

Journal of Materials Chemistry A

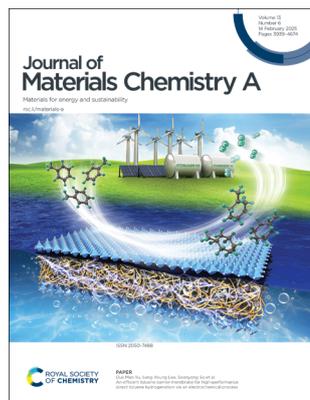
Materials for energy and sustainability

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.

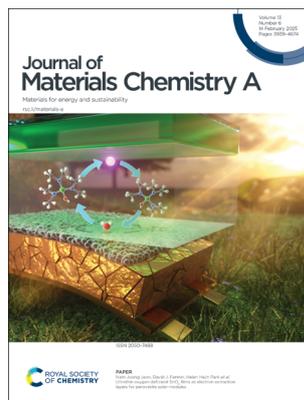
IN THIS ISSUE

ISSN 2050-7488 CODEN JMCAET 13(6) 3939–4674 (2025)



Cover

See Duk Man Yu, Sang-Young Lee, Soonyong So *et al.*, pp. 4090–4099. Image reproduced by permission of Soonyong So from *J. Mater. Chem. A*, 2025, 13, 4090.



Inside cover

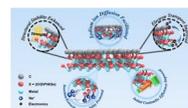
See Nam Joong Jeon, David J. Fermin, Helen Hejin Park *et al.*, pp. 4100–4106. Image reproduced by permission of Helen Hejin Park from *J. Mater. Chem. A*, 2025, 13, 4100.

REVIEWS

3958

Functional carbon-based covalent bridging bonds unlocking superior sodium-ion storage

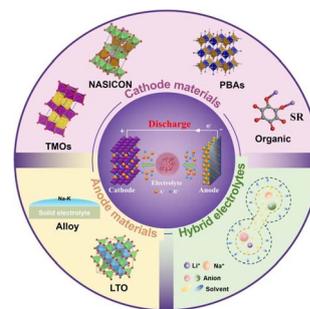
Jinliang Zhu,^{*} Manchuan Guo, Miao Hu, Fang Fu, Kerou Qiu, Shijian Wang,^{*} Guoxiu Wang and Bing Sun^{*}



3973

Recent progress in alkali metal (Li/Na/K) hybrid-ion batteries: pioneering the future of energy storage

Yan Zhang, Rui Cao, Chen Ouyang, Libing Jiang, Yi Wang, Mei Yang^{*} and Hui Xia^{*}



RSC Applied Polymers

GOLD
OPEN
ACCESS

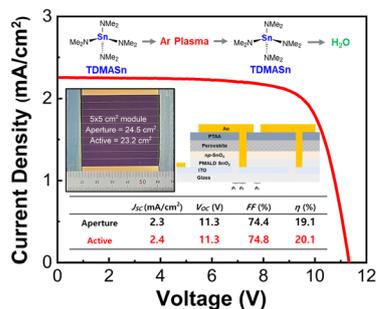
The application of polymers,
both natural and synthetic

Interdisciplinary and open access

rsc.li/RSCApplPolym

Fundamental questions
Elemental answers

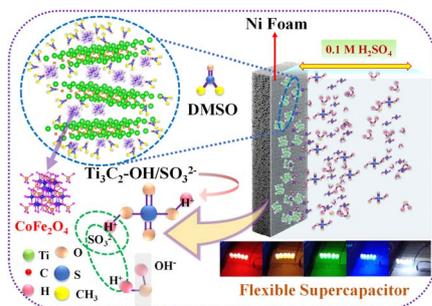
4100



Ultrathin oxygen deficient SnO_x films as electron extraction layers for perovskite solar modules

Jin-Won Lee, Joshua Sraqu Adu, Raphael E. Agbenyeke, Jude Laverock, Alice Sheppard, Eunyoung Park, Youngwoong Kim, Soonil Hong, Nam Joong Jeon,* David J. Fermin* and Helen Hejin Park*

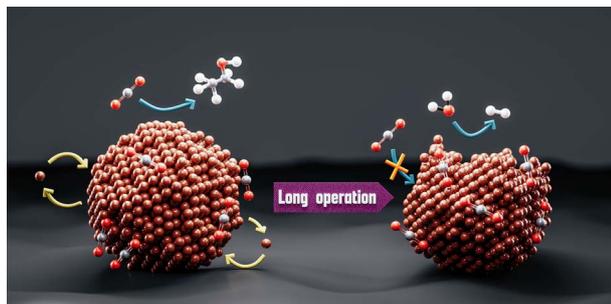
4107



Strategic intercalation of AB₂O₄ perovskite oxides for synergetic enhanced redox activity in sulphonated Ti₃C₂T_x MXene for energy storage applications

Jitesh Pani, Priyanka Chaudhary, Hitesh Borkar* and Meng-Fang Lin*

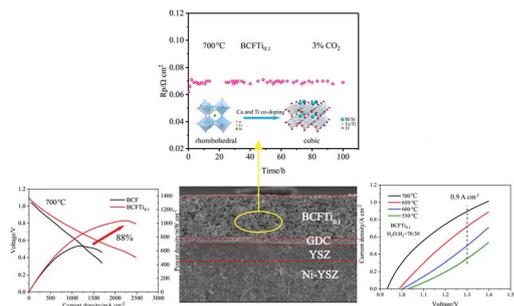
4119



Deactivation of copper electrocatalysts during CO₂ reduction occurs *via* dissolution and selective redeposition mechanism

