Journal of Materials Chemistry A

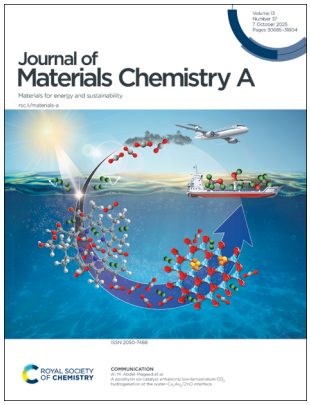
Materials for energy and sustainability

rsc.li/materials-a

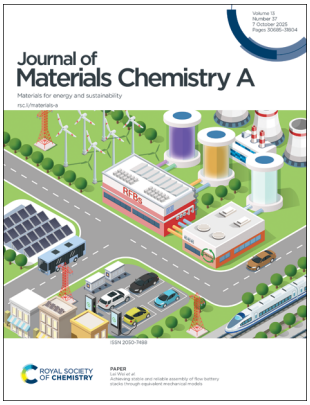
The Royal Society of Chemistry is the world's leading chemistry community. Through our high impact journals and publications we connect the world with the chemical sciences and invest the profits back into the chemistry community.

IN THIS ISSUE

ISSN 2050-7488 CODEN JMCAET 13(37) 30685–31804 (2025)



Cover
See Ali M. Abdel-Mageed *et al.*, pp. 30929–30936. Image reproduced by permission of Ali M. Abdel-Mageed and coworkers from *J. Mater. Chem. A*, 2025, **13**, 30929.



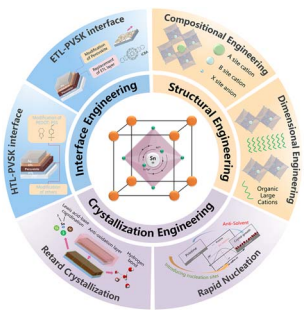
Inside cover
See Lei Wei *et al.*, pp. 30952–30966. Image reproduced by permission of Lei Wei from *J. Mater. Chem. A*, 2025, **13**, 30952.

REVIEWS

30708

Recent advances in tin halide perovskite solar cells: a critical review

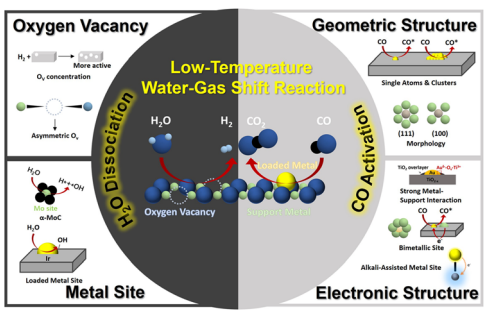
Boya Zhang, Zitian Zeng, He Dong,* Weiyin Gao* and Chenxin Ran*



30755

Reasonable active site design for promoting water dissociation and carbon monoxide activation in a low-temperature water-gas shift reaction

Shikun Wang, Shuangde Li,* Linfeng Nie and Yunfa Chen*



NEW JOURNAL

ROYAL SOCIETY OF CHEMISTRY

RSC Applied Interfaces

GOLD OPEN ACCESS

Interfacial and surface research with an applied focus

Interdisciplinary and open access

rsc.li/RSCApplInter

Fundamental questions
Elemental answers

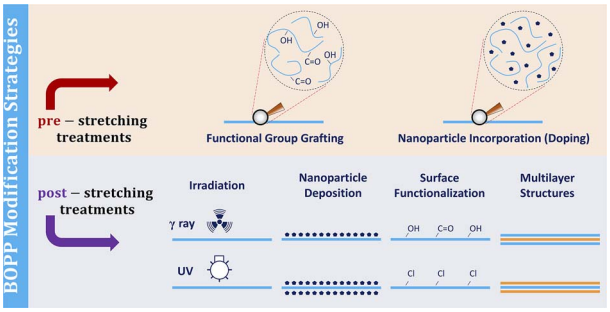
Registered charity number: 207890

REVIEWS

30768

Exploring modification strategies to enhance energy storage performance of BOPP dielectric films

Ali Yadegari* and Thomas Ebel



30796

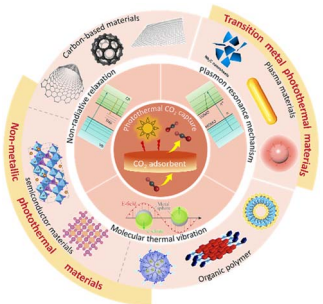
Recent advances in liquid metals as electrodes, electrolytes and interface stabilizers for lithium batteries and beyond

