

Materials Horizons

rsc.li/materials-horizons

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.

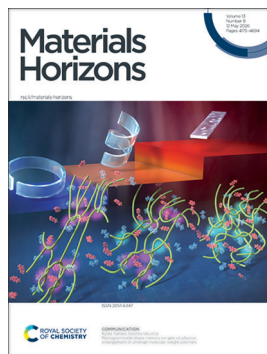
IN THIS ISSUE

ISSN 2051-6347 CODEN MHAOAL 13(9) 4175-4694 (2026)



Cover

See Dean C. Webster *et al.*, pp. 4360–4370. Image reproduced by permission of Dean C. Webster from *Mater. Horiz.*, 2026, 13, 4360.



Inside cover

See Ryota Tamate, Koichiro Uto *et al.*, pp. 4371–4383. Image reproduced by permission of Ryota Tamate from *Mater. Horiz.*, 2026, 13, 4371.

EDITORIAL

4188

Materials Horizons Emerging Investigator Series:
Professor Jingchao Li, Donghua University, China

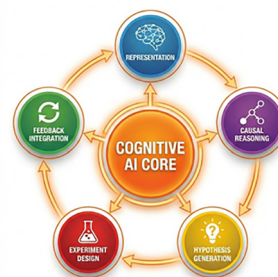


OPINION

4190

Cognitive AI beyond prediction: toward reasoning and discovery

Jianliang Gong, Han Zhou, Shicheng Yu* and Yiwang Chen*



Royal Society of Chemistry approved training courses

Explore your options.
Develop your skills.
Discover learning
that suits you.

**Courses in the classroom,
the lab, or online**

Find something for every
stage of your professional
development. Search our
database by:

- subject area
- location
- event type
- skill level

Members **get at least 10% off**

Visit rsc.li/cpd-training



**SAVE
10%**

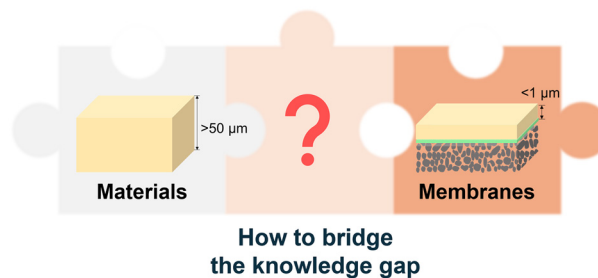


REVIEWS

4201

Advanced polymeric membranes for CO₂ separation: fundamentals, materials, and practical challenges

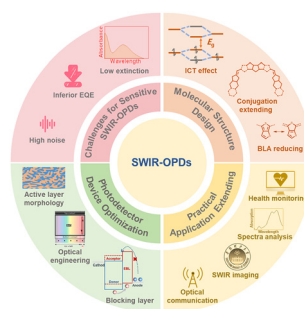
Tae Hoon Lee, Byung Kwan Lee, Young Hoon Cho, Hyo Won Kim, Sang Hoon Han, Seong Yong Ha and Ho Bum Park*



4233

Short-wave infrared organic photodetectors based on n-type small molecular semiconductors

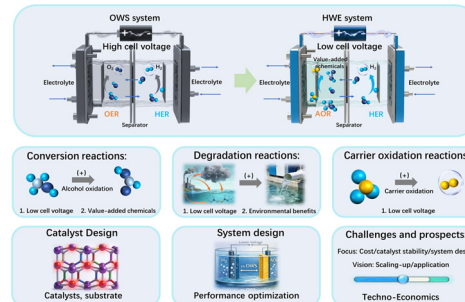
Bingyan Yin, Kangzhe Liu, Yang Chen, Yeye Wang, Xia Zhou and Chunhui Duan*



4261

Economic evaluation and catalyst design for hybrid water electrolysis systems

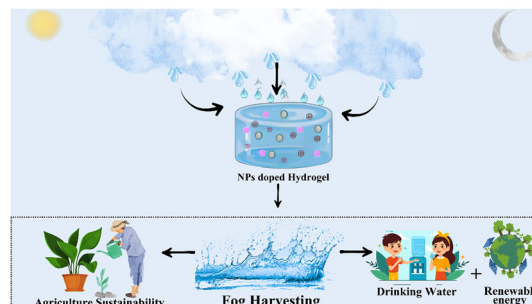
Duzheng He, Yanping Zhao, Shen Wang, Kang Wang, Jiayi Wang, Weijie Li, Miao Fan, Yi Wei, Vasily Bautin and Chao Han*