Blaž Tomc, Marjan Bele, Mohammed Azeezulla Nazrulla, Primož Šket, Matjaž Finšgar, Angelja Kjara Surca, Ana Rebeka Kamšek, Martin Šala, Jan Šiler Hudoklin, Matej Huš, Blaž Likozar and Nejc Hodnik*

4129



Incorporating high acidity cations in Co-free BiFeO₃-based air electrodes for enhancing their electrocatalytic activity and durability in reversible solid oxide cells

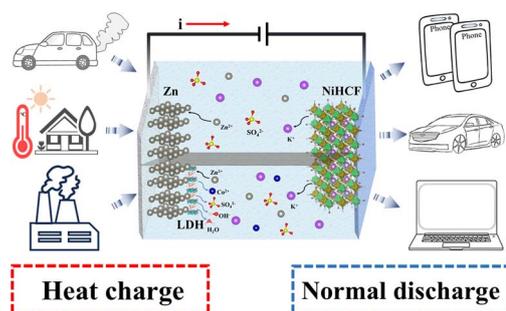
Shun Wang, Wen Jiang and Yifeng Zheng*



4142

Heat charging towards electrical energy saving and high-efficiency Zn-ion batteries

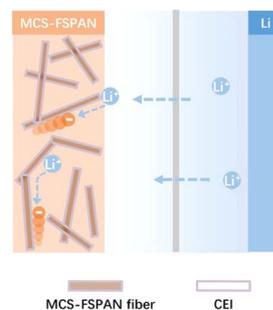
Xiaoling Sun, Yitong Li, Dewen Zeng, Zhiwei Zeng, Chen Gong, Changyi Wu and Hongyi Chen*



4150

Manganese cobalt sulfide-doped fibrous sulfurized polyacrylonitrile for high-rate and long-life lithium-sulfur batteries

Jiayu Wang, Xiangyang Zhao, Qingli Zou* and Min Wei



4159

Advancing oxygen evolution reaction efficiency in iron phthalocyanines: axial coordination as a key to structural and electronic tuning

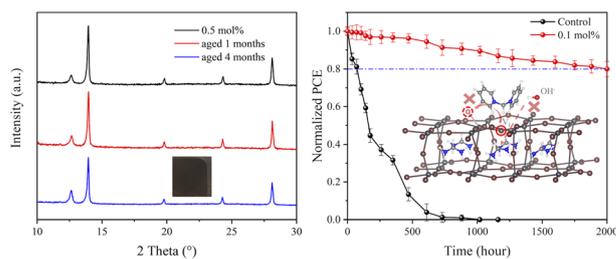
Jiangdong Bo, Yilin Wang, Jianghua Wang, Guoxin Zhang, Qian Yu, Xing Fan,* Hongbing Lu* and Haiping Lin*



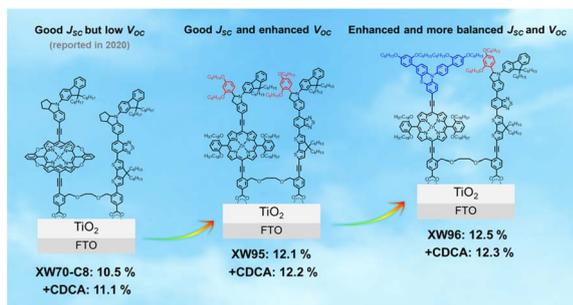
4167

Moisture-resistant perovskite solar cells: the role of 1,1'-methylenebispyridinium dichloride in enhancing stability and performance

Yong Hu, Letian Dai,* Tianyu Sun, Haodan Shi, Ying Xu, Junyi Huang, Xiongjie Li, Yan Shen and Mingkui Wang*



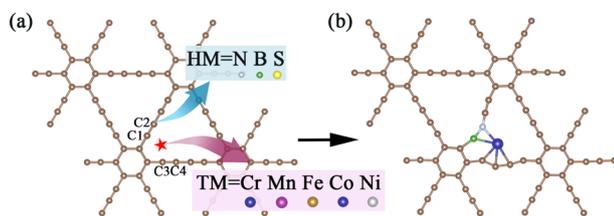
4176



Solar cells sensitized with doubly concerted companion dyes with optimized donors to achieve high efficiencies up to 12.5%: a record efficiency for iodine electrolyte-based DSSCs

Zhemin Li, Qingjun Lu, Yuqian Zhang, Qizhao Li, Wenjun Wu,* Shijun Li, Hailong Wang, Jianzhuang Jiang,* Chengjie Li* and Yongshu Xie*

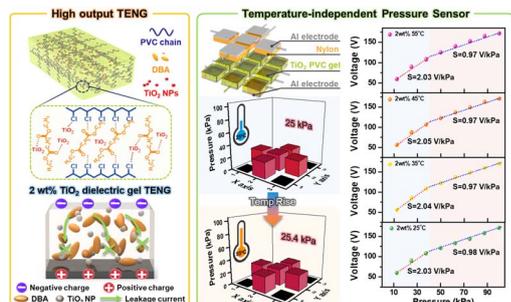
4186



High-throughput screening and an interpretable machine learning model of single-atom hydrogen evolution catalysts with an asymmetric coordination environment constructed from heteroatom-doped graphdiyne

