

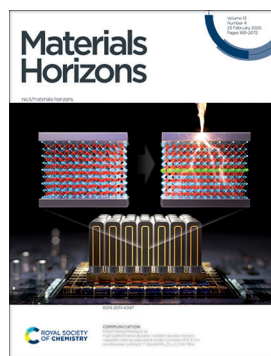
Materials Horizons

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.

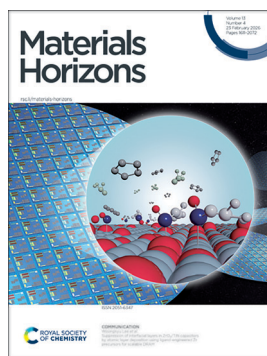
IN THIS ISSUE

ISSN 2051-6347 CODEN MHAOAL 13(4) 1611-2072 (2026)



Cover

See Cheol Seong Hwang *et al.*, pp. 1739–1756. Image reproduced by permission of Jonghoon Shin from *Mater. Horiz.*, 2026, 13, 1739.



Inside cover

See Woongkyu Lee *et al.*, pp. 1757–1765. Image reproduced by permission of Woongkyu Lee from *Mater. Horiz.*, 2026, 13, 1757.

EDITORIALS

1624

Celebrating the 30th anniversary of the School of Materials Science and Engineering at South China University of Technology

Baochun Guo, Yuguang Ma, Shi-Jian Su* and Yingjun Wang



1626

Materials Horizons Emerging Investigator Series: Prof. Himchan Cho, Department of Materials Science and Engineering, Korea Advanced Institute of Science and Technology (KAIST), Republic of Korea



**GOLD
OPEN
ACCESS**

EES Solar

**Exceptional research on solar
energy and photovoltaics**



Part of the EES family

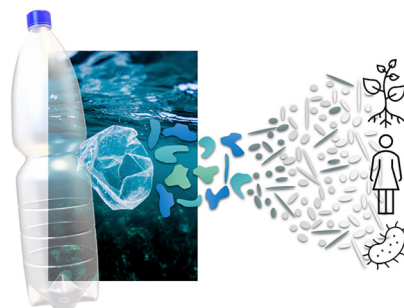
**Join
in** | Publish with us
rsc.li/EESSolar

FOCUS

1628

The dark matter in water, air and land: from microplastic to invisible nanoplastics

Martina H. Stenzel

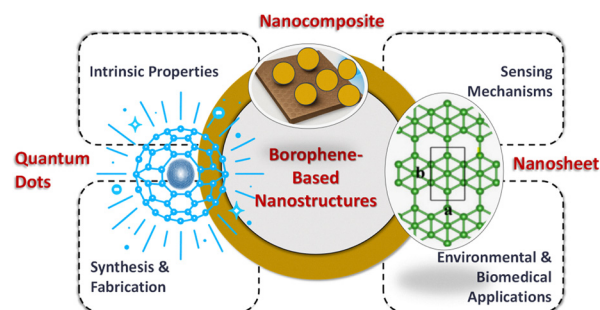


REVIEWS

1649

Next-generation borophene nanostructures for dual-domain sensing: from structural optimisation to biomedical and environmental applications

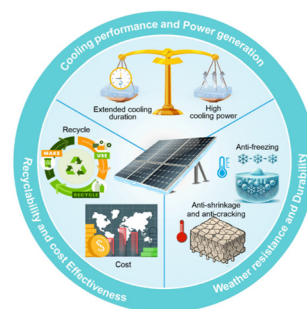
Chayanika Hazarika, Pulakesh Borah, Rituparna Duarah* and Manash R. Das*



1678

Hydrogel-based thermal management for photovoltaic safe operation and power generation enhancement

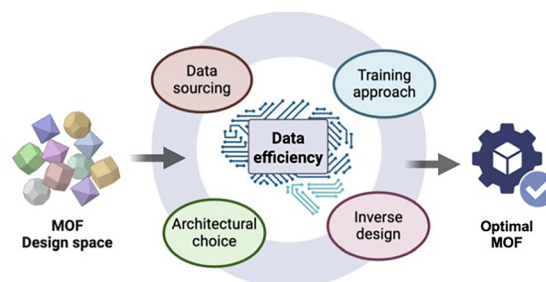
Xueqing Yang, Zhihua Zhou, Cheng Wang, Yuechao Chao, Junwei Liu* and Jinyue Yan*



