Open Access Article. Published on 03 June 2025. Downloaded on 3/15/2026 6:10:56 PM.
This article is licensed under a Creative Commons Attribution 3.0 Unported Licence.

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 12(11) 3561–3994 (2025)

Cover
See Vadim M. Kovrugin *et al.*, pp. 3712–3720. Image reproduced by permission of Vadim M. Kovrugin from *Mater. Horiz.*, 2025, **12**, 3712.

Inside cover
See Rui-Tao Wen *et al.*, pp. 3721–3730. Image reproduced by permission of Menghan Yin and Rui-Tao Wen from *Mater. Horiz.*, 2025, **12**, 3721.

EDITORIAL

3573

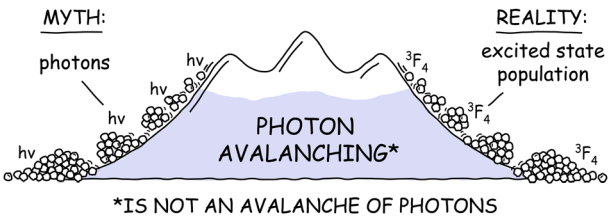
***Materials Horizons* Emerging Investigator Series: Dr Kyu-Young Park, Pohang University of Science and Technology, Republic of Korea**

FOCUS

3575

Unraveling the myths and mysteries of photon avalanching nanoparticles

Artiom Skripka* and Emory M. Chan*



View Article Online

ROYAL SOCIETY OF CHEMISTRY

Open Access Article. Published on 03 June 2025. Downloaded on 3/15/2026 6:10:56 PM.
This article is licensed under a Creative Commons Attribution 3.0 Unported Licence.

Environmental Science: Atmospheres

GOLD OPEN ACCESS

Connecting communities and inspiring new ideas

rsc.li/submittoEA

Fundamental questions
Elemental answers

Registered charity number: 207890

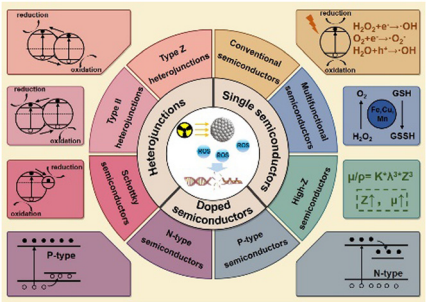
Open Access Article. Published on 03 June 2025. Downloaded on 3/15/2026 6:10:56 PM.
This article is licensed under a Creative Commons Attribution 3.0 Unported Licence.

REVIEWS

3598

Semiconductor-mediated radiosensitizers: progress, challenges and perspectives

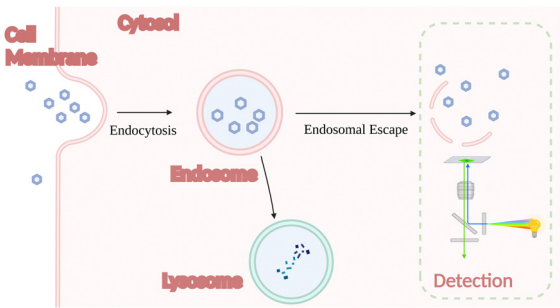
Yunsong Wang, Bocan Yang, Shujuan Liu,* Jiahe Song, Jinghuai Zhang, Xiangqun Chen, Nannan Zheng, Liangcan He,* Wei Cai and Shaoqin Liu*



3622

Advancing endosomal escape of polymeric nanoparticles: towards improved intracellular delivery

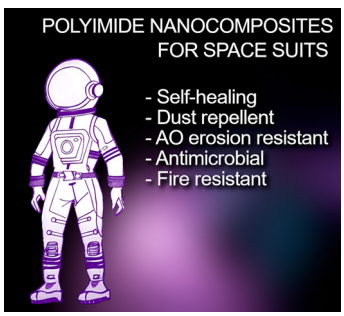
Yufu Wang, Vajini Ukwattage, Yijun Xiong and Georgina K. Such*



