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# Materials Horizons

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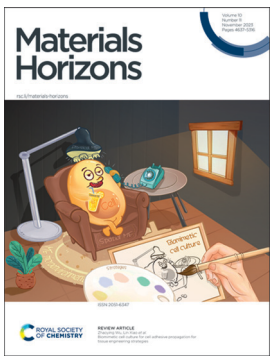


**Inside cover**
See Zhaoying Wu, Lin Xiao *et al.*, pp. 4662–4685. Image reproduced by permission of Lin Xiao from *Mater. Horiz.*, 2023, **10**, 4662.

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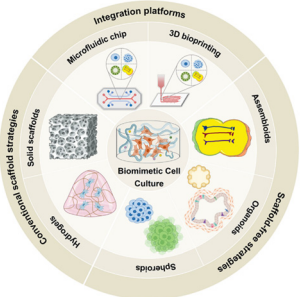


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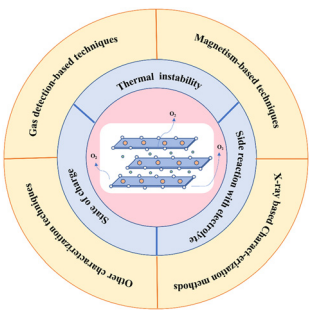
Junrun Feng, Zhuo Chen, Weihua Zhou and Zhangxiang Hao*

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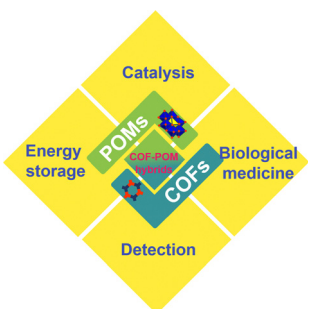
Rui Xue, Yin-Sheng Liu, Ming-Yue Wang, Hao Guo,* Wu Yang* and Guo-Yu Yang*



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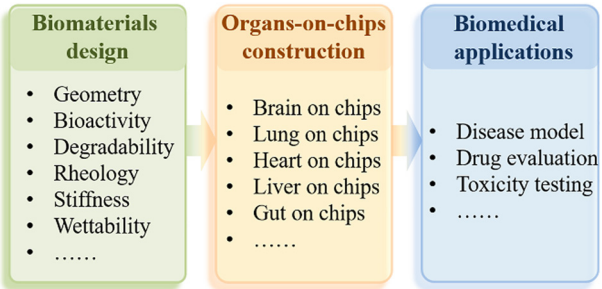


**Tailoring biomaterials for biomimetic organs-on-chips**

Lingyu Sun, Feika Bian, Dongyu Xu, Yuan Luo,* Yongan Wang* and Yuanjin Zhao*

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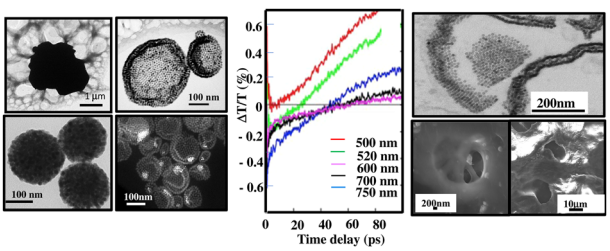


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M. P. Pileni

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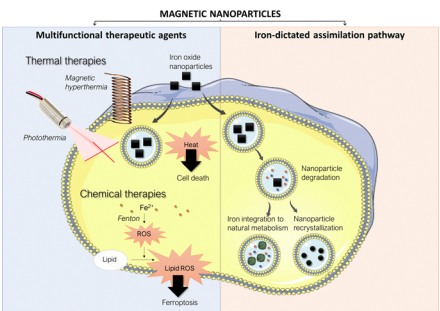


**Emergence of magnetic nanoparticles in photothermal and ferroptotic therapies**

Aurore Van de Walle,* Albert Figuerola, Ana Espinosa, Ali Abou-Hassan, Marta Estrader and Claire Wilhelm*

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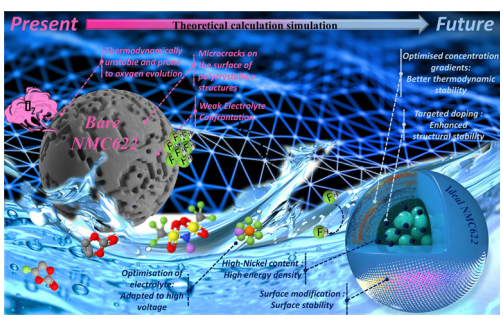


**A review on nickel-rich nickel–cobalt–manganese ternary cathode materials $LiNi_{0.6}Co_{0.2}Mn_{0.2}O_2$ for lithium-ion batteries: performance enhancement by modification**

Longjiao Chang,* Wei Yang, Kedi Cai, Xiaolong Bi, Anlu Wei, Ruifen Yang and Jianan Liu



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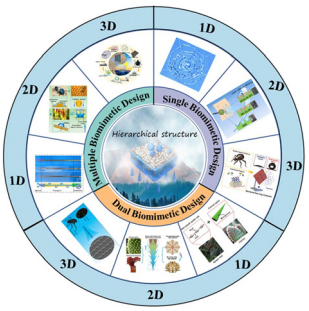
**Overview of the design of bionic fine hierarchical structures for fog collection**