Ying Zhao,* Shuai-Shuai Gao, Peng-Hui Ren, Li-Shuang Ma and Xue-Bo Chen*

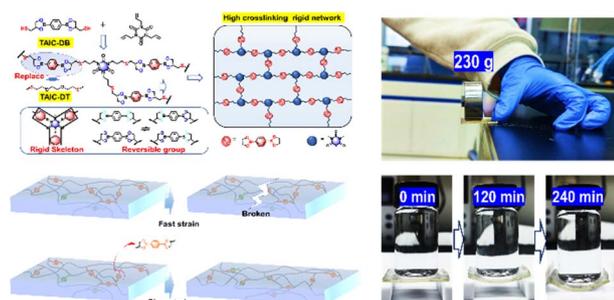
4197



High-output, thermally resilient Nano-TiO₂ dielectric gel triboelectric nanogenerator for energy harvesting and reliable temperature-independent pressure sensing

Hyosik Park, Yeonkyeong Ryu, Hyeonseoo Joo, Sujeong Gwak, Gerald Selasie Gbadam, Simiao Niu and Ju-Hyuck Lee*

4207



Rigid-flexible dynamic polymers based on borate bonds

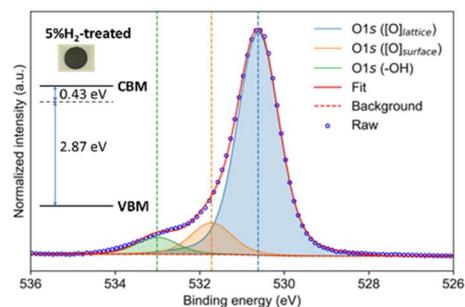
Jing Tu, Bo Chen, Xinhong Xiong, Weiming Xu and Jiayi Cui*



4214

Exploring the stability and protonic conductivity in W- and Mo-substituted LaNbO_4 under a reducing atmosphere

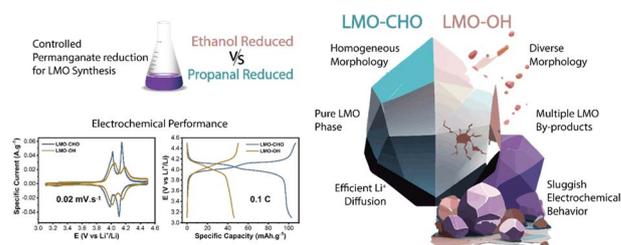
Kehan Huang, Yidong Han, Mark A. Isaacs and Stephen J. Skinner*



4225

Bridging the gap between manganese oxide precursor synthesis and lithium manganese oxide cathodes for high-voltage lithium-ion batteries

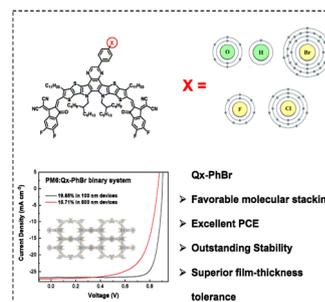
Mariam Baazizi, Mehdi Karbak, Mohamed Aqil, Simon Sayah, Mouad Dahbi and Fouad Ghamouss*



4237

Elucidating the effects of bromine substitution in asymmetric quinoxaline central core-based non-fullerene acceptors on molecular stacking and photovoltaic performances

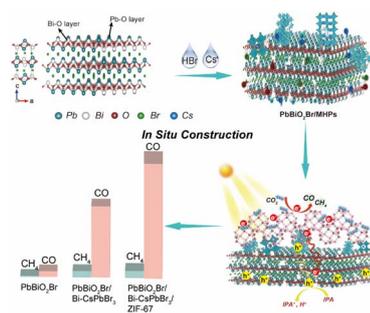
Dingding Qiu, Liting Zhang, Hao Zhang, Ailing Tang, Jianqi Zhang, Zhixiang Wei* and Kun Lu*



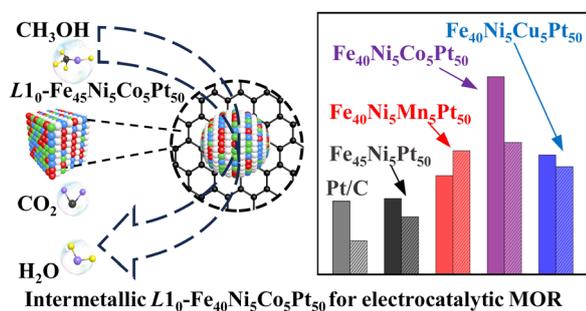
4247

In situ construction and composition engineering of PbBiO_2Br /metal halide perovskite heterojunctions for enhanced interfacial charge transfer and photocatalytic activity

Qi Qin, Wei-Qi Liu, Zhi-Hua Xia, Hong-Yan Chen* and Dai-Bin Kuang*



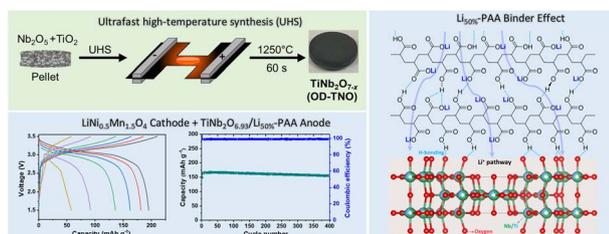
4257



Synthesis of intermetallic $L1_0$ - $Fe_{40}Ni_5M_5Pt_{50}$ ($M = Mn, Co, Cu$) nanoparticles for electrocatalytic methanol oxidation