4299

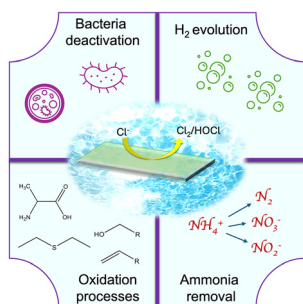
Sustainable advances in nanostructure-doped polymer hydrogels for fog harvesting: materials innovation, mechanistic insights and emerging applications

Mishal Zahra, Zhiguang Guo* and Muhammad Alfahad



REVIEWS

4327

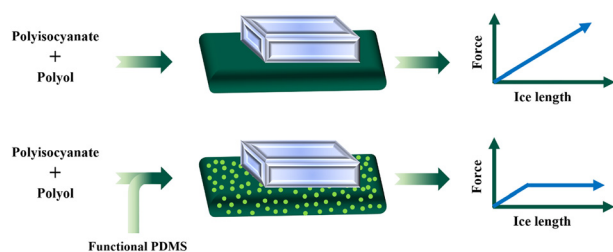


Clean production of chlorine (Cl_2) and hypochlorous acid (HOCl) from photocatalytic and photoelectrochemical seawater splitting

Rohul H. Adnan* and Yun Hau Ng*

COMMUNICATIONS

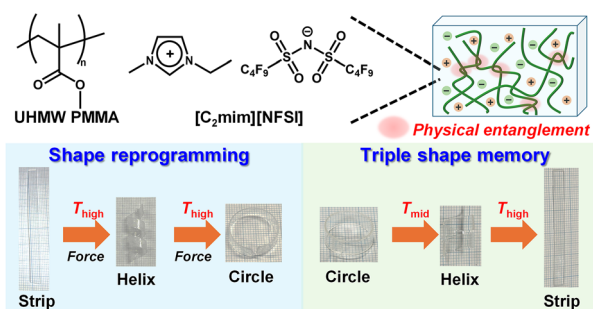
4360



A low interfacial-toughness self-segregating thermoset for large-scale ice-shedding coating application

David G. T. Boucher, Jiayue Huang, Joseph Dahlgren, Anish Tuteja and Dean C. Webster*

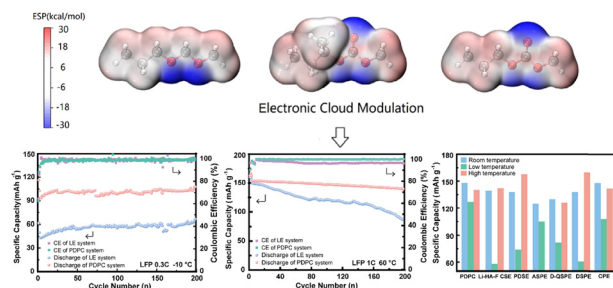
4371



Reprogrammable shape memory ion gels via physical entanglement of ultrahigh molecular weight polymers

Ryota Tamate,* Koichiro Uto,* Yuji Kamiyama and Takeshi Ueki

4384

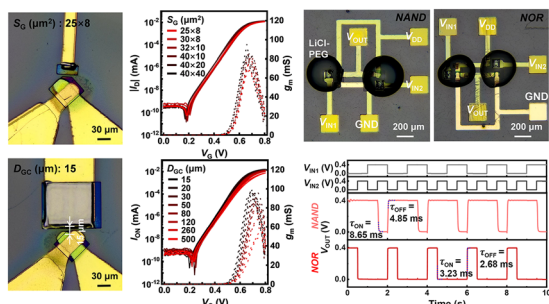


Boosting wide-temperature solid-state lithium metal batteries by polyether-carbonate hybridization

Jia Chou, Shengbo Yang, Chengyi Zhuo, Zhixing Wang, Huajun Guo, Xinhai Li, Guochun Yan, Guangchao Li, Wenjie Peng, Zhenghui Liu, Jiexi Wang and Hui Duan*