Danyan Zhan and Zhiguang Guo*

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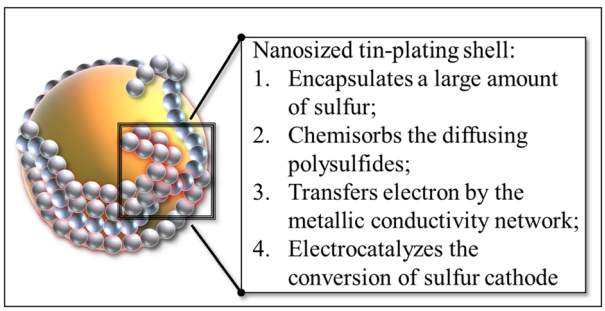
Chui-Yi Kung and Sheng-Heng Chung*

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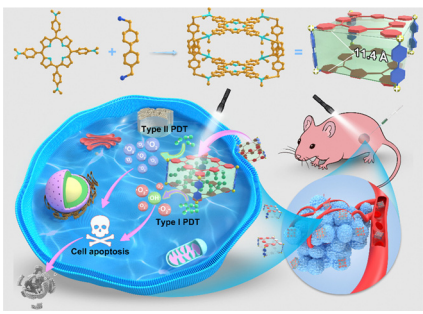
**A biocompatible pure organic porous nanocage for enhanced photodynamic therapy**

Zhong-Hong Zhu, Di Zhang, Jian Chen, Hua-Hong Zou, Zhiqiang Ni, Yutong Yang, Yating Hu,* Ruiyuan Liu,* Guangxue Feng* and Ben Zhong Tang

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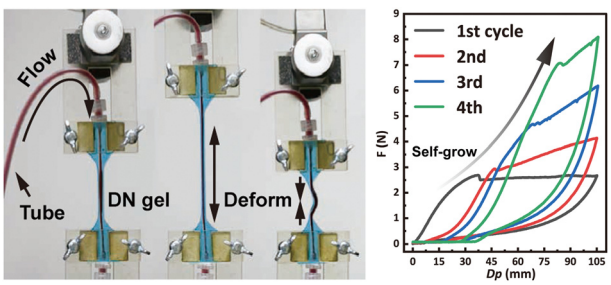
**Sustainable mechanochemical growth of double-network hydrogels supported by vascular-like perfusion**

Gumi Wei, Yumeko Kudo, Takahiro Matsuda, Zhi Jian Wang, Qi Feng Mu, Daniel R. King, Tasuku Nakajima* and Jian Ping Gong*



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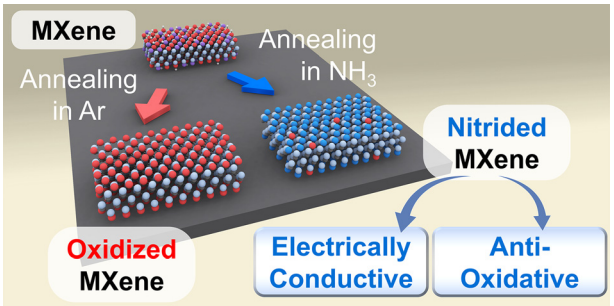


**Surface nitrided MXene sheets with outstanding electroconductivity and oxidation stability**

Wonsik Eom, Hwansoo Shin, Woojae Jeong, Rohan B. Ambade, Hyeonhoo Lee and Tae Hee Han*

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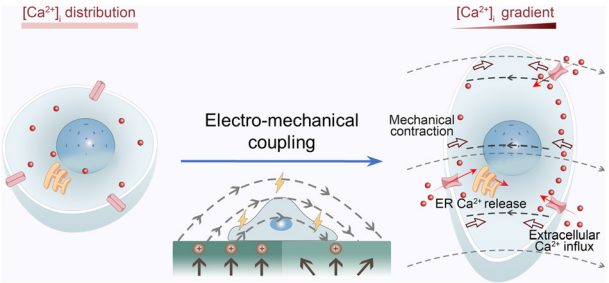


**Electro-mechanical coupling directs endothelial activities through intracellular calcium ion deployment**

Changhao Li, Peng Yu, Zhengao Wang, Cheng Long, Cairong Xiao, Jun Xing, Binbin Dong, Jinxia Zhai, Lei Zhou, Zhengnan Zhou, Yan Wang, Wenjun Zhu, Guoxin Tan, Chengyun Ning,* Yahong Zhou* and Chuanbin Mao*

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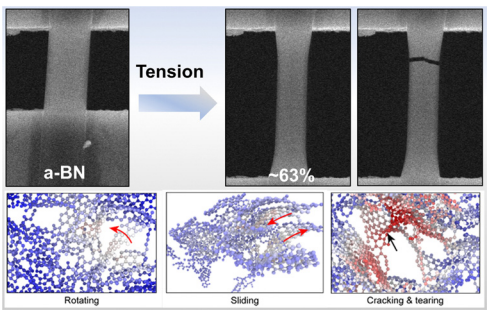


**Ductile amorphous boron nitride microribbons**

Mengya Zhu, Jingzhuo Zhou, Zezhou He, Yang Zhang, Hao Wu, Juzheng Chen, Yinbo Zhu, Yuan Hou,* Hengan Wu and Yang Lu*

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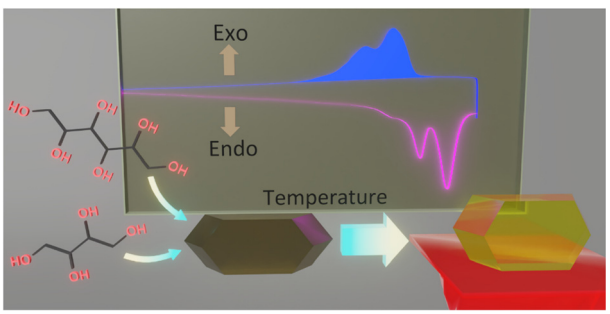


**Composite formation of covalent organic framework crystals and sugar alcohols for exploring a new class of heat-storage materials**