Chun Wu,* Kankan Zhou, Mengyao Huang, Dekang Ding, Zhiqiang Ma, Runqing Liu and Wenli Pei*

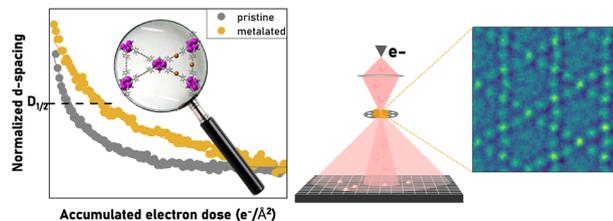
4265



Synergistic effect of an oxygen-defective $TiNb_2O_7$ anode and lithiated polyacrylic acid for high-power lithium-ion storage

Doosoo Kim, Siddhartha Nanda, Jong Heon Kim, Robson S. Monteiro, Luanna Silveira Parreira and Hadi Khani*

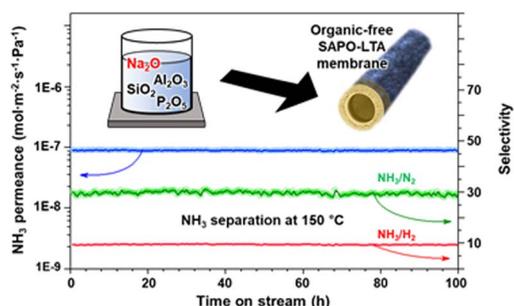
4281



High-resolution electron microscopy imaging of MOFs at optimized electron dose

Safiyye Kavak, Daen Jannis, Annick De Backer, Daniel Arenas Esteban, Arno Annys, Sergio Carrasco, Javier Ferrando-Ferrero, Raúl M. Guerrero, Patricia Horcajada, Jo Verbeeck, Sandra Van Aert and Sara Bals*

4292



Organic-free synthesis of silicoaluminophosphate zeotype membranes with tunable framework charge density

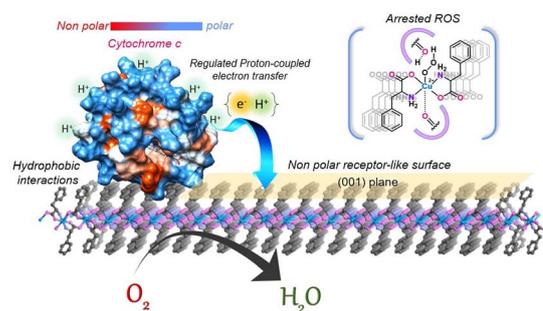
Sung Hwan Park, Bratin Sengupta, Saman Emami Gerami, Kaleb Friedman, Rumwald Lecaros, Amr F. M. Ibrahim and Miao Yu*



4299

A self-assembled nanozyme featuring precise active centers and topography exhibits controlled catalytic interplay with mitochondrial protein while regulating electron flow during bioinspired oxygen reduction

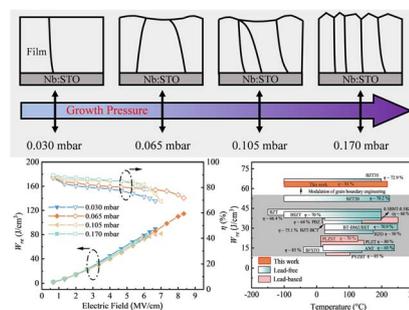
Adarsh P. Fatrekar and Amit A. Vernekar*



4309

High-energy density dielectric film capacitors enabled by grain boundary engineering

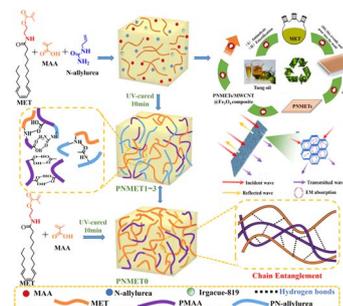
Yupeng Liu, Tian-Yi Hu, Ming Liu, Rui Lu, Lu Lu, Yiqin Lu, Qiuyang Han, Weijie Fu, Tingzhi Duan, Yanzhu Dai, Chunrui Ma,* Shao-Bo Mi* and Chun-Lin Jia



4317

Bio-based adaptable dynamically cross-linked networks and their composites: multiple stimulus responses and potential electromagnetic shielding applications

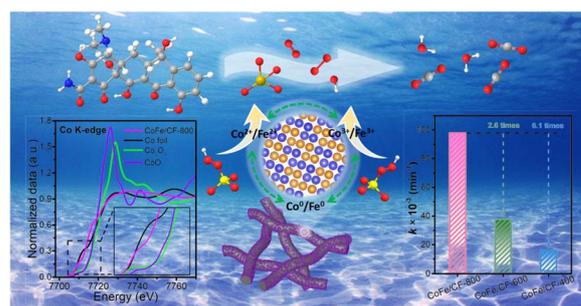
Yun Hu, Ye Sha, Lei Chen, Yufeng Ma, Qin Huang, Meng Zhang, Puyou Jia* and Yonghong Zhou



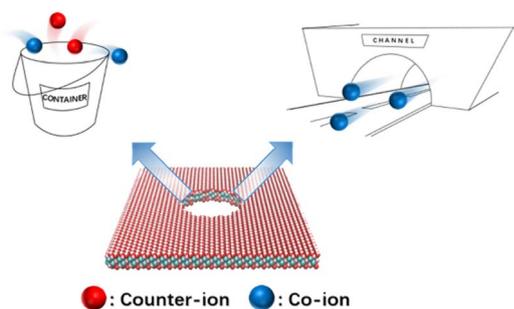
4329

Anchoring Co–Fe alloy nano-grains on carbon fibers by an *in situ* alloying strategy to boost the catalytic performance for rapid oxidative degradation of emerging contaminants

