $\text{CoO}_x$  clusters for enhanced photocatalytic pure water splitting**

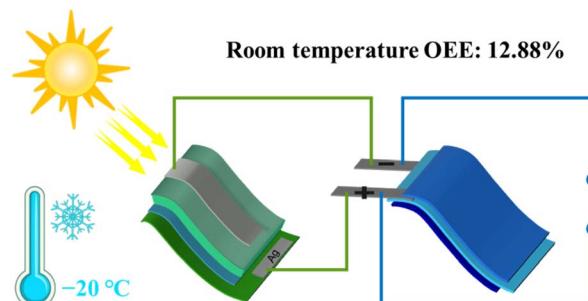
Qingsheng Zhang, Shuya Yuan, Huabing Yin,\* Jianjun Yang and Zhongjie Guan\*



18214

**Low-temperature suitability of flexible photo-rechargeable devices integrated with hydrogel-based lithium-ion batteries and perovskite solar cells**

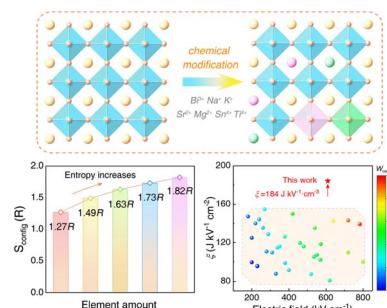
Wei Liu, Mingzhu He, Hai Lu, Hai Zhong,\* Ziwei Cai, Shaohang Wu,\* Yingxiang Tan, Xingjiang Liu\* and Yaohua Mai



18224

**Ultrahigh energy storage capacities in high-entropy relaxor ferroelectrics**

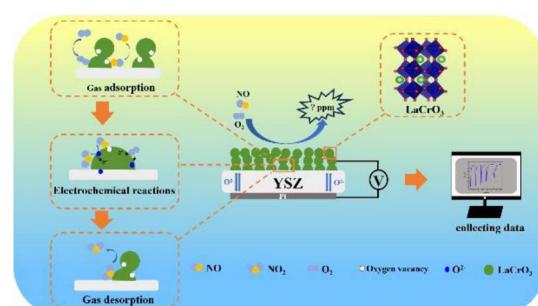
Yunyao Huang, Kaili Shang, Yule Yang, Wenjing Shi, Leiyang Zhang, Vladimir Laletin, Vladimir Shur, Ruiyi Jing and Li Jin\*



18234

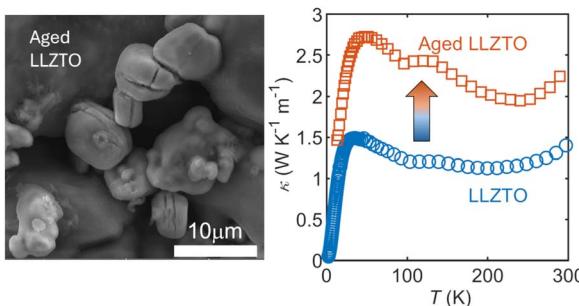
**Selective detection of NO using the perovskite-type oxide  $\text{LaMO}_3$  ( $\text{M} = \text{Cr, Mn, Fe, Co, and Ni}$ ) as the electrode material for yttrium-stabilized zirconia-based electrochemical sensors**

Hongqian Sun, Jing Song,\* Pengfei Shi, Zhenqian Cheng, Liangliang Tian, Mingjun Zhou and Tao Qi\*



## PAPERS

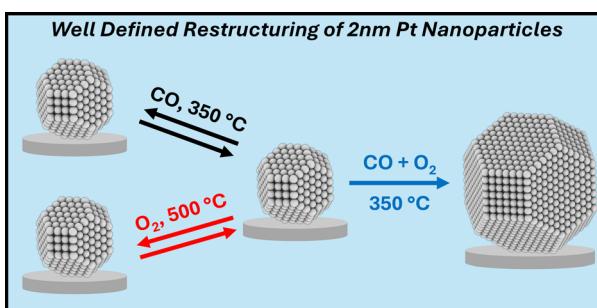
18248



**Thermal properties and lattice anharmonicity of Li-ion conducting garnet solid electrolyte  $\text{Li}_{6.5}\text{La}_3\text{Zr}_{1.5}\text{Ta}_{0.5}\text{O}_{12}$**