Yoichi Murakami,* Shoma Mitsui, Shiori Nakagawa, Xiaohan Wang, Hiroki Fujisawa, Meguya Ryu and Junko Morikawa*



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## COMMUNICATIONS

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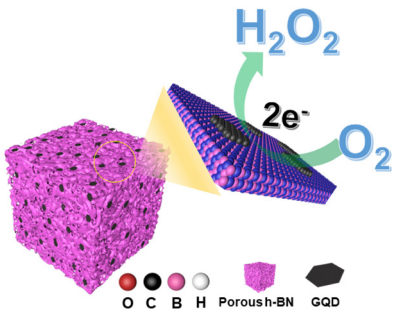
**Interfacial engineering of a vertically stacked graphene/h-BN heterostructure as an efficient electrocatalyst for hydrogen peroxide synthesis**

Yuying Zhao, Xiang Xu, Qixin Yuan, Yuhan Wu, Kang Sun, Bei Li, Zeming Wang, Ao Wang, Hao Sun, Mengmeng Fan* and Jianchun Jiang

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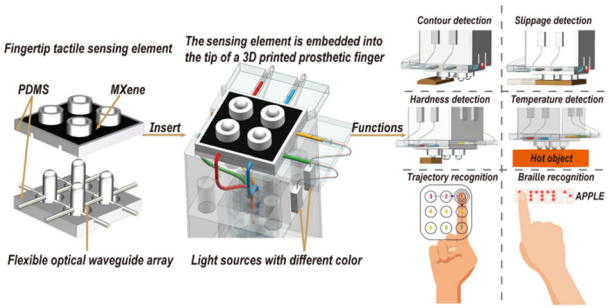
**Prosthetic finger for fingertip tactile sensing *via* flexible chromatic optical waveguides**

Jian Zhou, Chunqiao Fu, Jiahao Fang, Kedong Shang, Xiaobo Pu, Yong Zhang, Zhongbao Jiang, Xulei Lu, Changliu He, Lingxu Jia, Yuming Yao, Linmao Qian* and Tingting Yang*

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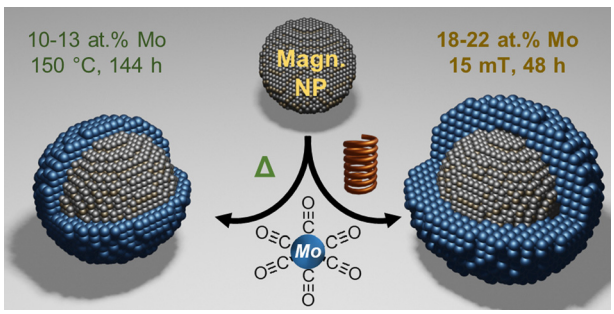
**Induction heating: an efficient methodology for the synthesis of functional core–shell nanoparticles**

Álvaro Raya-Barón, Sourav Ghosh, Jaime Mazarío, Víctor Varela-Izquierdo, Pier-Francesco Fazzini, Simon Tricard, Jerome Esvan and Bruno Chaudret*

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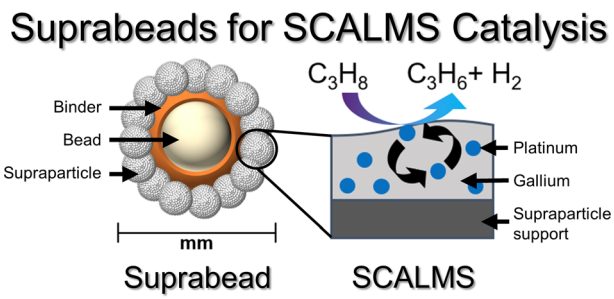
Thomas Zimmermann, Nnamdi Madubuko, Philipp Groppe, Theodor Raczka, Nils Dünninger, Nicola Taccardi, Simon Carl, Benjamin Apeleo Zubiri, Erdmann Spiecker, Peter Wasserscheid, Karl Mandel, Marco Haumann* and Susanne Wintzheimer*



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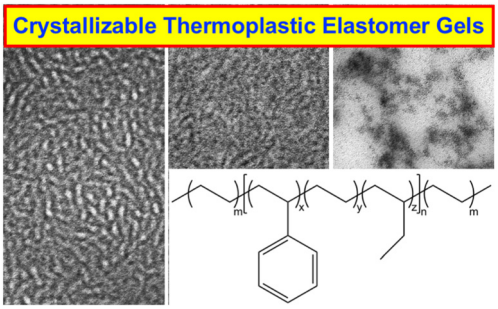


**Tunable thermoplastic elastomer gels derived from controlled-distribution triblock copolymers with crystallizable endblocks**

Nathan T. Hames, Drew Balsbough, Jiaqi Yan, Siyu Wu, Xiaobing Zuo and Richard J. Spontak*

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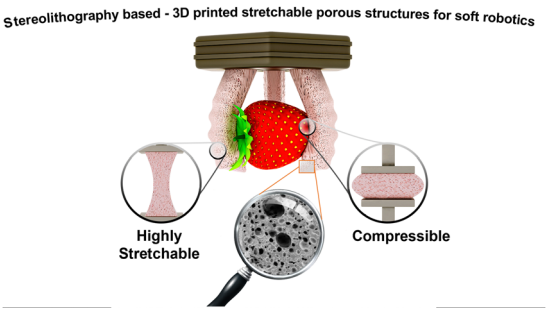
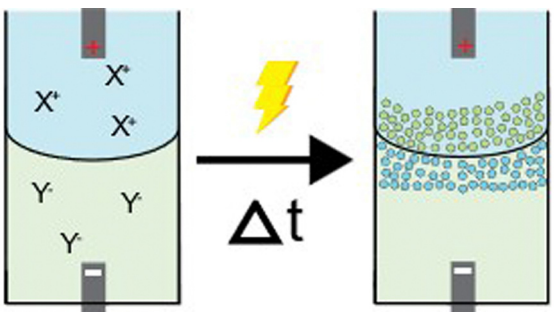