Man Yang, Xianghan Cheng, Fengting Geng, Wenyuan Han, Ping Niu, Long Xie, Zhen Li, Yong-Zheng Zhang,* Da-Shuai Zhang, Jing Xu,* Xiuling Zhang and Longlong Geng*



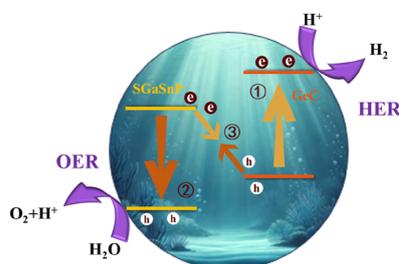
4343



“Channel” or “container”? Effect of the pore structure on ion transport in porous MXene electrodes

Kaiqing Sun, Shengzhe Ying, Xiao Tang, Yuling Zhao, Guohui Zhou* and Xiaomin Liu*

4356

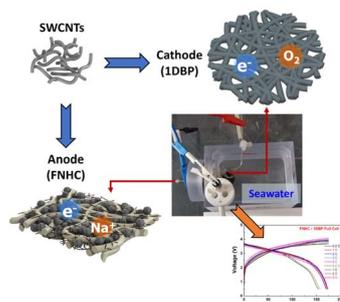


① Excited-State Electron Transfer ② Excited-State Hole Transfer
③ Electron-Hole Recombination

Enhancing photocatalytic water splitting via GeC/SGaSnP Z-scheme heterojunctions with built-in electric fields

Wenhua Lou, Gang Liu,* Xiaoguang Ma,* Chuanlu Yang, Lixun Feng, Ying Liu and Xiaochun Gao

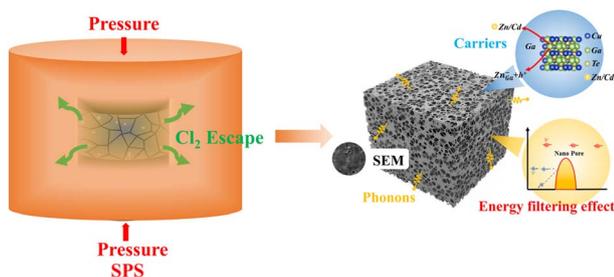
4367



Advanced 1D SWCNT-interwoven hybrid electrode architecture for enhanced electrochemical performance in Na-seawater batteries

Dae-Hyeon Jeong, Dowan Kim, Hyein Yu, Youngsik Kim, Yongil Kim* and Sang-Young Lee*

4380



Simultaneously boosting electrical and thermal transport properties of CuGaTe₂ through XCl₂ (X = Cd, Zn) doping-driven band and defect engineering

Sitong Luo, Jingxuan Liang, Zhibo Wei, Yifan Du, Liang Lv, Yuntian Jiang, Shuqi Zheng,* Weiyu Song and Zipei Zhang*



4390

Synergistically self-assembled *in situ* growth of MXene@MOF derived sodium alginate hydrogel 3D frameworks as next-generation electrocatalysts for oxygen and hydrogen evolution

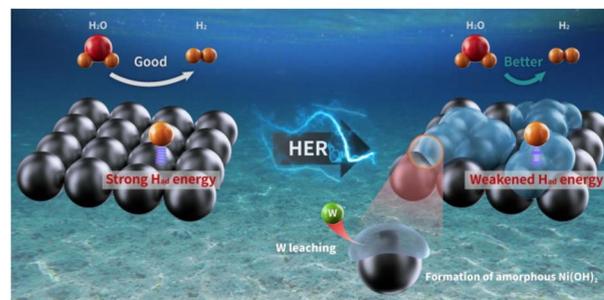
Saleem Raza, Ata Ur Rehman, Cheng Chen, Tianyu Zhao, Asif Hayat, Tariq Bashir, Liguang Shen,^{*} Yasin Orooji^{*} and Hongjun Lin^{*}



4404

Surface structure evolution of bimetallic nickel tungsten nitride ($\text{Ni}_2\text{W}_3\text{N}$) for high performance hydrogen evolution

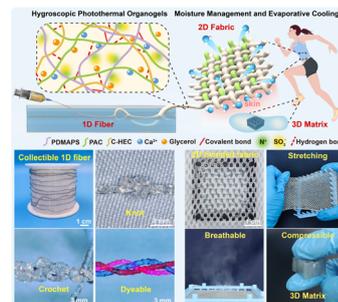
Ji Young Hwang, Yeonju Park, Young Mee Jung,^{*} Hyung-Kyu Lim^{*} and Duck Hyun Youn^{*}



4413

Tailor-made hygroscopic photothermal organogels for moisture management and evaporative cooling through a 1D-to-3D design

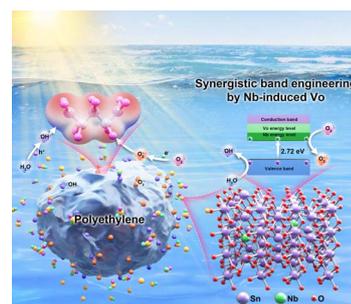
Yue Wang, Shuai Li, Jingjing Li, Yuke Sun, Zhaojun Li, Petri Murto, Zhihang Wang^{*} and Xiaofeng Xu^{*}