Yitian Wang, Shuchen Li, Nan Wu, Qianru Jia, Thomas Hoke, Li Shi, Yutao Li\* and Xi Chen\*

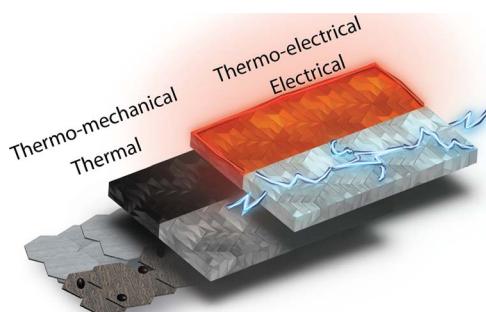
18258



**A well-defined supported Pt nanoparticle catalyst for heterogeneous catalytic surface science**

Taek-Seung Kim, Christopher R. O'Connor, Samantha L. Le and Christian Reece\*

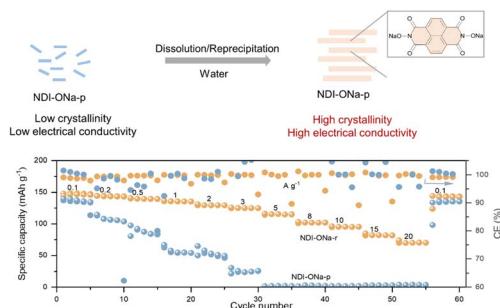
18269



**3D printing carbon–carbon composites with multilayered architecture for enhanced multifunctional properties**

Dharneendar Ravichandran, Anna Dmochowska, Barath Sundaravadielvan, Varunkumar Thippanna, Emile Motta de Castro, Dhanush Patil, Arunachalam Ramanathan, Yuxiang Zhu, M. Taylor Sobczak, Amir Asadi, Jorge Peixinho, Guillaume Miquelard-Garnier and Kenan Song\*

18286



**A recrystallized organic cathode with high electrical conductivity for fast sodium-ion storage**

Zixuan Shan, Shuangqin Yang, Xinya Zhang and Yuan Chen\*

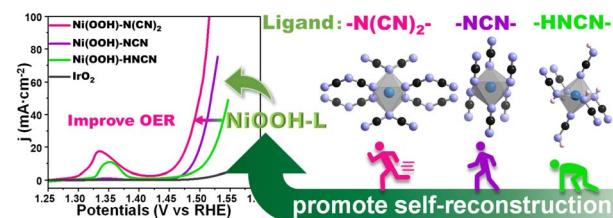


## PAPERS

18294

**Ligand-regulated Ni-based coordination compounds to promote self-reconstruction for improved oxygen evolution reaction**

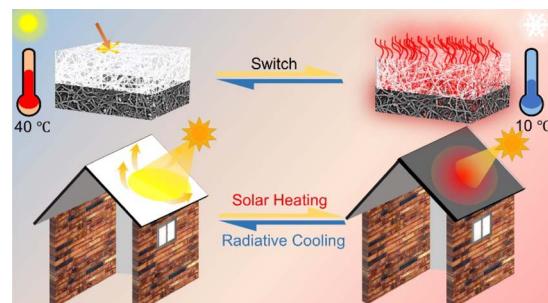
Muhammad Ajmal, Xiaolei Guo,\* Mazhar Ahmed Memon, Muhammad Asim, Chengxiang Shi, Ruijie Gao, Lun Pan, Xiangwen Zhang, Zhen-Feng Huang\* and Ji-Jun Zou



18304

**In situ switchable nanofiber films based on photoselective asymmetric assembly towards year-round energy saving**

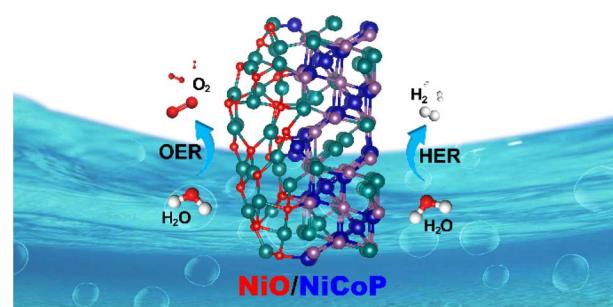
Liuqian An, Jiaxiang Ma, Peizhi Wang, Aleksandr Kuchmizhak, Jinxin Yao, Hongbo Xu\* and Wei Wang\*