3633

Polyimide nanocomposites for next generation spacesuits

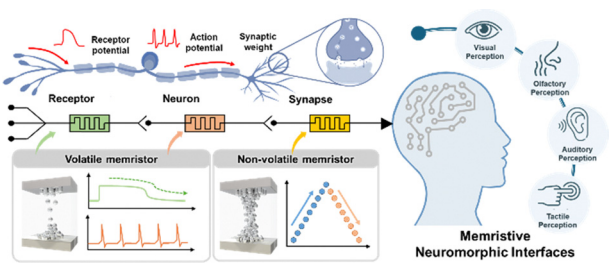
Priyanka Prakash, Janith Weerasinghe, Igor Levchenko, Karthika Prasad* and Katia Alexander*



3667

Memristive neuromorphic interfaces: integrating sensory modalities with artificial neural networks

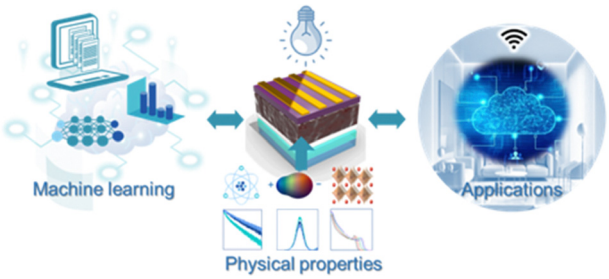
Ji Eun Kim, Keunho Soh, Su In Hwang, Do Young Yang and Jung Ho Yoon*



Open Access Article. Published on 03 June 2025. Downloaded on 3/15/2026 6:10:56 PM.
This article is licensed under a Creative Commons Attribution 3.0 Unported Licence.

REVIEWS

3691

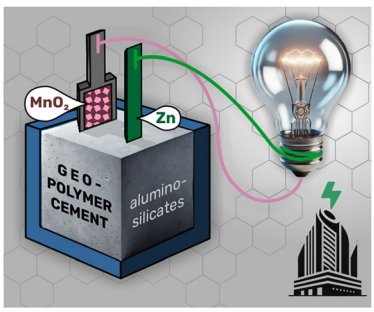


Indoor light energy harvesting perovskite solar cells: from device physics to AI-driven strategies

Wenning Chen, Kelvian T. Mularso, Bonghyun Jo* and Hyun Suk Jung*

COMMUNICATIONS

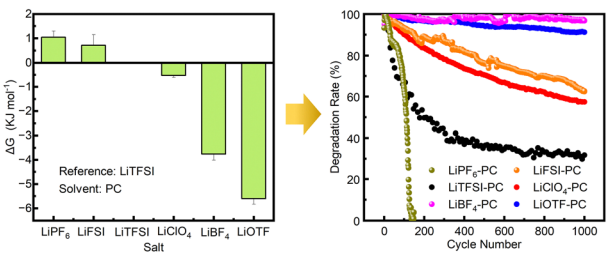
3712



A sustainable approach to energy storage in buildings: the first rechargeable geopolymer-based battery

Vadim M. Kovrugin,* Liliane Guerlou-Demourgues, Laurence Croguennec, Jorge S. Dolado and Cyril Aymonier

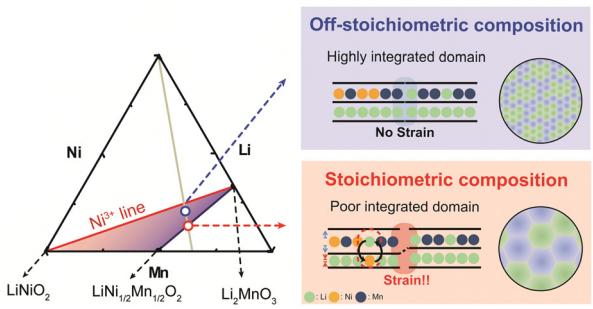
3721



Retaining superior electrochromic performance by effective suppression of ion trapping upon cycling

Renfu Zhang, Qingjiao Huang, Zhexuan Ou, Tooba Afaq Khan, Menghan Yin, Er Gao, Jiawei Sun and Rui-Tao Wen*