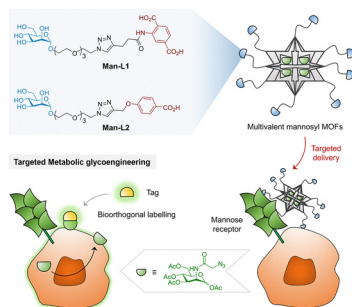
4441



Side gate vertical OECTs for integrated complementary circuits

Guohong Hu, Sihui Hou, Qijun Cai, Zefeng Fan, Jianhua Chen, Liang-Wen Feng and Wei Huang*

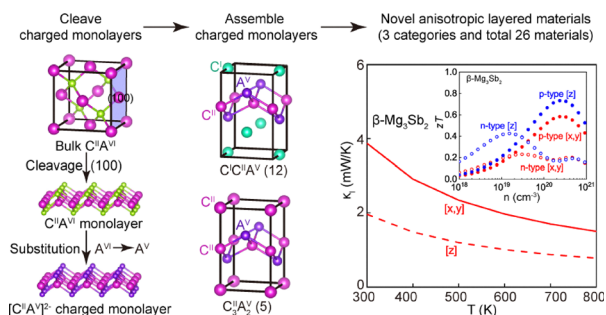
4450



Targeted metabolic glycoengineering using multivalent mannosyl metal-organic frameworks (MOFs)

Pei-Hong Tong, Chen Guo, Xi-Le Hu, Tony D. James,* Jia Li* and Xiao-Peng He*

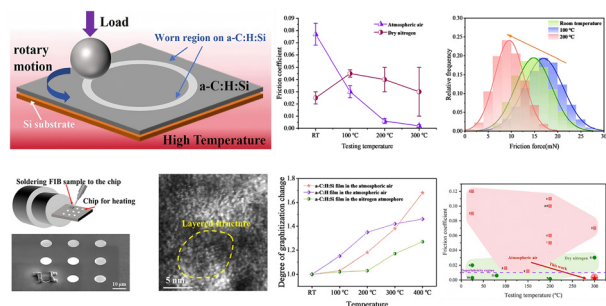
4458



Decoupling thermoelectric parameters in novel ionic layered materials: a charged monolayer stabilization strategy for enhanced anisotropy

Yaobo Li, Meng Pei, Ziyang Zuo, Dangdang Xu, Zhenzhen Feng, David B. Hayrapetyan, Christos S. Garoufalos, Sotirios Baskoutas, Yuli Yan* and Zaiping Zeng*

4468



Stable high-temperature superlubricity enabled by thermomechanical-induced interfacial graphitization and SiO_x-mediated structural locking

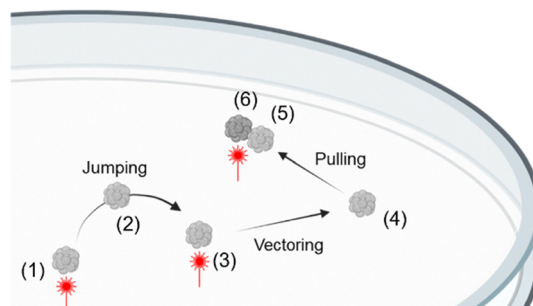
Jinyan Chen, Shouyi Sun, Bin Zhang, Xinchun Chen, Jianbin Luo and Jinjin Li*



4479

3D manipulation of cell spheroids using laser-actuated microrobots

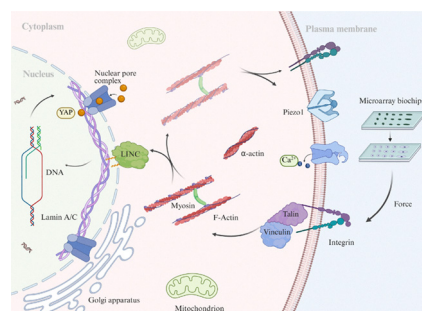
Y. Wang, P. Harder, N. İyisan and B. Özkale*



4489

Functional microarray biochips promote micropatterned adhesion-cytoskeleton-nuclear coupling to guide endothelial force-sensing mechanotransduction