18313

**Regulating catalytic kinetics in nanoclimbing-wall-like NiO/NiCoP hybrids for enhanced overall water splitting**

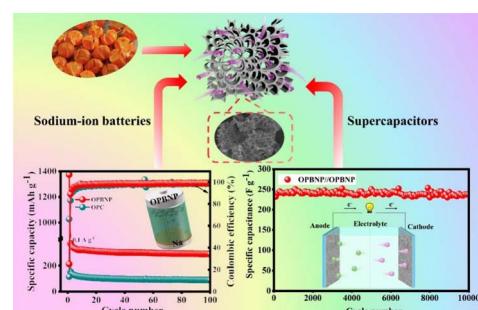
Xiuwen Wang,\* Lan Yu, Chunmei Lv, Ying Xie, Yanqing Jiao,\* Wen Xin, Tengfei Xu, Tingting Su and Libin Yang\*



18324

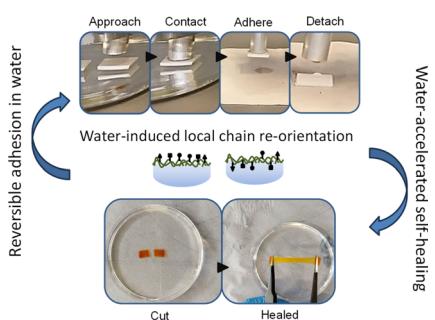
**Biomass-derived B/N/P co-doped porous carbons as bifunctional materials for supercapacitors and sodium-ion batteries**

Yanjiao Li, Xufei Zou, Shiqi Li, Yingying Chen,\* Guoxiu Wang, Hongxun Yang\* and Hao Tian\*



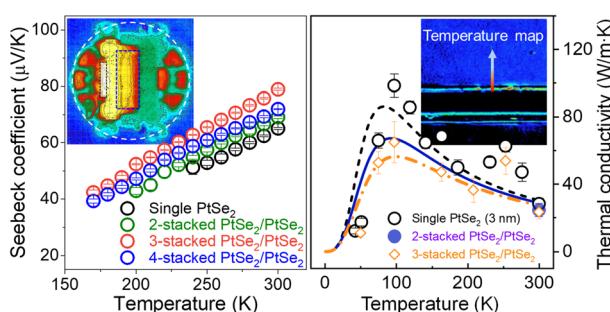
## PAPERS

18338

**Water-triggered self-healing and reversible underwater adhesion in metalorganic polymers**

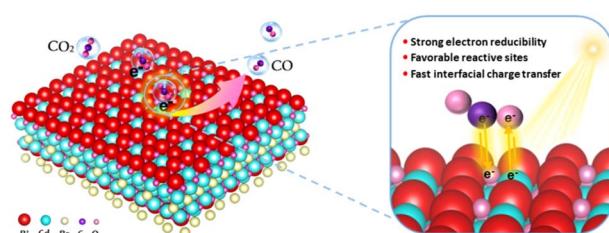
Elif Kaymazlar, Omer Andac and Santiago J. Garcia\*

18348

**Anomalous thermal transport of vertically stacked PtSe<sub>2</sub> thin films with interface formation**

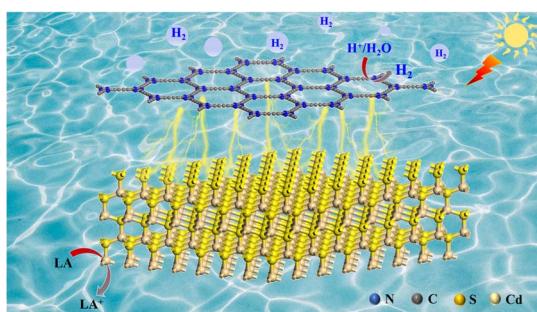
Jung-Min Cho, Won-Yong Lee, Farjana Ferdous Tonni, Min-Jeong Kim, Yun-Ho Kim, Hyeok Jun Kwon, Jae-Won Choi, Mona Zebarjadi, No-Won Park, Sree Sourav Das, Gil-Sung Kim\* and Sang-Kwon Lee\*