3731



Elucidating and controlling phase integration factors in Co-free Li-rich layered cathodes for lithium-ion batteries

Youngsu Lee, Jaesub Kwon, Jong-Heon Lim, Eunseong Choi, Kyoung Eun Lee, Shin Park, Docheon Ahn, Changshin Jo, Yong-Tae Kim, Yoon-Uk Heo, Geunho Choi, Byongyong Yu, Inchul Park* and Kyu-Young Park*

This journal is © The Royal Society of Chemistry 2025

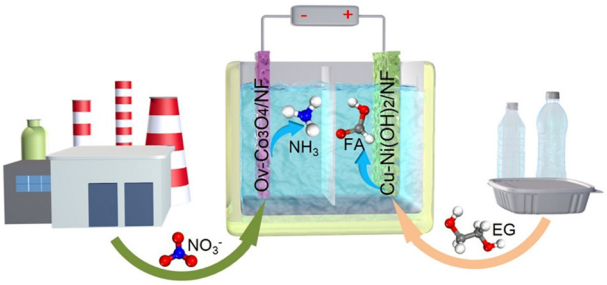
Open Access Article. Published on 03 June 2025. Downloaded on 3/15/2026 6:10:56 PM.
This article is licensed under a Creative Commons Attribution 3.0 Unported Licence.

COMMUNICATIONS

3743

Efficient co-production of ammonia and formic acid from nitrate and polyester *via* paired electrolysis

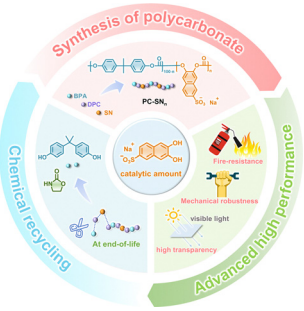
Mengmeng Du, Tao Sun, Xuyun Guo, Mingzhu Han, Yu Zhang,* Wenxuan Chen, Mengxiang Han, Jizhe Ma, Wenfang Yuan, Chunyu Zhou, Valeria Nicolosi, Jian Shang,* Ning Zhang* and Bocheng Qiu*



3752

Catalytic amounts of sodium-sulfonate–naphthol enable mechanically robust, ultra-transparent, super-fire-resistant and easily recyclable polycarbonate

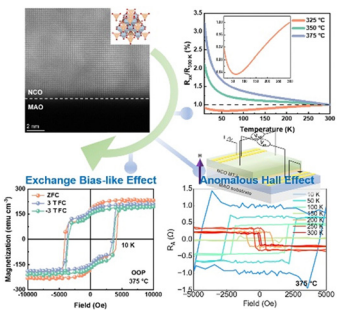
Yue Li, Lin Chen,* Pan Deng, Yan Guo, Xiu-Li Wang* and Yu-Zhong Wang



3762

Revealing the reversal of the anomalous hall effect and the exchange bias-like effect in single-phase perpendicularly magnetized $NiCo_2O_4$ epitaxial films

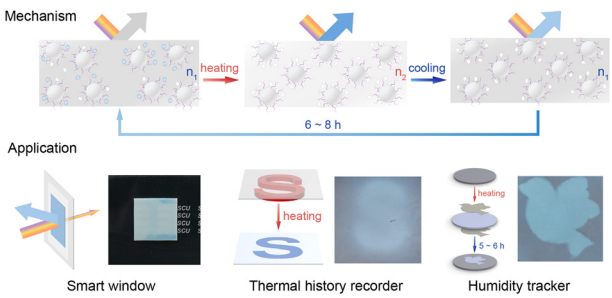
Penghua Kang, Guowei Zhou,* Jiashuo Liang, Guoxiu Ren, Jiahui Ji, Liying Wang, Chao Jin* and Xiaohong Xu*



3777

Unravelling the mechanism of coloration and prolonged discoloration in abnormally thermochromic PDMS nanocomposites

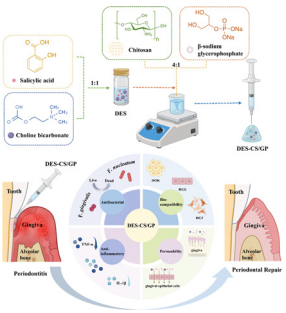
Yujie Peng, Peipei Shao, Ye Yuan, Jingru Mou, Rui-Tao Wen, Hong Chen and Ming Xiao*



Open Access Article. Published on 03 June 2025. Downloaded on 3/15/2026 6:10:56 PM.
This article is licensed under a Creative Commons Attribution 3.0 Unported Licence.