**3D printing stretchable and compressible porous structures by polymerizable emulsions for soft robotics**

Ouriel Bliah, Seonggun Joe, Roei Reinberg, Anderson B. Nardin, Lucia Beccai* and Shlomo Magdassi*

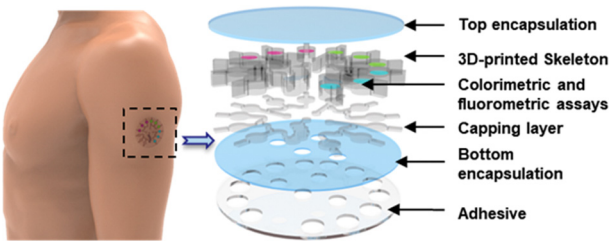
4986




**Voltage-driven ion flux promotes emulsification at the water|oil interface**

Guillermo Colón-Quintana and Jeffrey E. Dick*

4992




**3D-printed epidermal sweat microfluidic systems with integrated microcuvettes for precise spectroscopic and fluorometric biochemical assays**

Da Som Yang, Yixin Wu, Evangelos E. Kanatzidis, Raudel Avila, Mingyu Zhou, Yun Bai, Shulin Chen, Yurina Sekine, Joohee Kim, Yujun Deng, Hexia Guo, Yi Zhang, Roozbeh Ghaffari, Yonggang Huang and John A. Rogers*



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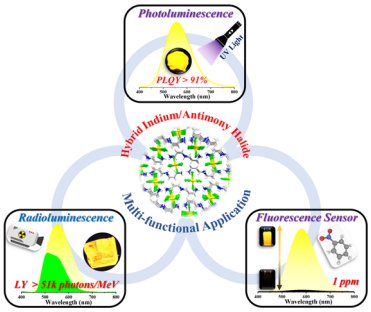
## COMMUNICATIONS

5004

**0D hybrid indium halide as a highly efficient X-ray scintillation and ultra-sensitive fluorescent probe**

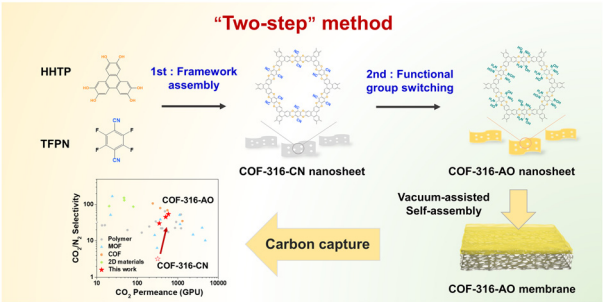
Dong-Yang Li, Yan-Bing Shang, Qi Liu, Hua-Wu Zhang, Xin-Yue Zhang, Cheng-Yang Yue* and Xiao-Wu Lei*




5016

**Two-step fabrication of COF membranes for efficient carbon capture**

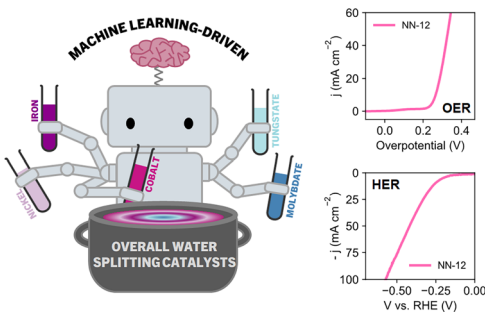
Yuhan Wang, Junyi Zhao, Sui Zhang, Zhiming Zhang, Ziting Zhu, Meidi Wang, Bohui Lyu, Guangwei He, Fusheng Pan* and Zhongyi Jiang*




5022

**Machine learning-assisted optimization of multi-metal hydroxide electrocatalysts for overall water splitting**

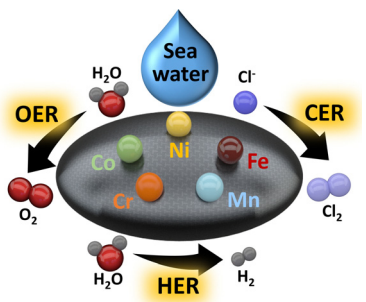
Carina Yi Jing Lim, Riko I Made, Zi Hui Jonathan Khoo, Chee Koon Ng, Yang Bai, Jianbiao Wang, Gaoliang Yang, Albertus D. Handoko* and Yee-Fun Lim*




5032

**High entropy alloying strategy for accomplishing quintuple-nanoparticles grafted carbon towards exceptional high-performance overall seawater splitting**

Gokul Raj, Ravi Nandan, Kanhai Kumar, Demudu Babu Gorle, Ambresh B Mallya, Sameh M. Osman, Jongbeom Na,* Yusuke Yamauchi and Karuna Kar Nanda*



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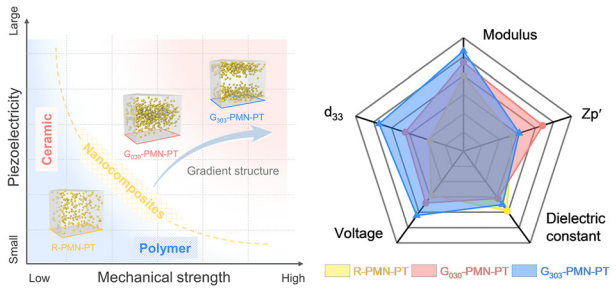
## COMMUNICATIONS