18358

**Intrinsic bimetallic cations regulating band centers and reactive sites for boosting CO<sub>2</sub> photoreduction**

Jingjing Wang, Fang Chen, Qing Liu and Hongwei Huang\*

18367

**Triazinyl-graphdiyne induces electron directional migration to drive charge separation of CdS for photocatalytic hydrogen evolution**

Qian Xiao, Linlin Fan, Yafeng Liu, Xin Guo\* and Zhiliang Jin

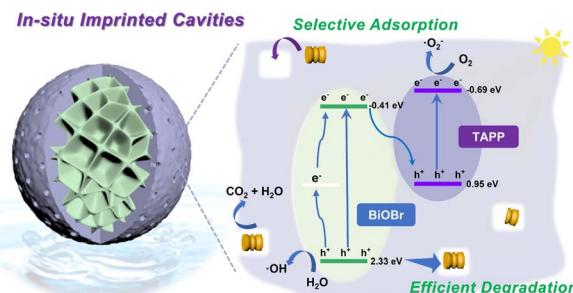


## PAPERS

18381

**In situ imprinted cavity fabrication within BiOBr@porphyrin composites for selective and efficient degradation of trace norfloxacin**

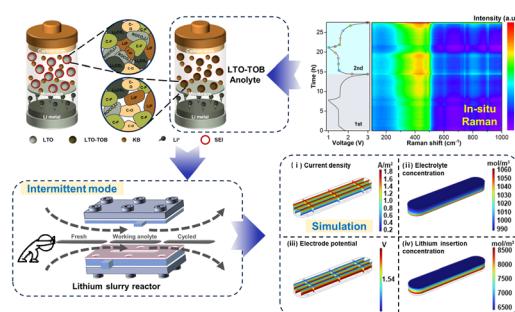
Xuemeng Tian, Pengcheng Wang, Yue Wang, Xiaoyu Shi, Long Zhang, Jinfeng Liu, Yangyang Wang and Ruixia Gao\*



18393

**Enhanced stability and the lithium storage mechanism of oxygen vacancy-induced heterogeneous Li<sub>4</sub>Ti<sub>5</sub>O<sub>12</sub>/TiO<sub>2</sub>(B) anolytes**

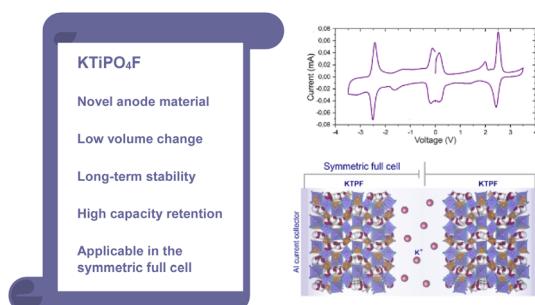
Fengjie Zhang, Wenhao Fang, Xiangkun Wu and Xingmei Lu\*



18404

**Exploring KTiPO<sub>4</sub>F as a robust polyanion anode material for potassium-ion batteries**

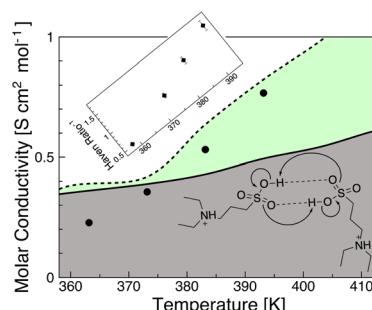
Vahid Ramezankhani,\* Nikita D. Luchinin, Sergey N. Marshenya, Maxim V. Zakharkin, Alexander A. Golubnichiy, Anatolii V. Morozov, Olga Emilianova, Keith J. Stevenson, Evgeny V. Antipov, Artem M. Abakumov and Stanislav S. Fedotov\*