Xinlong Wang, Shanshan Li, Yu Feng,* Hui Liu, Wei Zhang, Ruiqing Li, Man Zhang,* Jiancheng Wang, Huaiyu Shao, Yuxin Tang, Chunyan Cao* and Mingzheng Ge*

30823

Recent advances of photothermal technology in CO_2 capture and methanation

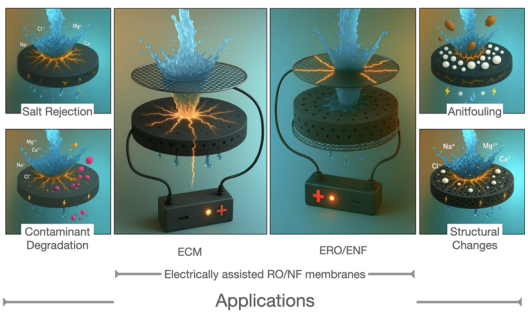
Yu Zhu, Qiao Peng, Muhammad Adnan Zeb, Jinlong Zhang, Juying Lei and Lingzhi Wang*



30843

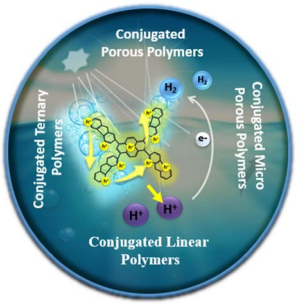
A review of the design, applications, and mechanisms of electrically assisted reverse osmosis and nanofiltration processes

Haya Nassrullah, Jamaliah Aburabie, Shabin Mohammed, Nidal Hilal and Raed Hashaikeh*



REVIEWS

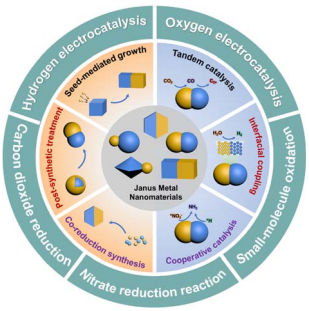
30870



Innovative approaches to the molecular design, synthesis, and functionalization of conjugated organic polymer (D–A, D–π–A, A–A–D, and A–D–A) photocatalysts for sustainable hydrogen production

Pachaiyappan Murugan and Shi-Yong Liu*

30906

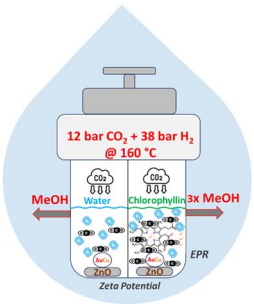


Recent advances in metal-based Janus nanomaterials: synthesis and electrocatalytic applications

Biao Huang,* Yiming Wang, Fukai Feng, Nailiang Yang, Yiyao Ge* and Ming Zhao*

COMMUNICATIONS

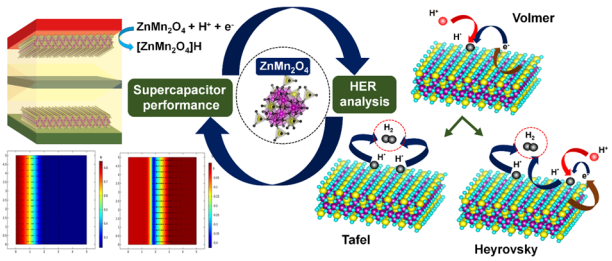
30929



A porphyrin co-catalyst enhancing low-temperature CO_2 hydrogenation at the water–Cu_xAu_y/ZnO interface

Hung Mac, Katja Neubauer, Thanh Huyen Vuong, M. Parlinska-Wojtan and Ali M. Abdel-Mageed*

30937



Bifunctional spinel $ZnMn_2O_4$ nanostructures for efficient supercapacitors and water splitting electrocatalysts: a synergistic experimental and modeling study

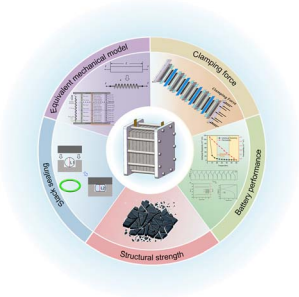
Souvik Sau, Manisha Kundu, Shriparna Roy, Indrajit Mondal, Somen Biswas, Piyali Halder, Biplab Kumar Paul, Dheeraj Mondal* and Sukhen Das*

PAPERS

30952

Achieving stable and reliable assembly of flow battery stacks through equivalent mechanical models