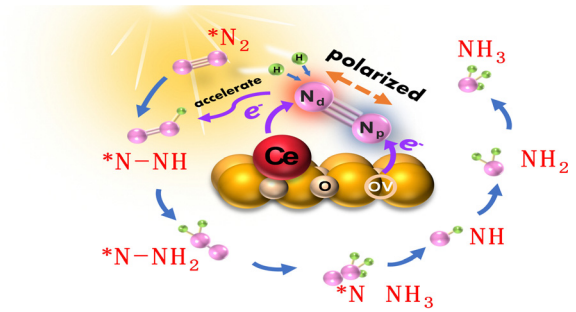
5045




**Modulating piezoelectricity and mechanical strength *via* three-dimensional gradient structure for piezoelectric composites**

Tao Yang, Weili Deng,* Guo Tian, Lin Deng, Wanghong Zeng, You Wu, Shenglong Wang, Jieling Zhang, Boling Lan, Yue Sun, Long Jin and Weiqing Yang*

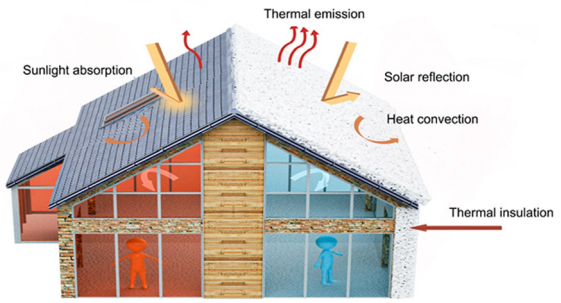
5053




**Electron transfer bridge inducing polarization of nitrogen molecules for enhanced photocatalytic nitrogen fixation**

Huiyi Li, Jiongrong Wang, Zhoushilin Ruan, Pengfei Nan, Binghui Ge, Ming Cheng, Lan Yang, Xiaohong Li, Qilong Liu, Bicai Pan, Qun Zhang,* Chong Xiao* and Yi Xie*

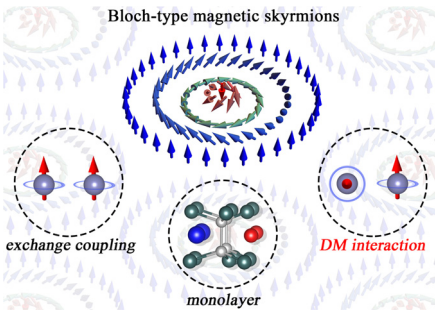
5060




**Controllable-morphology polymer blend photonic metafoam for radiative cooling**

Yajie Wang, Tiecheng Wang, Jun Liang, Jiawei Wu, Maiping Yang, Yamin Pan,* Chong Hou, Chuntai Liu, Changyu Shen, Guangming Tao* and Xianhu Liu*

5071




**Bloch-type magnetic skyrmions in two-dimensional lattices**

Wenhui Du, Kaiying Dou, Zhonglin He, Ying Dai,* Baibiao Huang and Yandong Ma*



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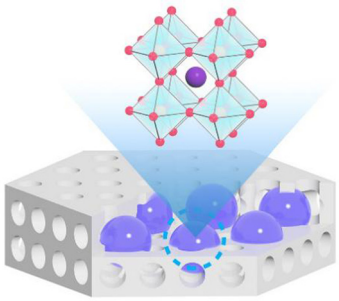
## COMMUNICATIONS

5079

**Ultrasmall water-stable $CsPbBr_3$ quantum dots with high intensity blue emission enabled by zeolite confinement engineering**

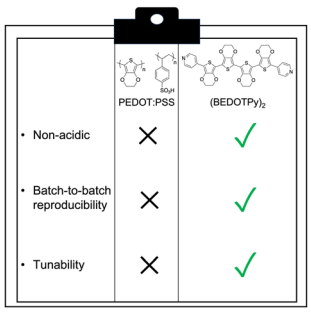
Hongyue Zhang, Bolun Wang, Zijian Niu, Guangrui Chen, Buyuan Guan, Jiyang Li* and Jihong Yu*



5087

**A pyridine-capped quaterthiophene as an alternative to PEDOT:PSS, processable from organic solvents and without acidity, for more stable electronic devices**

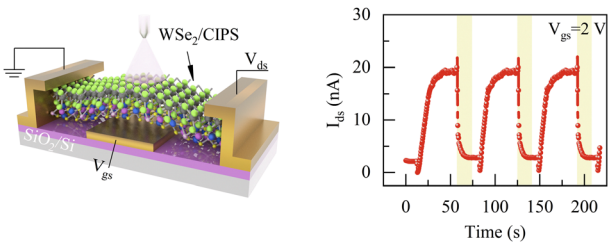
Eman J. Hussien, Joseph Cameron, Neil J. Findlay, Rupert G. D. Taylor, Michael Johnson, Lyudmyla Kanibolotska, Alexander L. Kanibolotsky and Peter J. Skabara*




5099

**A polar-switchable and controllable negative phototransistor for information encryption**

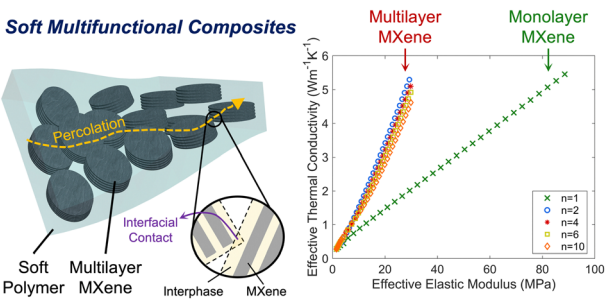
Aiping Cao, Shubing Li, Hongli Chen, Menghan Deng, Xionghu Xu, Liyan Shang, Yawei Li, Anyang Cui and Zhigao Hu*