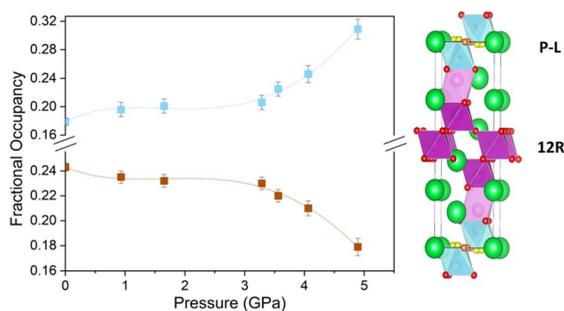
4429

Synergistic dual-defect band engineering for highly efficient photocatalytic degradation of microplastics via Nb-induced oxygen vacancies in SnO_2 quantum dots

Jianqiao Liu, Dan Zhao, Xian Wu, Di Wu, Ningning Su, Yang Wang, Fang Chen, Ce Fu,^{*} Junsheng Wang^{*} and Qianru Zhang^{*}



4444



Tuning of the ionic conductivity of $\text{Ba}_7\text{Nb}_4\text{MoO}_{20}$ by pressure: a neutron diffraction and atomistic modelling study

V. Watson, Y. Zhou, D. N. Tawse, O. J. Ballantyne, C. J. Ridley, J. A. Dawson and A. C. Mclaughlin*

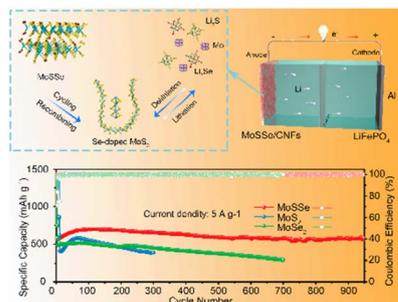
4452



Facilitating polysulfide conversion kinetics via multifunctional solid-state electrolytes under lean electrolyte conditions for lithium–sulfur batteries

Hyunji Park, Jooyoung Lee and Choongho Yu*

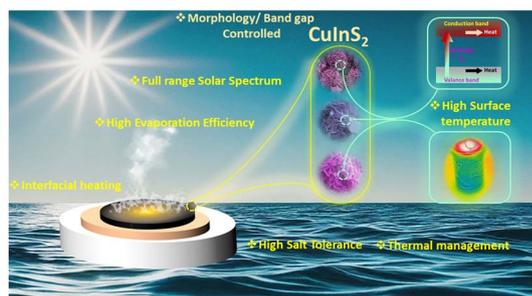
4460



Anchoring intermediate phases via few-layer MoSSe nanosheets in flexible porous carbon fiber for stable lithium ion storage

Mengluan Gao, Zhe Cui, Jinqi Zhu, Rujia Zou,* Wenqing Wang, Ye Chen* and Huifang Chen*

4470



Soft template-assisted design and synthesis of anisotropic 2D–3D CuInS_2 with a controlled morphology and band gap: exploring photothermal interfacial water evaporation

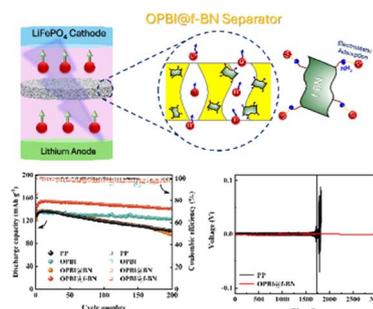
Ashok Barhoi, Bhagirath Mahto, Haider Ali and Sahid Hussain*



4486

Enhancing lithium metal battery safety and performance: a thermally stable poly(aryl ether benzimidazole) separator with 2D-functionalized boron nitride for 3000 hours lithium plating/stripping

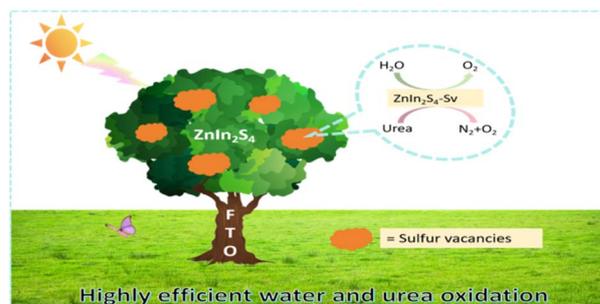
Guanghao Zhang, Dongxia Xian, Shabab Hussain, Bin Zhang,* Wenjie Lin, Xiongzhi Xiang* and Lei Wang*



4496

Incorporation of sulfur vacancies in the ZnIn_2S_4 photoanode for highly efficient photoelectrochemical water splitting and urea oxidation

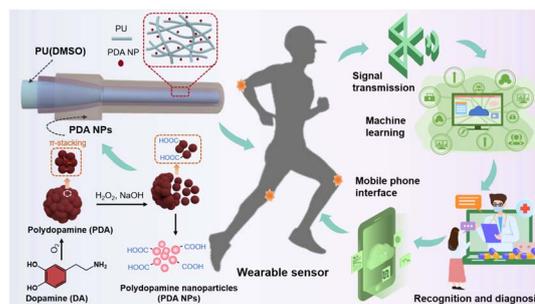
Peiyue Hu, Chuanyi Ruan, Jingjing Quan, Chenglong Li, Xingming Ning,* Pei Chen,* Zhongwei An and Xinbing Chen*