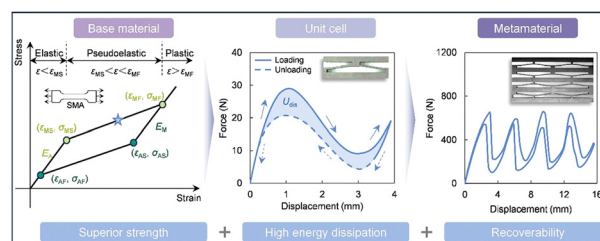
Yan Hou, Wenlong Wang, Shihui Xu, Xue Zhang, Zhiwei Liu, Kyubae Lee, Nana Wang,* Yongtao Wang* and Heng Yin*



4505

Harnessing pseudoelasticity in SMA-based negative stiffness mechanical metamaterials for superior strength and recoverability

Xianhua Yao, Liangyu Huang, Jiale Cheng, Jiachen Li, Yiwei Yin, Yifan Wang, Xiaohu Yao and Nan Hu*

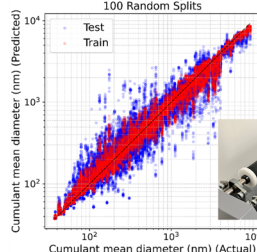


4519

A data-driven approach for the modeling of a ball-milled dispersion of BaTiO₃ nanoparticles

Takumi Ono, Tarojiro Matsumura, Kiwamu Sue and Satoru Takeshita*

Machine learning to model formulation

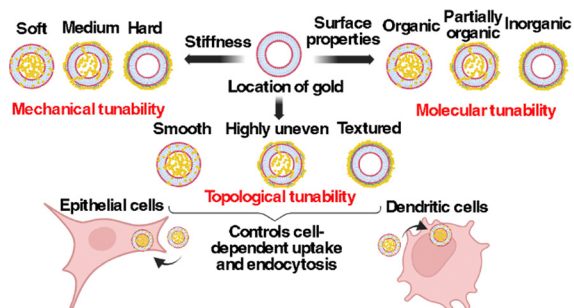
Random Forest Regression
100 Random Splits

linear

$$\phi = d_0 (d_{ball}^*)^a (m_{dispersant}^*)^b \times (t_{total})^c (m_{ball}^*)^d \times (\mu_{solvent}^*)^e (m_{BT}^*)^f \times (t_{sampling}^*)^g$$



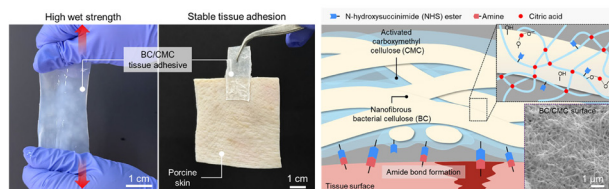
4526



The paradox of gold–liposome nanohybrids: the location of gold governs unconventional properties and drives cellular behavior

Ansuja P. Mathew, Vandhana Kandavelkumar, Nabila Masud, Sebastian Huerta-Romo Picazo, Susheel Kumar Nethi, Saji Uthaman, Xiaona Wen, Wenyu Huang, Surya K. Mallapragada, Anwasha Sarkar and Rizia Bardhan*

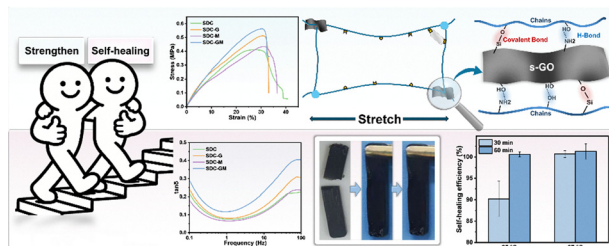
4546



A nanofibrous bacterial cellulose–carboxymethyl cellulose composite with high wet strength and active ester-mediated stable tissue adhesion in dynamic environments

Donghyun Hwang, Donghyeok Kang, Kiho Sung and Sungchul Shin*

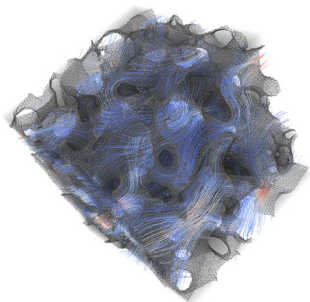
4559



Uncompromised reinforcement: polysiloxane with 100% room-temperature self-healing and antifouling