18412

**Superionicity by design: high proton conductivity in a fluorine-free protic ionic liquid**

Hanno Maria Schütz, Stefano Nejrotti, Henry Adenusi, Alessandro Mariani,\* Enrico Bodo,\* Matteo Bonomo,\* Alessandro Innocenti, Claudia Barolo, Xinpei Gao and Stefano Passerini\*



## PAPERS

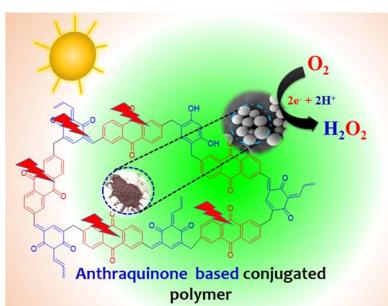
18423



### A self-cleaning intraoral flex-occlusometer based on superhydrophobic capacitive sensors for dental health monitoring

Xin Sun, Ziyi Dai,\* Zijie Zhang, Xiaoli Fan, Zhiwei Fu, He Zhu, Rong Cai\* and Kai Qian\*

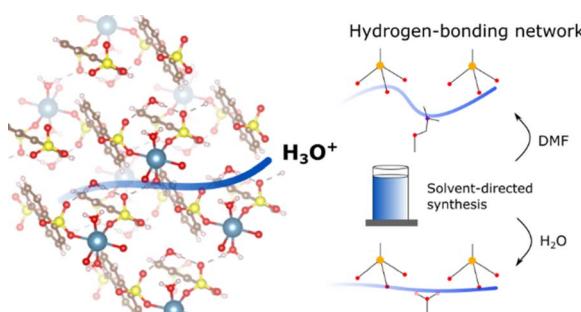
18433



### An anthraquinone-based conjugated donor–acceptor (D–A) polymer as a highly efficient photocatalyst for hydrogen peroxide production

Ajay V. Munde, Devendra M. Sanke, Nani Gopal Ghosh, Jasmine Bezboruah, Shiladitya Roy and Sanjio S. Zade\*

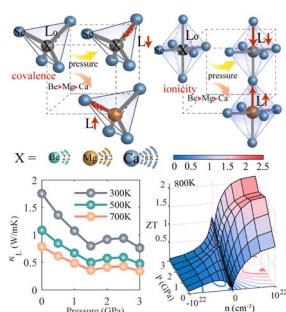
18440



### Modulating proton conductivity through crystal structure tuning in arenedisulfonate coordination polymers

Chao Sun, Christopher M. Pask, Sang T. Pham, Emilio Rapaccioli, Andrew J. Britton, Stuart Micklethwaite, Andrew Bell, Maximilian O. Besenhard, Rik Drummond-Brydson, Ke-Jun Wu and Sean M. Collins\*

18452



### Origin of positive/negative effects on pressure-dependent thermal conductivity: the role of bond strength and anharmonicity

Fang Lyu, Wei Cao,\* Han-Pu Liang, Tan Peng, Yue Hou, Xiaolu Zhu, Ling Miao, Ziyu Wang,\* Rui Xiong\* and Jing Shi

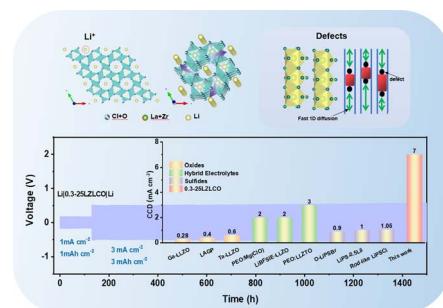


## PAPERS

18459

**A novel  $\text{LaCl}_3$ -based oxychloride solid-state electrolyte enables fast Li-ion transport and is compatible with lithium metal**

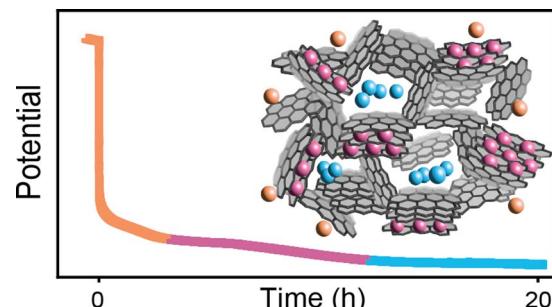
Xuxia Hao, Kai Chen,\* Min Jiang, Yanping Tang, Yuexin Liu and Kefeng Cai\*