4503

Multi-channel wearable fiber sensors with high sensitivity for limb motion recognition

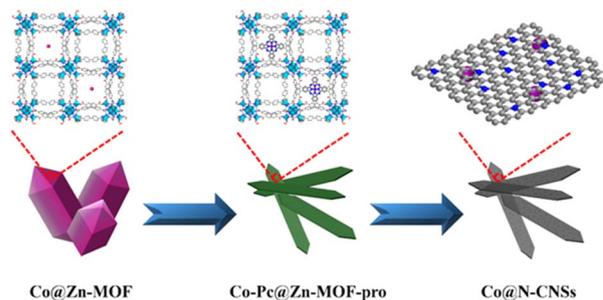
Wei Yan, Haonan Zhang, Xinxin Cai, Chenbin Ma, Dongmin Ma, Hongbo Lu,* Guanglei Zhang* and Weixing Song*



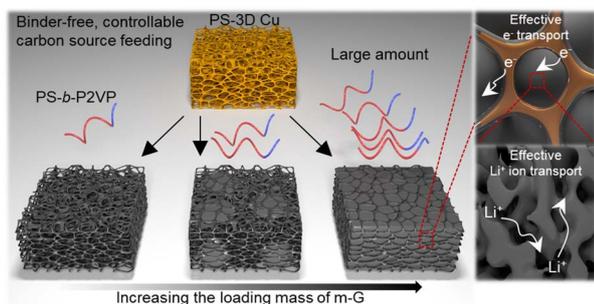
4513

Size-confined Co nanoparticles embedded in ultrathin carbon nanosheets for enhanced oxygen electrocatalysis in Zn-air batteries

Yang Liu, Qi Yan, Fayuan Ge, Xinde Duan, Tingting Wu and Hegen Zheng*



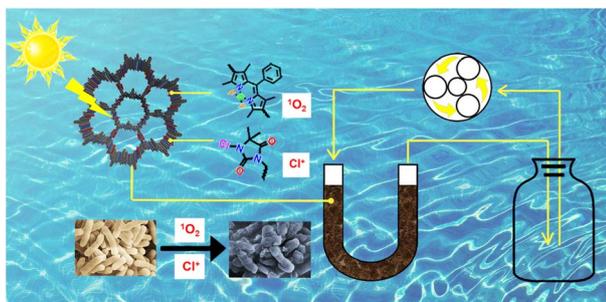
4521



Ultrahigh mass loading, binder-free synthetic approach for mesoporous graphitic carbon in 3D current collector for high energy lithium-ion batteries

Jun Kim, Keon-Woo Kim, Hyeongkeon Yoon, Shin Park, Dokyung Woo, Hangjun Jo, Changshin Jo* and Jin Kon Kim*

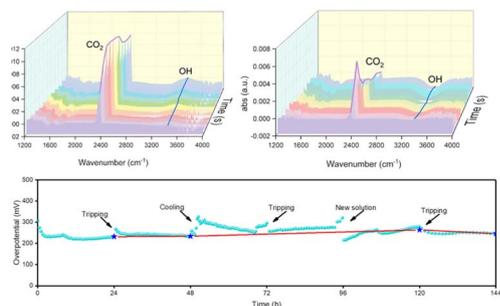
4530



BODIPY and *N*-halamine-decorated covalent organic framework with synergistic antibacterial capabilities for sunlight-powered water sterilization

Shuai Liu, Lin-Li Yao, Xin-Ru Wang, Guo-Yan Zhao, Fei Li, Bing-Jian Yao* and Yu-Bin Dong

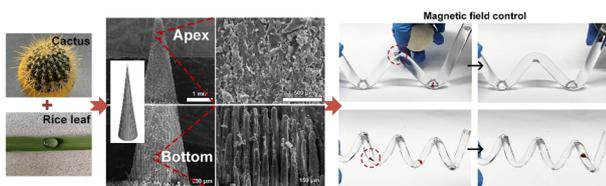
4538



Boosting hydrogen production from alkaline water splitting *via* electrochemical active surface reconstruction of transition metal sulfide electrocatalysts

Chenhao Shi, Jing Zhou, Muzaffar Ahmad Boda, Kunfeng Zhao, Zhiquan Yang, Dingwang Yuan* and Zhiguo Yi*

4550



A magnetic-responsive conical microcolumn for removing oil pollution in tubes and emulsion filtering with ultra-high separation flux

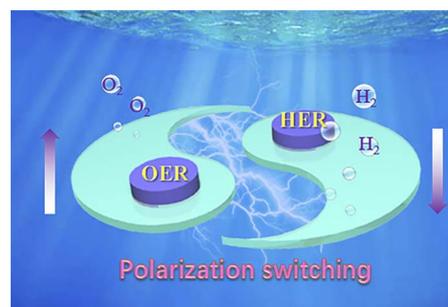
Lei Kang, Yang Zhang, Yun-yun Song,* Yan Liu and Zhong-qiang Zhang



4563

Ferroelectric switching driven photocatalytic overall water splitting in the As/In₂Se₃ heterostructure

Rui Xiong, Lili Zhang,* Cuilian Wen, Masakazu Anpo, Yee Sin Ang* and Baisheng Sa*



4576

Improving nitrate-to-ammonia conversion efficiency on electrodeposited nickel phosphide via surface δ-FeOOH modification