5110

**Are MXenes suitable for soft multifunctional composites?**

Cerwyn Chiew and Mohammad H. Malakooti*



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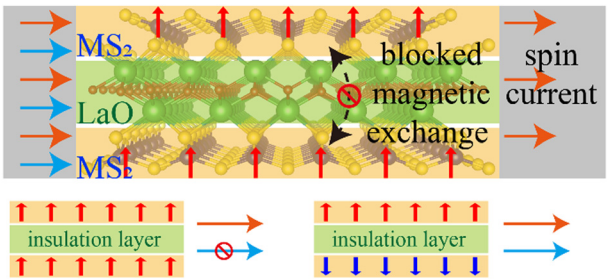
## COMMUNICATIONS

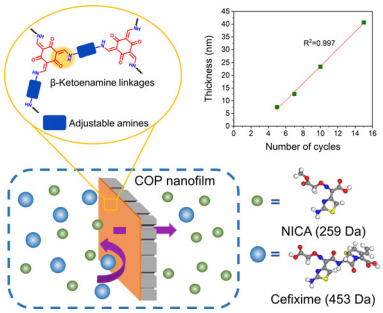
5126




**$LaOMS_2$ (M = Ti, V, and Cr): novel crystal spin valves without contact**

Haoyun Bai, Di Liu and Hui Pan*

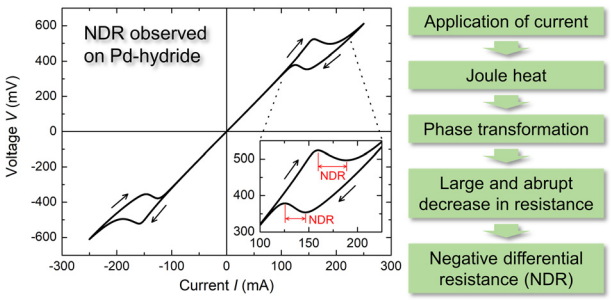
5133




**Tailor-made β-ketoenamine-linked covalent organic polymer nanofilms for precise molecular sieving**

Hukang Guo, Chuanjie Fang,* Fupeng Li, Wenshou Cui, Ruiyan Xiong, Xing Yang and Liping Zhu*

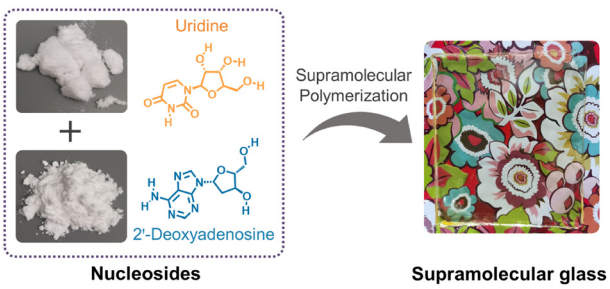
5143




**Negative differential resistance based on phase transformation**

Takashi Harumoto,* Hiroyuki Fujiki, Ji Shi, Yoshio Nakamura and Yuji Sutou

5152




**Bulk and transparent supramolecular glass from evaporation-induced noncovalent polymerization of nucleosides**

Shuanggen Wu, Changyong Cai, Xunqiu Wang, Qiao Zhang, Zhijian Tan,* Fenfang Li and Shengyi Dong*



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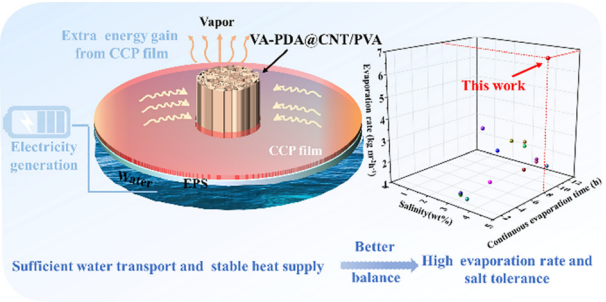
## COMMUNICATIONS

5161

**Gradient heating induced better balance among water transportation, salt resistance and heat supply in a high performance multi-functional solar-thermal desalination device**

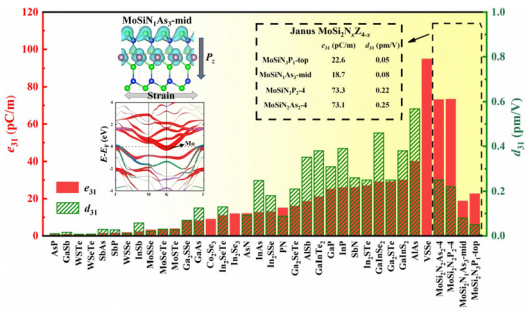
Chuanliang Chen, Lianhu Xiong, Xuezhong Zhang, Ke Tian, Zijian Dai, Qiang Fu and Hua Deng*




5177

**Monolayer polar metals with large piezoelectricity derived from $MoSi_2N_4$**

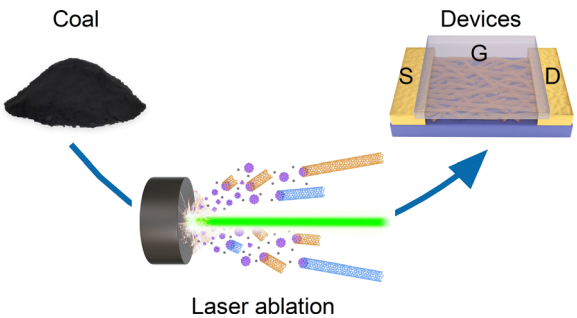
Yan Yin, Qihua Gong,* Min Yi* and Wanlin Guo