1694

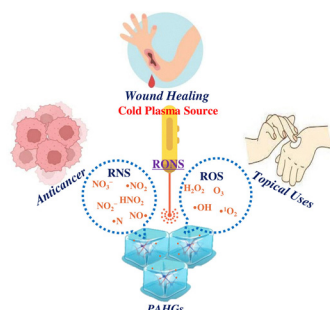
Machine learning to design metal–organic frameworks: progress and challenges from a data efficiency perspective

Diego A. Gómez-Gualdrón,* Tatiane Gercina de Vilas, Katherine Ardila, Fernando Fajardo-Rojas and Alexander J. Pak*



REVIEWS

1716

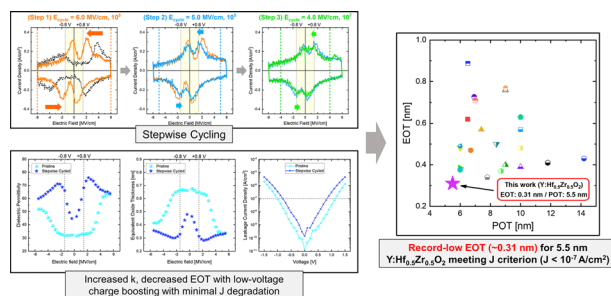


Synergistic integration of hydrogels and cold plasma for biomedical applications and therapeutics

Muzammil Kuddushi,* Parin Dal, Huihui Gan,* Dingnan Lu* and David Z. Zhu

COMMUNICATIONS

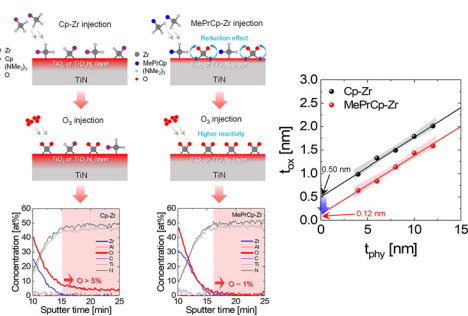
1739



High-performance dynamic random access memory capacitor with an equivalent oxide thickness of 0.31 nm via stepwise cycling in Y-doped Hf_{0.5}Zr_{0.5}O₂ thin films

Jonghoon Shin, Haengha Seo, Janguk Han, Tae Kyun Kim, Heewon Paik, Haewon Song, Hansub Yoon, Han Sol Park, Kyung Do Kim, Seong Jae Shin, Jae Hee Song, Sanghyup Lee, Seungheon Choi, Dong Hoon Shin, Juneseong Choi and Cheol Seong Hwang*

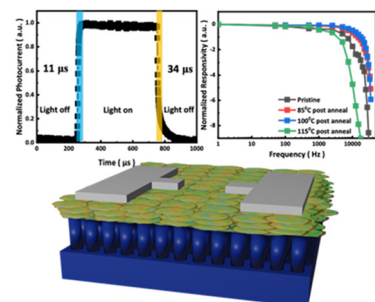
1757



Suppression of interfacial layers in ZrO₂/TiN capacitors by atomic layer deposition using ligand-engineered Zr precursors for scalable DRAM

Hyeongjun Kim, Juan Hong, Sangyeon Jeong, Kyunghun Lyu, Seungmin Jo, Seokho Cho, Juhyeong Kim, Byung-Kwan Kim, Jin-Sik Kim and Woongkyu Lee*

1766



High-entropy layered double hydroxides enabled wide-bandwidth near-infrared photodetection with viable environmental resistance

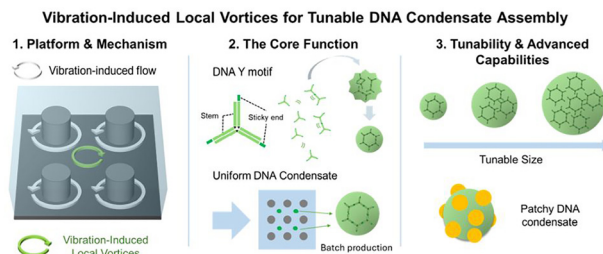
Kent-Tien Liang, Li-Mei Cheng, Kai-Lin Hsiao, Po-Hsuan Hsiao, Yi-Ting Li and Chia-Yun Chen*



1777

A platform for the formation of uniform DNA condensate droplets using vibration-induced local vortices