COMMUNICATIONS

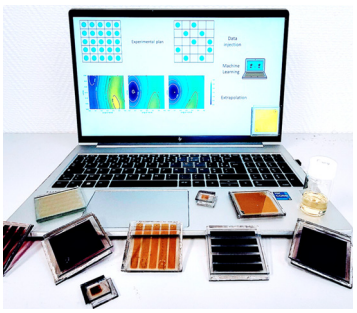
3788



Development of an injectable salicylic acid–choline eutectic hydrogel for enhanced treatment of periodontitis

Jin Zhang, Lingzhuang Meng, Yinan Jia, Jianshu Li, Xinyuan Xu* and Xin Xu*

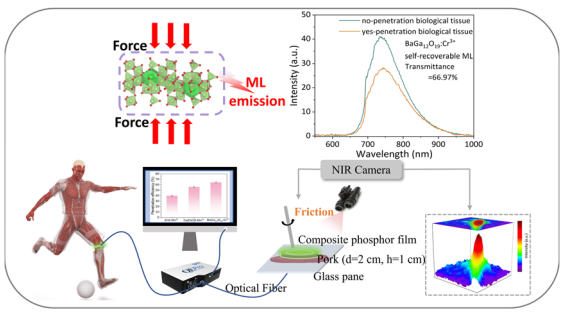
3803



Data-driven modelling for electrolyte optimisation in dye-sensitised solar cells and photochromic solar cells

Johan Liotier,* Antonio J. Riquelme, Valid Mwalukuku, Quentin Huaulmé, Yann Kervella, Renaud Demadrille* and Cyril Aumaître*

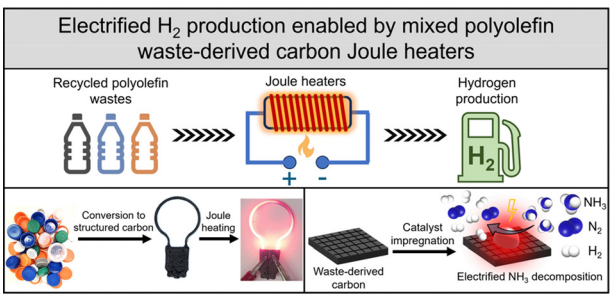
3815



Self-recoverable broadband near infrared mechanoluminescence from $BaGa_{12}O_{19}:Cr^{3+}$ using a multi-site occupation strategy

Xuesong Wang, Yao Xiao, Puxian Xiong,* Pan Zheng, Sheng Wu, Zhiyao Zhou, Binli Xiao, Peishan Shao, Meihui Zhang, Jianhui Liu, Jiulin Gan, Yan Wang* and Qi Qian*

3827



Upcycling of mixed polyolefin wastes to 3D structured carbon Joule heaters for decarbonized hydrogen production

Anthony Griffin, Jiachun Wu, Adam Smerigan, Paul Smith, Gbadeoluwa Adedigba, Rui Shi, Yizhi Xiang* and Zhe Qiang*

This journal is © The Royal Society of Chemistry 2025

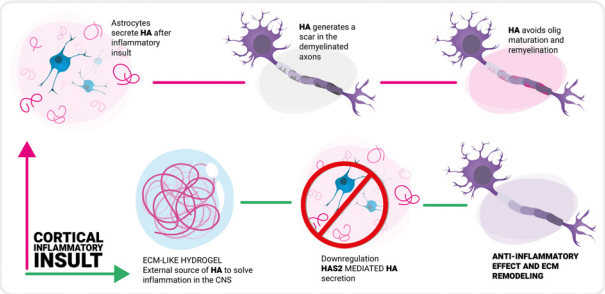
Open Access Article. Published on 03 June 2025. Downloaded on 3/15/2026 6:10:56 PM.
This article is licensed under a Creative Commons Attribution 3.0 Unported Licence.