18469

**Investigation of sodium insertion in hard carbon with *operando* small angle neutron scattering**

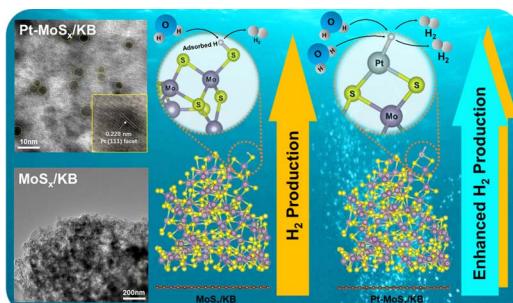
Emily M. Reynolds, Jack Fitzpatrick, Martin O. Jones, Nuria Tapia-Ruiz, Helen Y. Playford, Stephen Hull, Innes McClelland, Peter J. Baker, Serena A. Cussen and Gabriel E. Pérez\*



18476

**Low loading of Pt in radiation-synthesized  $\text{Pt}-\text{MoS}_x/\text{KB}$  nanocomposites for enhancing the electrocatalytic hydrogen evolution reaction**

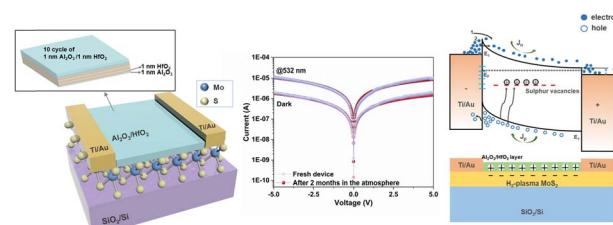
Yicheng Wang, Shuangxiao Li, Xueyan Que, Zeyu Zhang, Ling Xu, Yue Wang, Jing Peng, Jiuqiang Li, Shuanglin Hu, Yinyong Ao\* and Maolin Zhai\*



18487

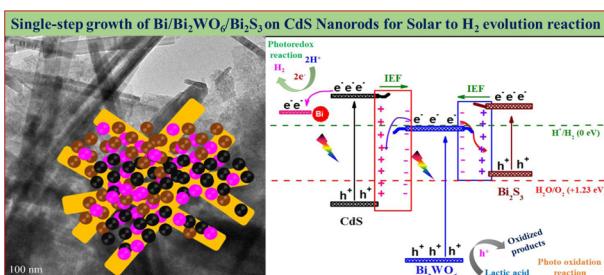
**High responsivity and stability of MSM structured  $\text{MoS}_2$  photodetectors by remote hydrogen plasma treatment and alternating growth of  $\text{Al}_2\text{O}_3/\text{HfO}_2$  passivation layers**

Yulin Li, Yajun Tian, Lingjie Bao, Haoran Cheng\* and Qijin Cheng\*



## PAPERS

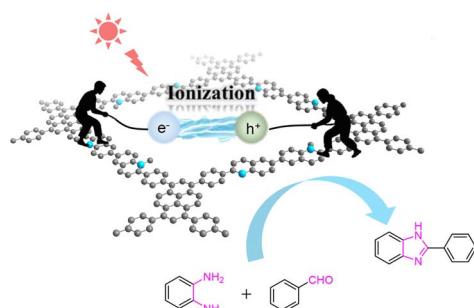
18498



**Internal electric field promoted charge separation via bismuth-based ternary heterojunctions with near-infrared light harvesting properties for efficient photoredox reactions**

Rama Krishna Chava,\* Younghwan Im and Misook Kang\*

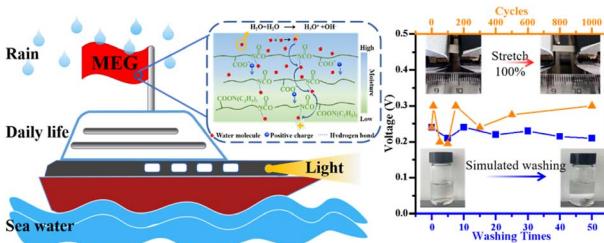
18512



**Ionization-triggered low exciton binding energy in covalent organic frameworks for efficient photocatalytic synthesis of benzimidazole**