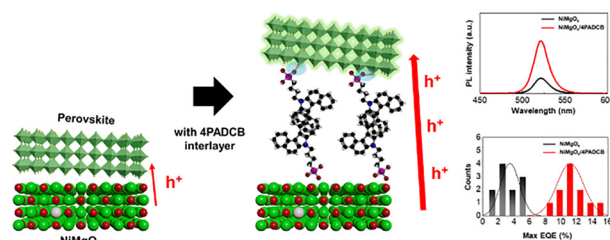
Zhitai Huang, Kanji Kaneko, Ryotaro Yoneyama, Tomoya Maruyama, Takeshi Hayakawa, Masahiro Takinoue and Hiroaki Suzuki*



1787

Interface-modified NiMgO_x layers with dibenzocarbazole molecules for high-efficiency perovskite light-emitting diodes

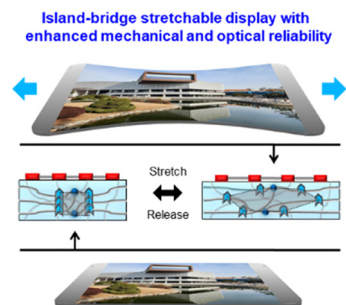
Hyungdoh Lee, Jun-Seo Lee, Seungmin Shin, Wonjeong Yu, In Hye Kwak, Hyung Joong Yun, Seungbum Hong and Himchan Cho*



1796

Synergistic substrate design for enhanced mechanical and optical stability in island-bridge stretchable displays

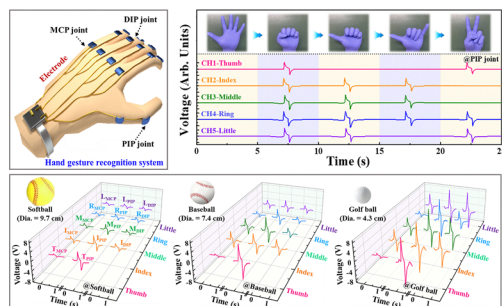
Hagseon Kim, Byung Jo Um, Jaehyeock Chang, Yong Ha Hwang, Sooyeon Baek, Young Hun Jung, Byeong-Soo Bae* and Kyung Cheol Choi*



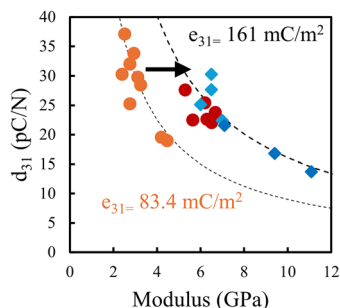
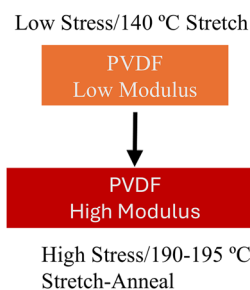
1807

Hand-gesture recognition using self-powered and single-electrode motion sensors fabricated with InN nanowires

Jaehyeok Shin, Seunghwan Jhee, Sumin Kang, Hye Min Oh, Chang Kyu Jeong, Siyun Noh and Jin Soo Kim*



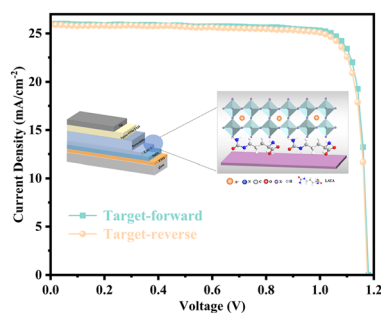
1817



Beyond the melting point annealing of poly(vinylidene fluoride) for enhanced piezoelectric performance

Stephen T. Hsieh, Sheng Ye,* Rui Jian, Jon R. Peterson, Hao Mei and Andrew J. Ouder Kirk

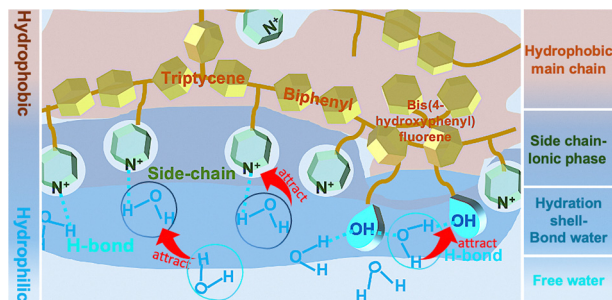
1831



A single-molecular bridge for simultaneously passivating dual-interface defects to fabricate high-efficiency and stable perovskite solar cells