COMMUNICATIONS

3841

Hyaluronic acid-based hydrogels modulate neuroinflammation and extracellular matrix remodelling in multiple sclerosis: insights from a primary cortical cell model

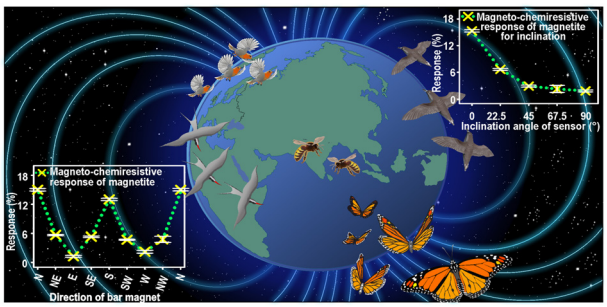
Sergio Martin-Saldaña,* Mansoor Al-Waeel, Enrico Bagnoli, Merari Tumin Chevalier, Yazhong Bu, Christopher Lally, Una Fitzgerald and Abhay Pandit*



3855

Discovery of magnetic field line dependent anisotropic chemiresistive response in magnetite: a new piece to the puzzle of magnetoreception

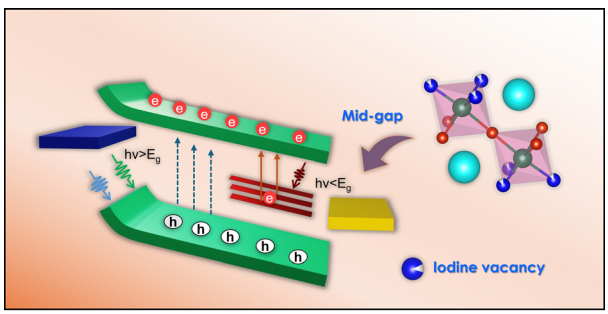
Pratyasha Rudra and Swastik Mondal*



3865

Benign mid-gap halide vacancy states in 2D-bismuth-based halide perovskite microcrystals for enhanced broadband photodetectors

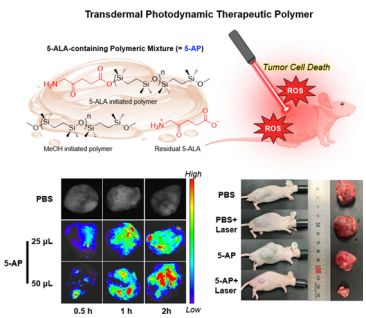
Kuntal Singh, Mozakkar Hossain, Pabitra Kumar Nayak, Sougata Karmakar, Akash Tripathi, Prakash Sarkar, Pratyasha Rudra, A. V. Muhammed Ali, G. Krishnamurthy Grandhi, Paola Vivo, Swastik Mondal, K. V. Adarsh, Dibyajyoti Ghosh and K. D. M. Rao*



3878

Transdermal therapeutic polymer: *in situ* synthesis of biocompatible polymer using 5-aminolevulinic acid as a photosensitizer precursor and a polymer initiator

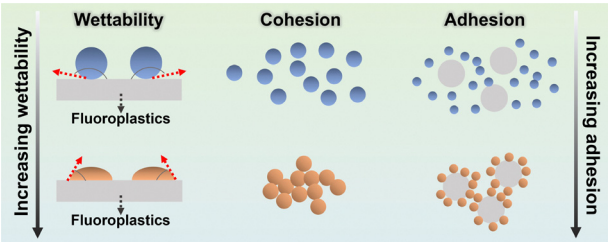
Jaehoon Kim, Eun Woo Seo, Hyunyoung Choi, Hyo In Kim, Jinbong Park, Junyang Jung* and Dokyoung Kim*



Open Access Article. Published on 03 June 2025. Downloaded on 3/15/2026 6:10:56 PM.
This article is licensed under a Creative Commons Attribution 3.0 Unported Licence.