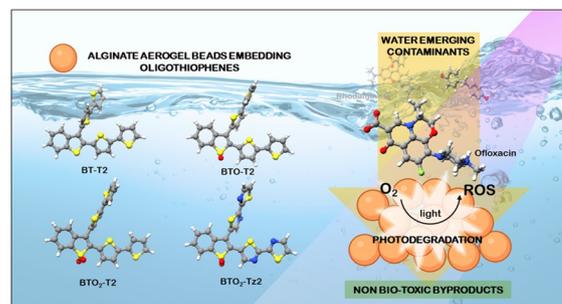
Anelisse B. Silva, Eduardo A. Reis, Jiajun Hu, Josep Albero, Caue Ribeiro, Lucia H. Mascaro and Hermenegildo Garcia*



4587

Alginate–oligothiophene aerogels as photocatalysts for the degradation of emerging organic contaminants in water

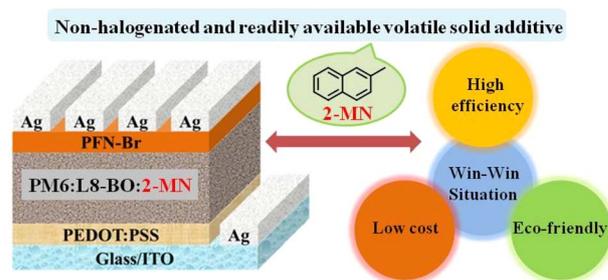
Andrea Trifoglio, Francesca Tunioli, Laura Favaretto, Massimo Zambianchi, Cristian Bettini, Ilse Manet, Livia Mariani, Anna Barra Caracciolo, Paola Grenni, Manuele Di Sante, Matteo Di Giosia, Tainah Dorina Marforio, Edoardo Jun Mattioli, Matteo Calvaresi* and Manuela Melucci*



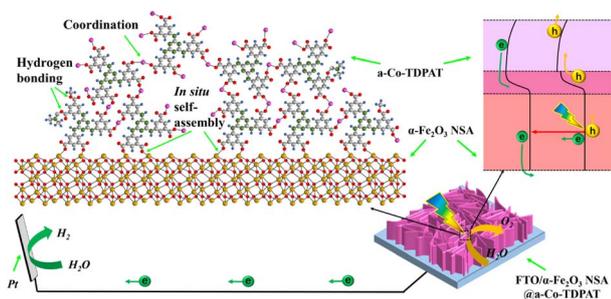
4600

Methylated naphthalene additives with various melting and boiling points enable a win–win scenario of optimizing both cost and efficiency of polymer solar cells

Tao Li, Xiaoying Zhang, Qi Chen, Zhi-Guo Zhang,* Ping Shen* and Chao Weng*



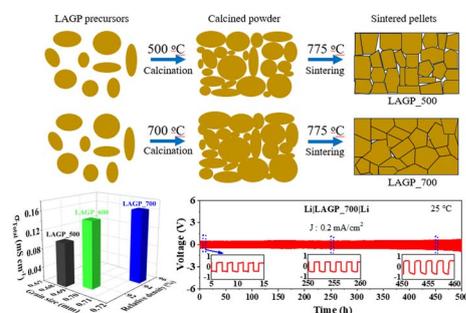
4614



In situ controllably self-assembled amorphous Co–TDPAT MOFs as superior cocatalysts of α -Fe₂O₃ nanosheet arrays for highly efficient and ultrastable photoelectrochemical oxygen evolution

Weiguang Hu, Qinghua Xia, Lian Ying Zhang, Jianguo Lu, Qinggang He and Weiyong Yuan*

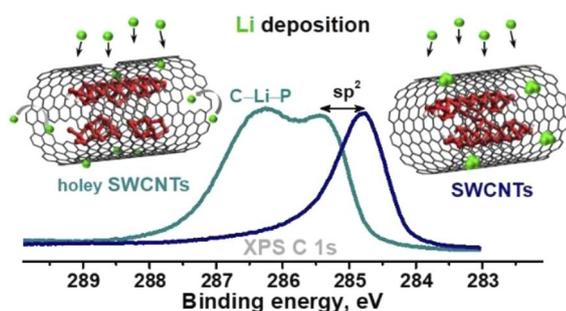
4624



Calcination-driven enhancement of LAGP for high-performance solid-state lithium metal batteries

Seo In Jung, Mohammad Nasir and Hee Jung Park*

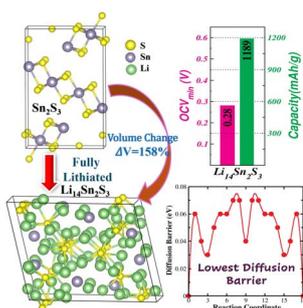
4634



Synergistic effect of sidewall holes and encapsulated phosphorus to improve lithium storage in single-walled carbon nanotubes

Anna A. Vorfolomeeva, Yuliya V. Fedoseeva, Elena V. Shlyakhova, Konstantin A. Kovalenko, Anna A. Makarova, Evgeny Yu. Gerasimov, Alexander V. Okotrub and Lyubov G. Bulusheva*

4650



High-performance Sn₂S₃ as a conversion-alloying anode material for lithium-ion batteries: insights from first-principles calculations

Dwaipayan Chakraborty,* Zubair Nabi Ganaie* and Priya Johari*



4662

Enhancing oxygen activation toward promoted photocatalytic oxidation of methane to liquid oxygenates with $\text{ReO}_2@\text{TiO}_2$: the regulation of oxygen affinity

Linghui Yan, Shuyue Wang,* Chao Qian and Shaodong Zhou*