Bin Du,* Weiyuan Chen, Dingwei Wang, Weidan Gu, Siyuan Wang, Yan Hou, Yuexin Lin* and Lin Song*

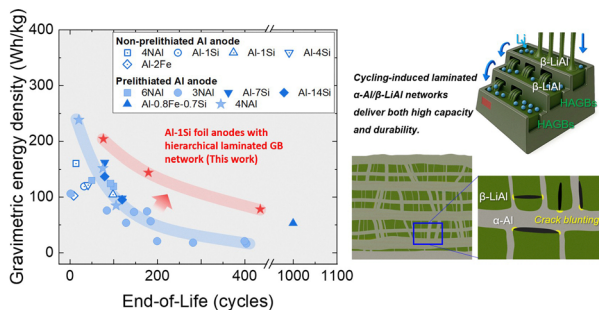
1842



Microphase water control utilizing highly hydrophilic anion-exchange ionomers

Yang Xiao, Xiao-Wen Lei, Lianqin Wang, Xinyi Cao, Runfei Yue, Shan Guan, Junfeng Zhang,* Yan Yin,* Tianyou Wang* and Michael D. Guiver*

1850



Overcoming the energy–durability trade-off in aluminum foil anodes via hierarchical laminated grain boundaries

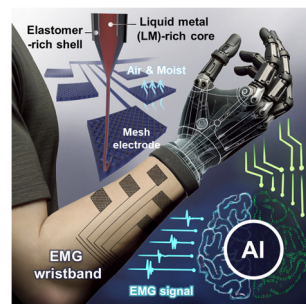
Hee-Tae Jeong and Woo Jin Kim*



1866

From muscle to motion: GaIn nanoparticle-TPU core/shell mesh electrodes for intelligent prosthesis

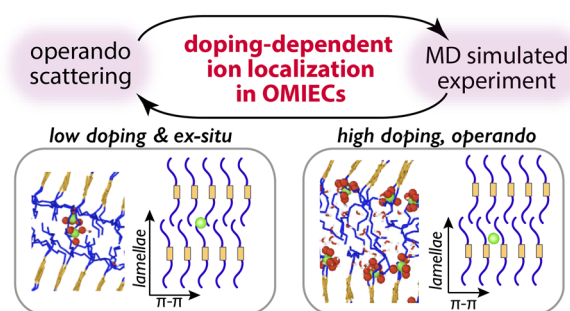
Yeonjee Jeon, Seongjun Moon, Chanho Jung, Jonghyeon Noh, Jaeyu Lee, Safina Abdusamievna Saidova, Jaehun Lee, Seungseok Han, Seonju Jeong, Kee-Eung Kim, Wu Bin Ying,* Kyung Jin Lee* and Jung-Yong Lee*



1877

Charge state-dependent ion condensation near conjugated polymer backbones

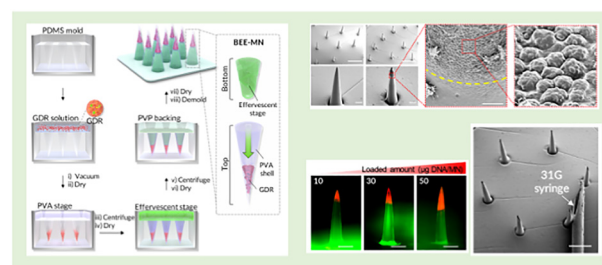
Dilara Meli, Quentin Thomas, Nicolas Rolland, Guillaume Freychet, Christina J. Kousseff, Priscila Cavassin, Lucas Q. Flagg, Vincent Lemaur, Abhijith Surendran, Zeinab Hamid, Sophie Griggs, Ruiheng Wu, Rosalba A. Huerta, Isaiah D. Duplessis, Bryan D. Paulsen, Tobin J. Marks, Lincoln J. Lauhon, Iain McCulloch, Lee J. Richter, David Beljonne and Jonathan Rivnay*



1887

DNA-based Bi-layered effervescent ejecting microneedle (BEE MN) for glucose-responsive insulin delivery