COMMUNICATIONS

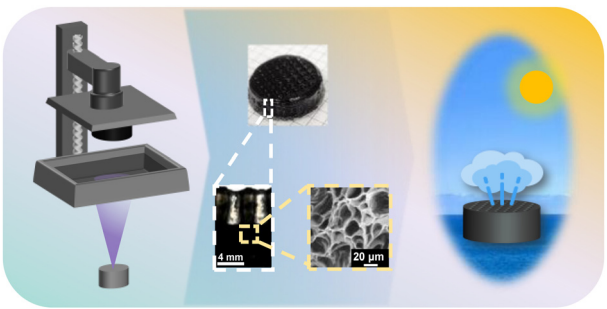
3888



Adhesion and affinity of supramolecular adhesives on fluorinated surfaces

Guohong Yao, Zhiyuan Guo, Gai Zhao* and Shengyi Dong*

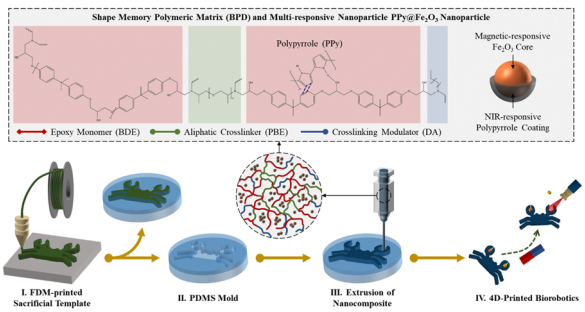
3897



Precision-engineered, polymer-lean, digital light processing 3D-printed hydrogels for enhancing solar steam generation and sustainable water treatment

Shudi Mao, Xin Stella Zhang, Yihan Shi, An Feng, Casey Onggowarsito, Xiaoxue Helen Xu, Lisa Aditya, Youyi Sun,* Long D. Nghiem* and Qiang Fu*

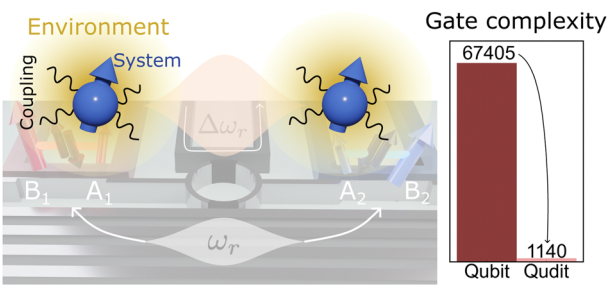
3907



Development of novel multi-responsive 4D printed smart nanocomposites with polypyrrole coated iron oxides for remote and adaptive transformation

Shengbo Guo, Tarun Agarwal, Shuaiqi Song, Kausik Sarkar and Lijie Grace Zhang*

3918



Simulating open quantum systems with molecular spin qudits

Sebastián Roca-Jerat, Emilio Macaluso, Alessandro Chiesa, Paolo Santini and Stefano Carretta*

This journal is © The Royal Society of Chemistry 2025

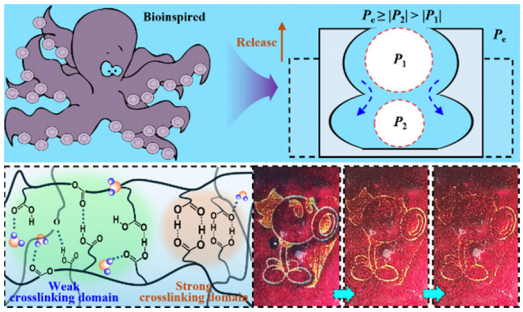
Open Access Article. Published on 03 June 2025. Downloaded on 3/15/2026 6:10:56 PM.
This article is licensed under a Creative Commons Attribution 3.0 Unported Licence.