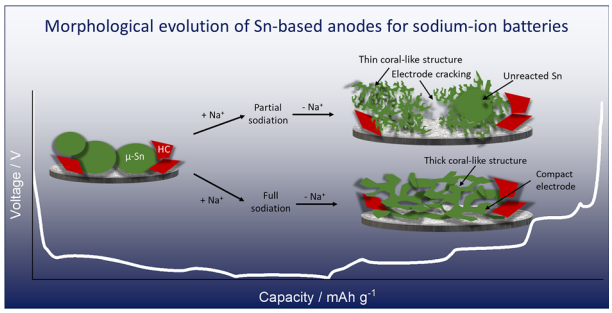
Honghao Qi, Lyuming Pan, Haoyao Rao, Meisheng Han, Jing Sun, Jiayou Ren, Qinping Jian, Yubai Li, Liuping Chen, Lin Zeng and Lei Wei*



30967

Assessing the role of morphological changes as the origin of improved cycling stability of Sn-based anodes for sodium-ion batteries

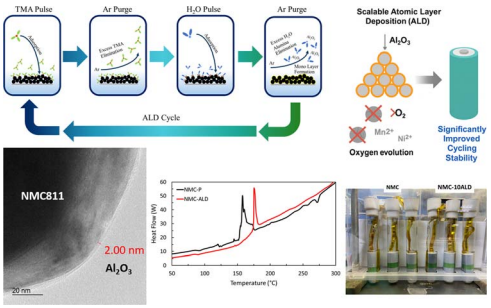
Carla Albenga, James A. Gott, Amalie Skurtveit, Jason M. Warnett, Faduma M. Maddar, Alexey Y. Koposov, Gustavo Pinzón, Geoff West and Ivana Hasa*



30985

Suppressing failure mechanisms in thick Ni-rich cathodes using angstrom-level alumina coatings

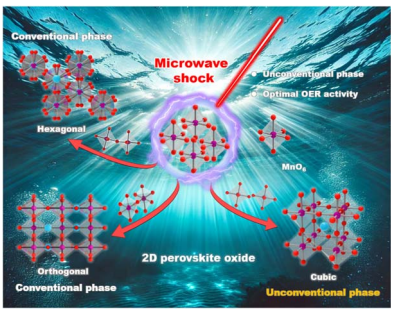
Surat Prempluem, Thitiphum Sangsanit, Worapol Tejangkura and Montree Sawangphruk*



31002

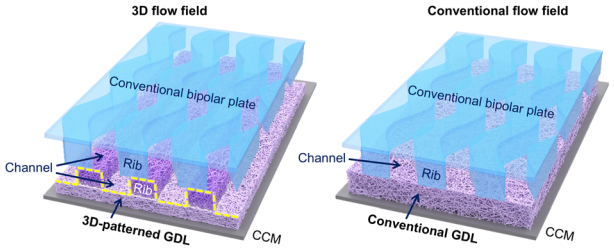
Microwave shock-driven thermal engineering of unconventional cubic 2D $LaMnO_3$ for efficient oxygen evolution

Jiao Dai, Mingjie Wang, Haoran Tian, Wenhui Fan, Kaisi Liu, Weilin Xu, Huiyu Jiang,* Huanyu Jin* and Jun Wan*



PAPERS

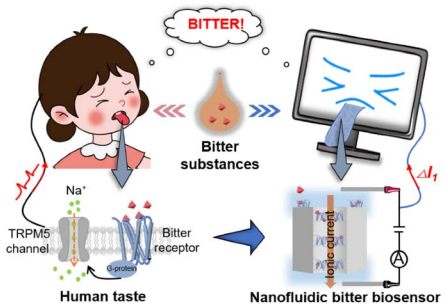
31013



Easily accessible 3D flow fields through 3D-patterned GDL to enhance PEMFC performance *via* excellent water–gas separation transport

Xi Cheng, Can He, Qinglin Wen, Yuzhuo Jiang, Wei Li, Jiahao Huang, Wentao Huang, Xingyu Zhu, Xueyan Chu, Fandi Ning, Lining Sun, Bin Tian and Xiaochun Zhou*

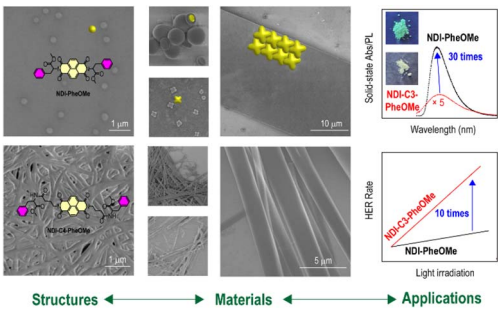
31023



A biomimetic nanofluidic tongue for highly selective and sensitive bitterness perception