Yoonbin Ji, Kyung A. Kim, Iksoo Jang and Jong Bum Lee*

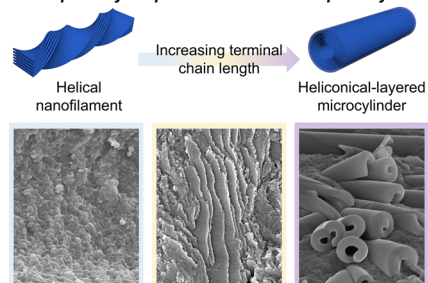


1896

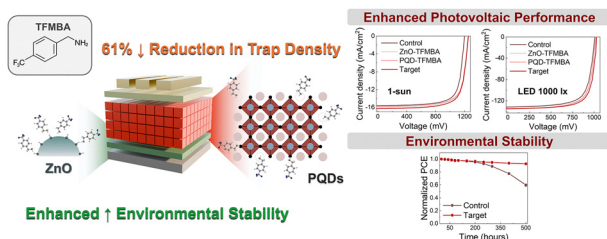
Structural polymorphism in bent-core liquid crystals: from helical nanofilaments to heliconical-layered microcylinders with light-responsive properties

Hyewon Park, HyeonJun Kim, Yeongsik Kim, Hyungju Ahn, Joanna M. Wolska,* YongJoo Kim* and Dong Ki Yoon*

A Unique Polymorphism of B4 Phase Liquid Crystals



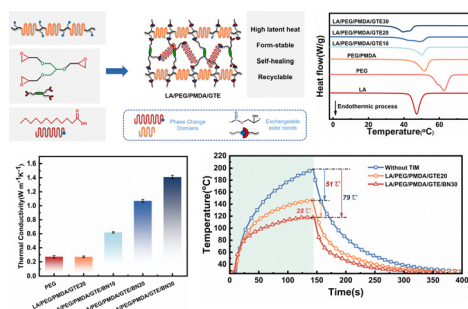
1906



Bi-synergistic ligand-mediated passivation of surface defects for highly efficient and stable cesium-lead-iodide perovskite quantum dot photovoltaics

Minju Yang, Seon Joong Kim, Tae Hyuk Kim, Hyungju Ahn, Min Jong Lee, Yunsang Kim and Jae Won Shim*

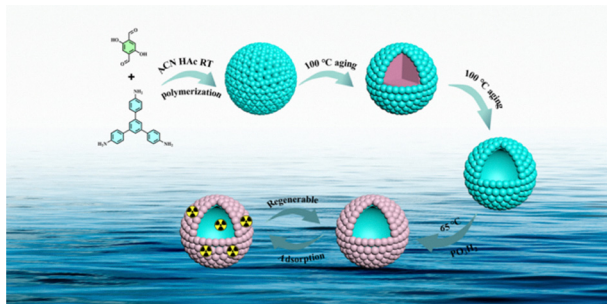
1918



High latent heat and recyclable shape stable phase change materials with dynamic ester bonds for thermal management

Chunrui Zhai, Yaofei Xu, Dongliang Wang, Lebin Zhan, Yixin Feng, Bili Lin, Hongzhou Li and Fubin Luo*

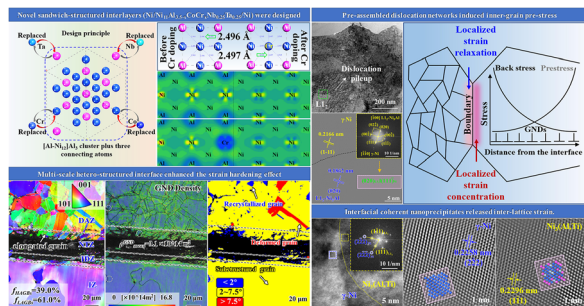
1929



Amorphous-crystalline transition-induced hollowing of covalent organic frameworks: a structural evolution boosting uranium adsorption

Cuicui Shao, Zhijian Li,* Yuxin Sun, Wei Xu, Yougan Wang* and Chunhui Deng*

1939



Compositional and structural control toward boosting inner-grain prestress and releasing the inter-lattice strain of an FGH99 diffusion-bonded superalloy