Haoran Li, Yuheng Chen, Yanchao Wu, Huimin Qi,* Huijing Li* and Ga Zhang*

4569



Performance optimization of bijels as a novel type of catalyst support structure

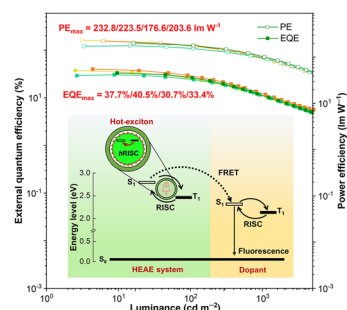
J. M. P. Beunen and J. Harting*



4582

Ultra-high-power-efficiency organic light-emitting diodes based on a hot-exciton-assisted exciplex (HEAE) system

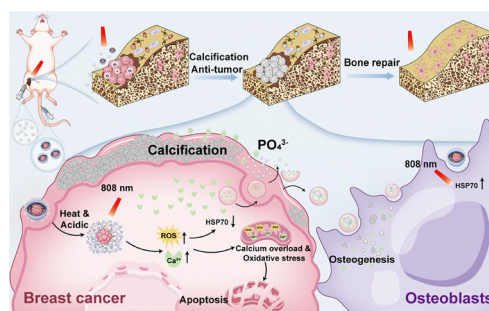
Jingli Lou, Junwei He, Baoxi Li, Han Zhang,*
Yichao Chen, Ben Zhong Tang and Zhiming Wang*



4590

Bone-targeted calcification-photothermal nanoplatform for synergistic tumor ablation and bone regeneration in breast cancer bone metastasis

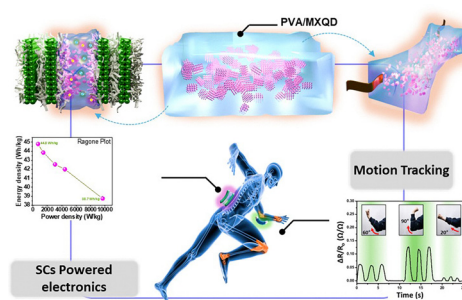
Zhili Ran, Xinyi Li, Guibo Lu, Jiapeng Dong,
Yaoxun Zeng, Junze Tang, Huiling Ye, Guining Cao,
Yikun Shang, Ziyue Li, Qionge Sun, Xiang Su, Yan He*
and Xujie Liu*



4606

Multifunctional PVA/MXQDs hydrogels for integrated flexible strain sensing and solid-state energy storage systems

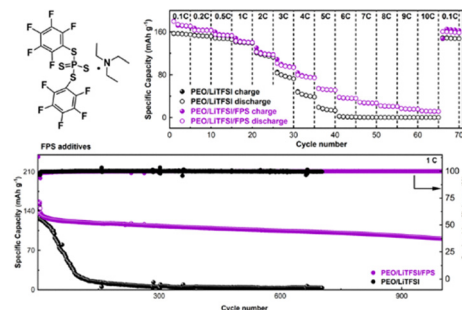
Emad S. Goda, Jae Sang Cho and Dong Hwan Wang*



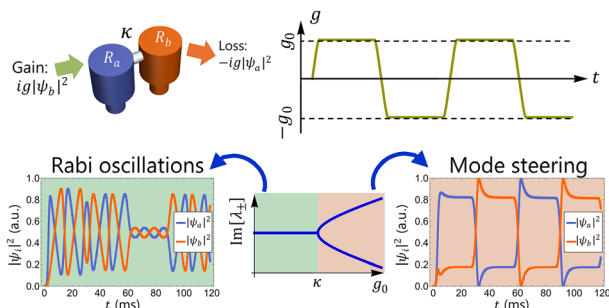
4616

A multifunctional organic additive with diversified elements (F, S, P, and N) for high-performance PEO/LiTFSI electrolytes

Siyu Fang, Junyan Tang, Qian Liang, Lingzhi Shao,
Duo Peng, Ping Xue, Mi Tang,* Lingjun Kong* and
Zhengbang Wang*