COMMUNICATIONS

3929

Self-damping photonic crystals with differentiated reversible crosslinking domains for biomimetic delayed visual perception of underwater impact stress

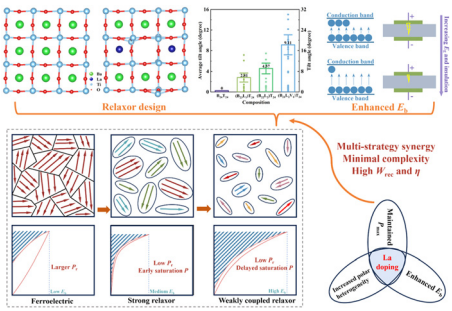
Yong Qi, Jiahui Wang, Tong Hu, Xianfei Cao, Shi Li, Qingyu Liu, Zhaoyong Gao and Shufen Zhang*



3939

Weakly coupled relaxor construction in lead-free ferroelectrics with simple composition for superior energy-storage performance

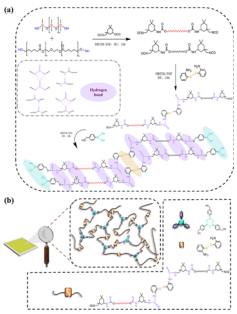
Minghao Liu, Chen Ming, Zhen Liu,* Hongbo Liu,* Bing Han, Narendirakumar Narayanan, Xuantong Liu, Kai Dai, Teng Lu, Xuefeng Chen, Zhigao Hu, Yun Liu and Genshui Wang*



3949

Development of highly robust polyurethane elastomers possessing self-healing capabilities for flexible sensors

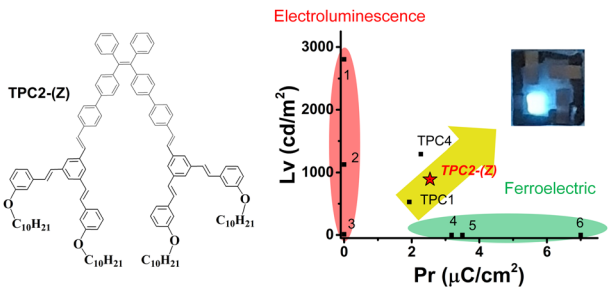
Hao Tian, Wentong Lu, Caiyan Wang, Runhua Wang, Peilong Zhou, Fan Fei, Mengyang Xu and Jincheng Wang*



3965

Synergistic enhancement of luminescence and ferroelectricity driven by (*Z*)-clipping of a tetraphenylethene

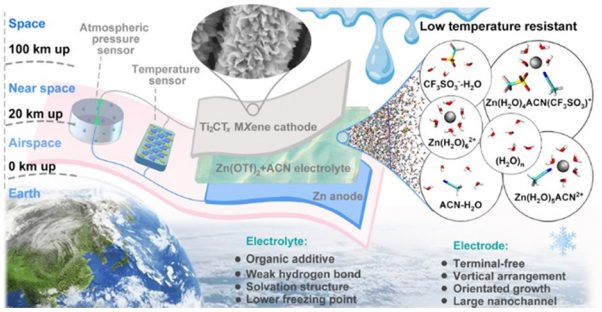
Sewon Lim, Donghwan Kim, Hee Jung Kim, Hwandong Jang, Sienoh Park and Eunkyoung Kim*



Open Access Article. Published on 03 June 2025. Downloaded on 3/15/2026 6:10:56 PM.
This article is licensed under a Creative Commons Attribution 3.0 Unported Licence.

COMMUNICATIONS

3979



Low-temperature, low-pressure Zn-ion hybrid supercapacitor in extreme near-space application

Weijia Liu, Haiqing Liu, Yin Sun, Zhiyi Gao,* La Li* and Guozhen Shen*

CORRECTION

3991

Correction: Transforming patterned defects into dynamic poly-regional topographies in liquid crystal oligomers

Yuxin You, Youssef M. Golestani, Dirk J. Broer, Tinghong Yang, Guofu Zhou, Robin L. B. Selinger,* Dong Yuan* and Danqing Liu*

This journal is © The Royal Society of Chemistry 2025