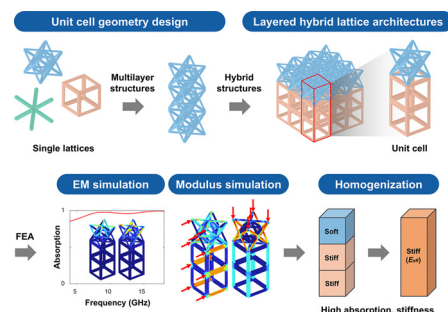
Xiaolong Hong, Zhiwei Qin,* Xin Jiang, Jilong Wang, Jiachen Li, Zhijie Ding, Jingkuan Wang, Shuyan Shi, Peng Li and Honggang Dong*



1952

Layered hybrid lattice architectures for broadband electromagnetic absorption and improved structural stiffness

Hyoui Yoon, Dahyun Daniel Lim, Grace X. Gu and Sangryun Lee*

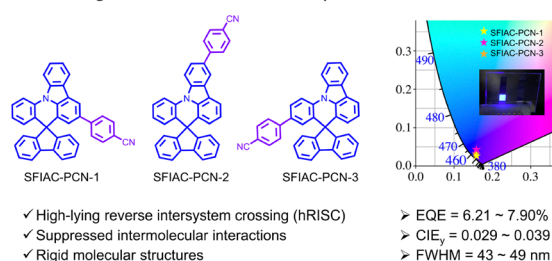


1966

High-efficiency nondoped near-ultraviolet organic light-emitting diodes based on spiro luminogens with high-lying reverse intersystem crossing

Jiajie Zeng, Guoxia Hao, Xing Wu, Xiaobin Dong, Tingxuan Guo, Ben Zhong Tang and Zujin Zhao*

Spiro Luminogens for Efficient Nondoped Near Ultra-Violet OLEDs

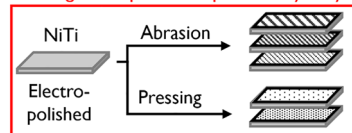


1973

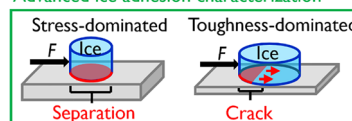
Towards nickel–titanium shape memory alloys for coatingless icephobic materials

Luca Stando, Francesca Villa, Davide Parlato, Riccardo Motto, Mauro Mameli, Carlo Antonini* and Paola Bassani*

Coatingless icephobic shape memory alloys



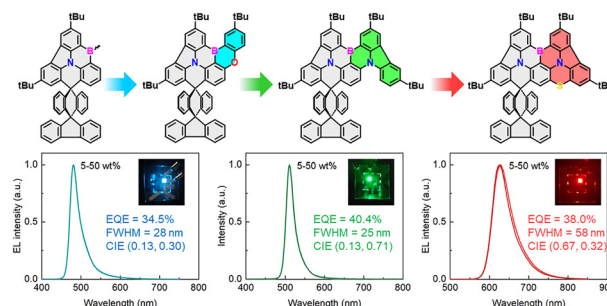
Advanced ice adhesion characterization



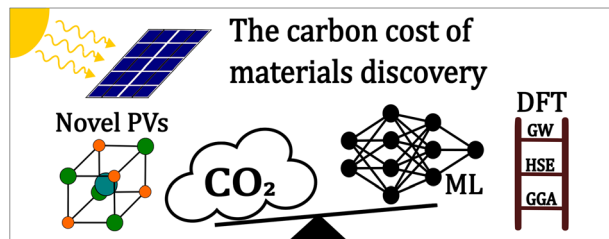
1984

Orthogonal di-spiro skeleton engineering on suppressing π - π stacking and spectral broadening for high-performance narrowband electroluminescence

Hao-Ze Li, Yu-Tao Yang, Yi-Cheng Zhao, Feng-Ming Xie,* Jian-Xin Tang* and Yan-Qing Li*



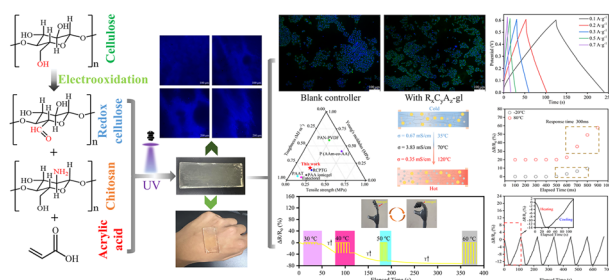
1993



The carbon cost of materials discovery: Can machine learning really accelerate the discovery of new photovoltaics?