5185

**Single-walled carbon nanotubes synthesized by laser ablation from coal for field-effect transistors**

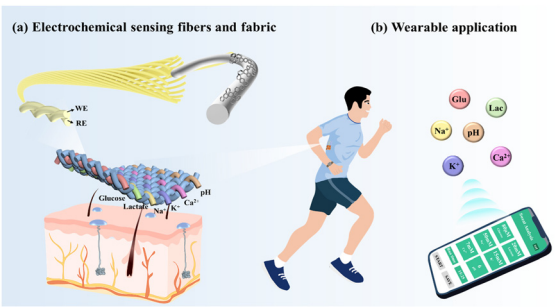
Shaochuang Chen, Yuguang Chen, Haitao Xu, Min Lyu, Xinrui Zhang, Zhen Han, Haoming Liu, Yixi Yao, Chi Xu, Jian Sheng, Yifan Xu, Lei Gao, Ningfei Gao, Zeyao Zhang,* Lian-mao Peng and Yan Li*




5192

**Hierarchical Fermat helix-structured electrochemical sensing fibers enable sweat capture and multi-biomarker monitoring**

Hang Tian, Lichao Wang, Weifeng Yang, Kerui Li, Qinghong Zhang, Yaogang Li,* Hongzhi Wang and Chengyi Hou*



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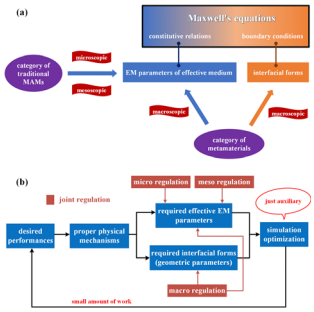
## COMMUNICATIONS

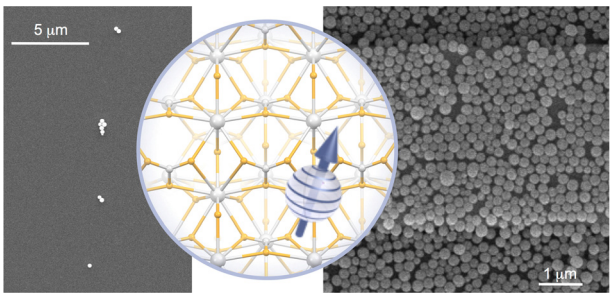
5202




**Establishing a unified paradigm of microwave absorption inspired by the merging of traditional microwave absorbing materials and metamaterials**

Mengchao Guo, Xiaokun Wang, Haiyan Zhuang, Yuyao Dai, Wei Li, Xuyao Wei, Dongming Tang, Baoshan Zhang, Ping Chen and Yi Yang*

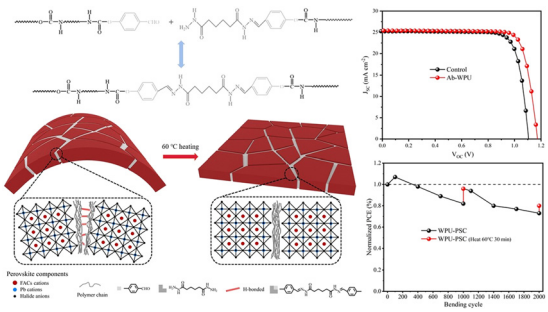
5214




**Dilute Gd hydroxycarbonate particles for localized spin qubit integration**

Inés Tejedor, Ainhoa Urtizberea, Eva Natividad, Jesús I. Martínez, Ignacio Gascón and Olivier Roubeau*

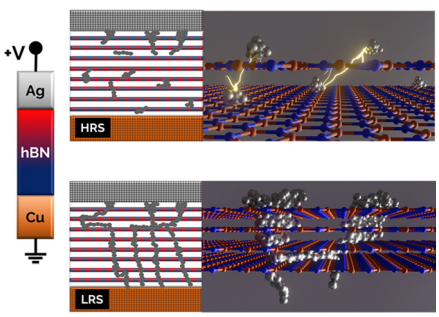
5223




**Dynamic covalent polymer engineering for stable and self-healing perovskite solar cells**

Peng Xu, Jian Liu, Shuai Wang, Jiujiang Chen, Bin Han, Yuanyuan Meng, Shuncheng Yang, Lisha Xie, Mengjin Yang,* Runping Jia* and Ziyi Ge*

5235



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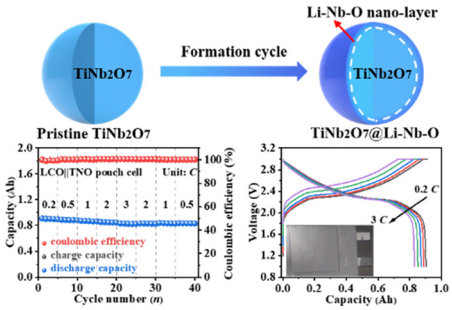
## COMMUNICATIONS

5246

**Micrometer-scale single crystalline particles of niobium titanium oxide enabling an Ah-level pouch cell with superior fast-charging capability**