Dekang Huang,\* Yuwei Zhang, Huaji Pang, Xianwen Hu\* and Yonggang Xiang\*

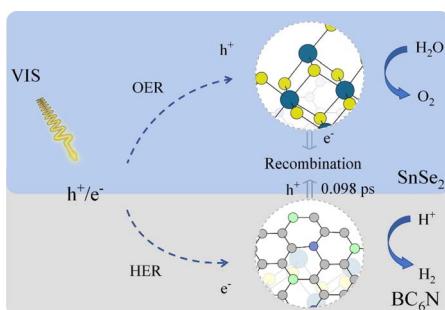
18519



**Waterborne polyurethane: an easily available material for moist-electric generator with unique stretchability and water resistance**

Yuying Zhang, Linghui Kong, Yuzhu Zhai, Lehao Pan, Wanying Cao, Mingwei Tian,\* Lijun Qu\* and Yijun Jiang\*

18528



**Ultrafast carrier recombination in a BC<sub>6</sub>N/SnXY Z-scheme heterostructure for water splitting: insights from ground- and excited-state carrier dynamics**

Jingshan Zong, Cheng He\* and Wenxue Zhang\*

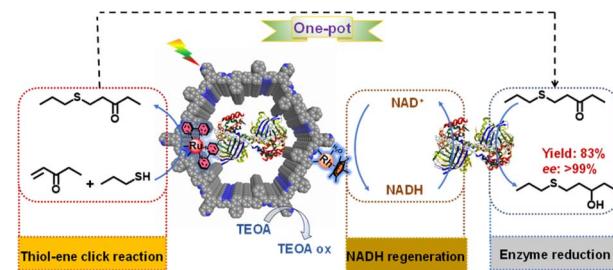


## PAPERS

18537

**Enzyme immobilization in a Ru( $N^+N$ )<sub>3</sub>-modified covalent organic framework for photoenzymatic cascade catalysis**

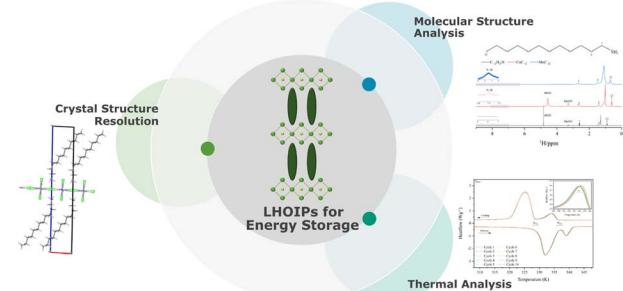
Yanxia Wang, Bingchen Guo, Zhihua Chai, Ming Gao, Yanlin Li, Yang Yu\* and Shengli Huang\*



18544

**Copper- and manganese-based layered hybrid organic-inorganic compounds with polymorphic transitions as energy storage materials**

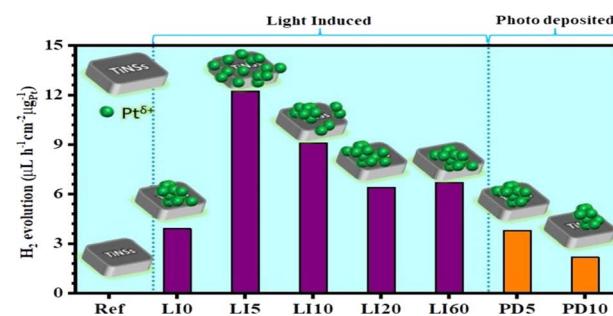
R. Salgado-Pizarro, C. Puigjaner, J. García, A. I. Fernández\* and C. Barreneche



18554

**Synergistic enhancement of photocatalytic hydrogen production in TiO<sub>2</sub> nanosheets through light-induced defect formation and Pt single atoms**

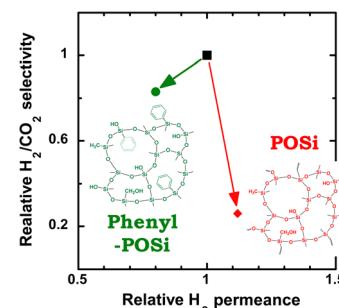
Majid Shahsanaei, Nastaran Farahbakhsh, Sadegh Pour-Ali, Annika Schardt, Setareh Orangpour, Carsten Engelhard, Shiva Mohajernia, Manuela S. Killian\* and Sina Hejazi\*