Matthew Walker and Keith T. Butler*

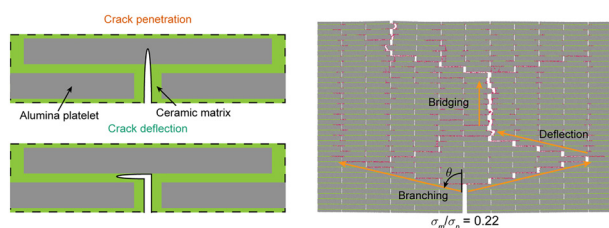
2005



High-sensitivity, dual-mode, flexible, electrooxidized cellulose-based electronic skins with compatible mechanical properties and antimicrobial activity for wide-temperature applications

Dongxu Ma, Yuan Zhou, Ronggui Peng, Yunpeng Zhen, Like Gao, Linrui Ma, Ningbo Ding, Chen Yang, Yunlong Luo, Yong Zhang, Kailei Lu, Yali Cui, Ziyi Yan, Li Liu and Guixin Wang*

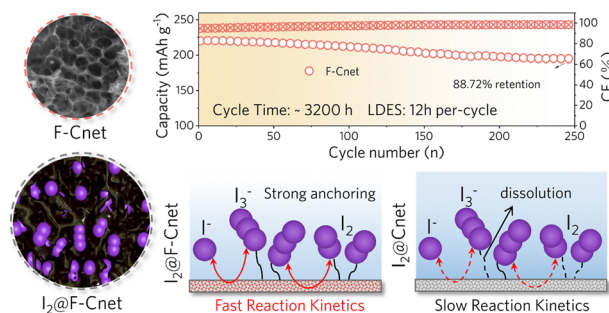
2022



Achieving strength and toughness limits of anisotropic microstructured alumina ceramics through interface engineering

Zezhou He, Rohit Pratyush Behera, Huajian Gao* and Hortense Le Ferrand*

2035



Fluorine-doped 3D honeycomb carbon network for long-duration aqueous zinc-iodine batteries

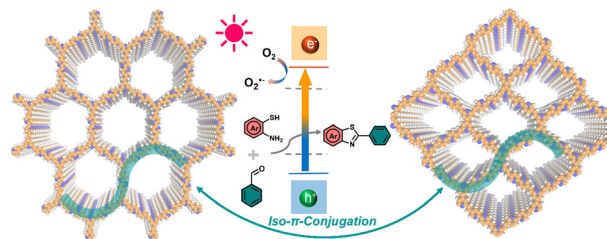
Wenwen Cao, Zhenglin Li, Haichao Huang,* Tao Hu, Yuanwei Zhang, Chenxi Dong, Haibo Hu, Yiqiang Sun* and Guojin Liang*



2045

Vinylene-linked covalent organic frameworks with fully pyridine-patterned iso- π -conjugation for photoredox catalysis

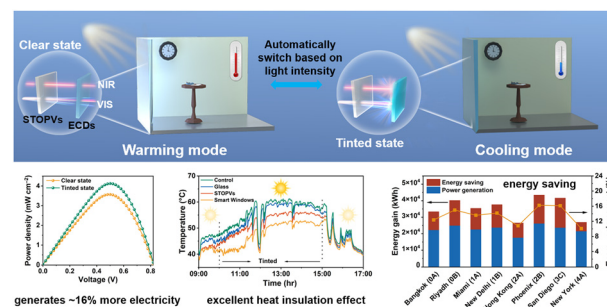
Fancheng Meng, Zixing Zhang, Xiaomeng Li, Lingjun Zeng, Bai Xue,* Biao Jiang, Xin Jin,* Jindong Wu, Jianneng Li, Kui Yang and Fan Zhang*



2052

Energy-generating smart windows based on reversible metal electrodeposition

Hailin Yu, Liutao Chen, Jiayu Wang,* Chunxiang Bao, Yang Liu, Yuanhao Li, Yating Mo, Yingyue Hu, Nakul Jain, Xi He, Yinghan Wang, Qichao Ran, Cenqi Yan, Zhe Wang, Borong Lin, Yinhua Zhou, Feng Gao* and Pei Cheng*



2060

Weavable ion–electron hybrid gel fibers with adjustable thermopower and high output voltage for wearable energy harvesting

Mao Zhang, Qianyang Li, Minhan Cheng, Jianwei Jing and Hua Deng*