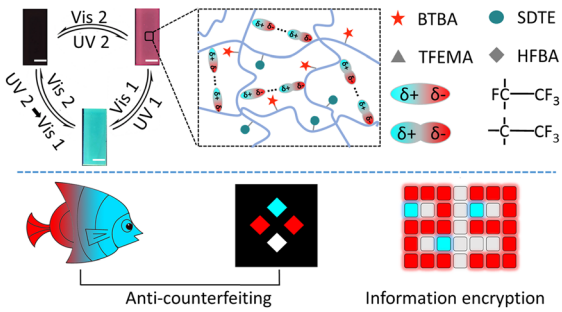
Renming Zhan, Shiyu Liu, Wenyu Wang, Zihe Chen, Shuibin Tu, Xiancheng Wang, Hanlong Ge, Hongyu Luo, Tianqi Chai, Yangtao Ou, Yuchen Tan and Yongming Sun*




5256

**Highly stretchable and self-healing photoswitchable supramolecular fluorescent polymers for underwater anti-counterfeiting**

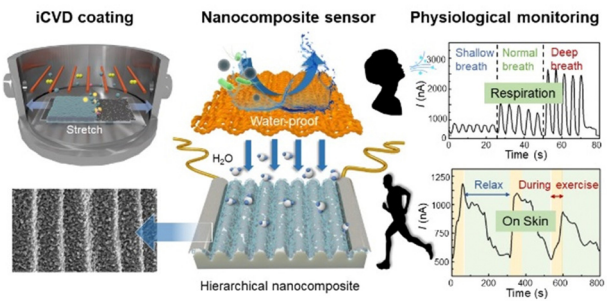
Haitao Deng, Hong Wang, Yong Tian, Zhong Lin, Jiaxi Cui* and Jian Chen*




5263

**Ultrathin hierarchical hydrogel–carbon nanocomposite for highly stretchable fast-response water-proof wearable humidity sensors**

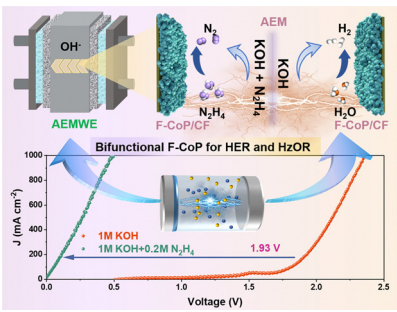
Bingqi Pan, Peipei Su, Minghui Jin, Xiaocheng Huang, Zhenbo Wang, Ruhao Zhang, He Xu, Wenna Liu and Yumin Ye*




5277

**Anion-modulated CoP electrode as bifunctional electrocatalyst for anion-exchange membrane hydrazine-assisted water electrolyser**

Kaixun Li, Yun Tong,* JinFeng He, Xiang-Yang Liu* and Pengzuo Chen*



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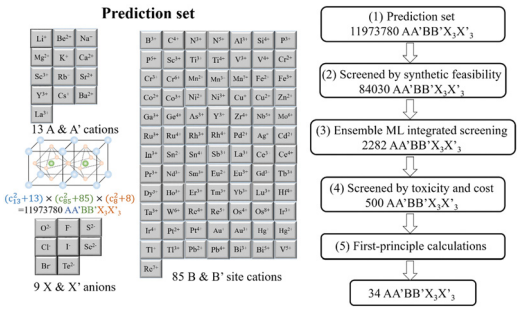
## COMMUNICATIONS

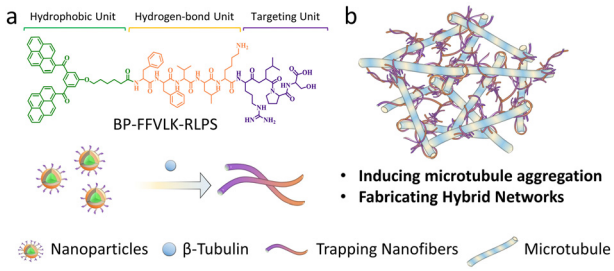
5288




### Discovery of all-inorganic lead-free perovskites with high photovoltaic performance *via* ensemble machine learning

Xia Cai,* Yan Li, Jianfei Liu, Hao Zhang,* Jianguo Pan* and Yiqiang Zhan

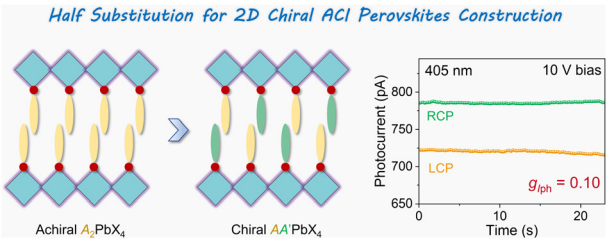
5298




### An adhesive peptide specifically induces microtubule condensation

Yi-Jing Li, Jia-Qi Wang, Wen Tian, Lu Han, Ting Xiao, Xiu-Hai Wu, Lei Wang, Pei-Pei Yang,* Hui Cao,* Wan-Hai Xu* and Hao Wang*

5307




### Alternating chiral and achiral spacers for constructing two-dimensional chiral hybrid perovskites toward circular-polarization-sensitive photodetection

Shihai You, Panpan Yu, Tingting Zhu, Qianwen Guan, Jianbo Wu, Hongliang Dai, Haiqing Zhong, Zeng-Kui Zhu and Junhua Luo*

## RETRACTIONS

5313

### Retraction: Progressive p-channel vertical transistors fabricated using electrodeposited copper oxide designed with grain boundary tunability

Sung Hyeon Jung, Ji Sook Yang, Young Been Kim, Nishad G. Deshpande, Dong Su Kim, Ji Hoon Choi, Hee Won Suh, Hak Hyeon Lee and Hyung Koun Cho*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RETRACTIONS

5314

## Retraction: Ambipolar operation of progressively designed symmetric bidirectional transistors fabricated using single-channel vertical transistor and electrochemically prepared copper oxide

Sung Hyeon Jung, Ji Sook Yang and Hyung Koun Cho*

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