18563

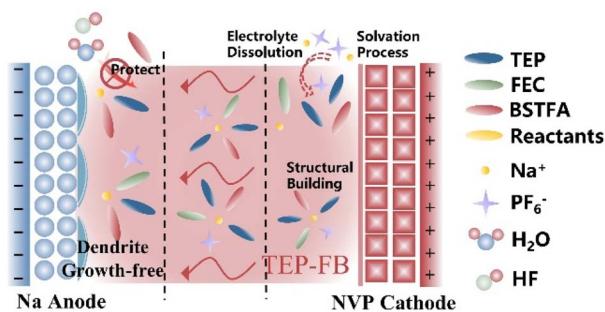
**Phenyl-incorporated polyorganosilica membranes with enhanced hydrothermal stability for H<sub>2</sub>/CO<sub>2</sub> separation**

Vinh T. Bui, Varun R. Satti, Elizabeth Haddad, Ameya Manoj Tandel, Narjes Esmaeili, Sai Srikanth Chundury, Fathy Attia, Lingxiang Zhu and Haiqing Lin\*



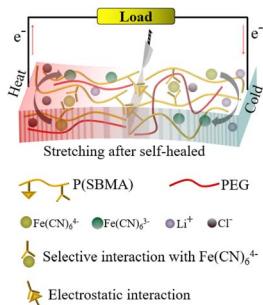
## PAPERS

18572

**Inhibition of sodium dendrites by solvent structural reorganization for non-flammable high-performance sodium-metal batteries**

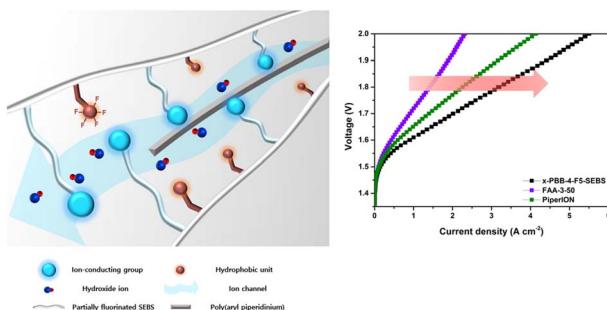
JiYuan You, Bo Zhang, Tianle Li, Yuqian Li and Wenju Wang\*

18582

**A hydrogel thermoelectrochemical cell with high self-healability and enhanced thermopower both induced by zwitterions**

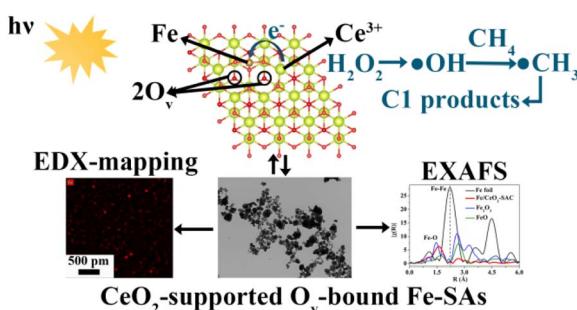
Youfa Liu, Li Yin, Sheng Chen, Yao Liu, Qingjiang Liu, Liangliang Yang, Yingchun Li, Qian Zhang\* and Yan Huang\*

18593

**Crosslinked high-performance anion exchange membranes based on poly(dibenzyl N-methyl piperidine) and pentafluorobenzoyl-substituted SEBS**

Soomin Jeon, SeongMin Han, Junghwa Lee, Kyungwhan Min, Sang Yong Nam\* and Tae-Hyun Kim\*

18604

**Highly efficient ambient temperature photo-oxidation of CH<sub>4</sub> to C<sub>1</sub> products over CeO<sub>2</sub> supported single-atom Fe with oxygen vacancies**

Hailong Tang, Yongqing Ma, Chuhong Zhu, Min Wang, Ganhong Zheng, Xiao Sun\* and Meiling Wang\*