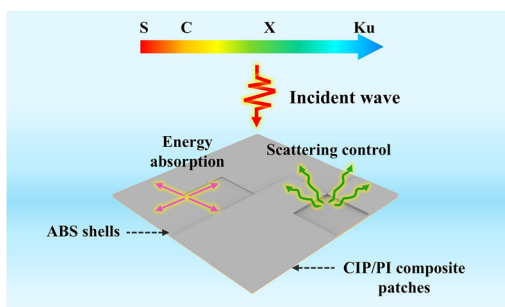
4627



Eigenmode steering in spatiotemporal gain–loss acoustic metamaterials

Wai Chun Wong, Gregory J. Chaplain and Jensen Li*

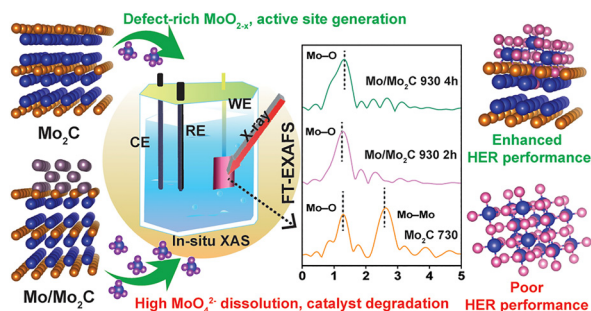
4634



A low-RCS coding metasurface utilizing 3-D printed ABS shells and carbonyl iron powder/polyimide composite patches via hybrid mechanisms

Sen Zhang, Qing An, Dawei Li, Ke Chen, Junming Zhao,* Tian Jiang,* Wenhe Liao, Tingting Liu and Yijun Feng

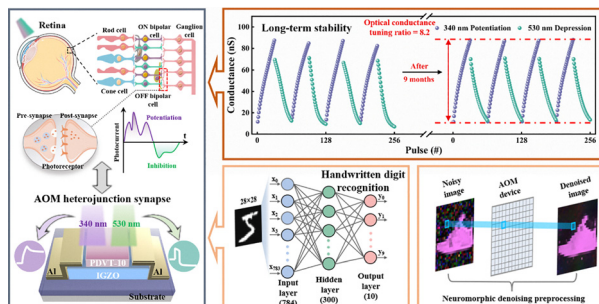
4643



Dynamic surface reconstruction governs the hydrogen evolution activity of Mo₂C electrocatalysts in alkaline media

Palash Jyoti Gogoi, Chandraraj Alex, Swetarekha Ram, Nikhil N. Rao, Muhammed Safer Naduvil Kovilakath, Seung-Cheol Lee, Satadeep Bhattacharjee* and Neena S. John*

4653



All-optically modulated PDVT-10/IGZO heterojunction synapses for neuromorphic applications

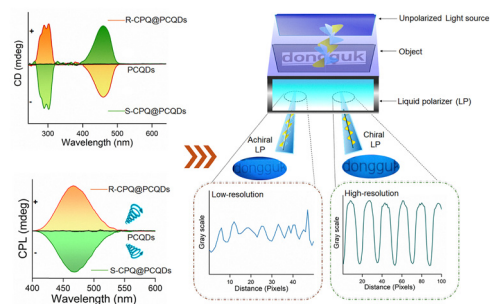
Shanshan Jiang, Kesheng Wang, Yujiao Li, Jiawei Yang, Bingyan Wang, Peng Chen, Bo He, Huanhuan Wei, Changjin Wan* and Gang He*



4663

Supramolecular hydrogen-bonded chiral networks enable blue circularly polarized emission from polymeric carbon quantum dots

Sourav Mal, Youngsin Park, Deblina Das, Abhisheek Meena, Yongcheol Jo, Kwangseuk Kyhm, Robert A. Taylor, Atanu Jana* and Sangeun Cho*



4677

Unveiling the synergistic piezo-phototronic dynamics in indium selenide incorporated poly(vinylidene fluoride) nanocomposites for next-generation energy harvesting

Ananya Aishwarya, Urosa Latief, Abhishek Naskar, Jitendra Pratap Singh and Arup R. Bhattacharyya*