Yanan Li, Hua Zheng, Lei Xu, Linfeng Chen,* Fan Xia and Yanlin Song

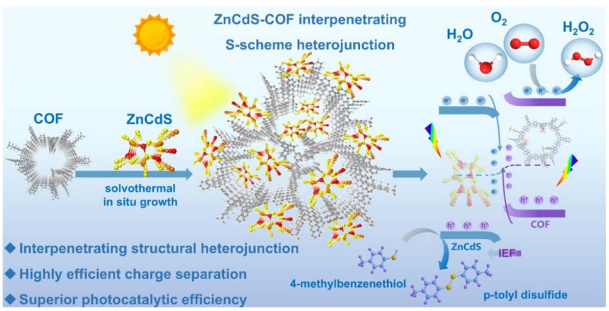
31034



Unveiling morphology evolution and key intermediates in the self-assembly of amino acid-naphthalene diimide triads

Yuan Zheng, Haoyu Li, Wenwen Li, Guo Wang, Boya Wang, Li Wang,* Xiaolin Zhu* and Xiaoyan Tang*

31043



Covalent organic framework confined nanocrystals towards interpenetrating heterojunctions for efficient photocatalytic H_2O_2 production and selective organic catalysis

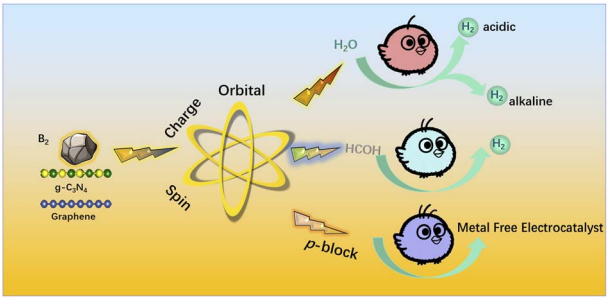
Hanqi You, Mengchao Guo, Shihuan Gao, Yaning Du, Jiani Yang, Kun Xiong, Teng Lu,* Shuang Li,* Chong Cheng* and Changsheng Zhao

PAPERS

31055

One stone, three birds: dual hydrogen production from water reduction and formaldehyde oxidation predicted on metal-free electrocatalysts

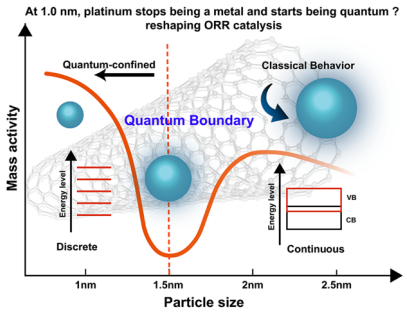
Dongyu Huo, Guang Yang, Zhiyuan Jia, Rui Pang, Xiaoyan Ren* and Shunfang Li*



31065

One nanometer matters: quantum-induced discontinuity in the oxygen reduction reaction catalyzed by platinum nanoparticles

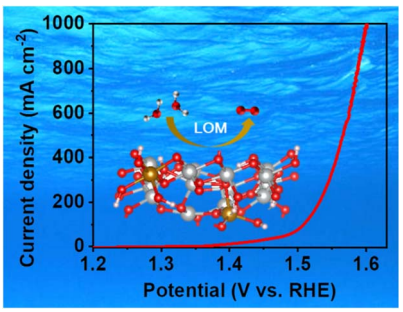
Zhuoya Deng, Yuanyuan Liu, Pengfei Wang, Zhunda Zhu, Nutthira Pakkang, Garbis Atam Akceoglu, Sangwoo Chae, Yasuyuki Sawada, Li Yang and Nagahiro Saito*



31077

Lattice oxygen activation through reconstruction of transition metal fluoride for efficient ampere-level current density oxygen evolution

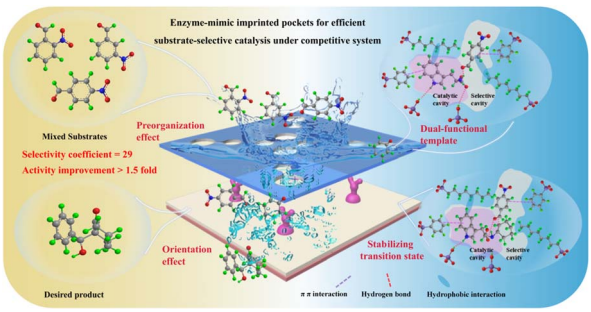
Liping Ji, Yaxian Shen, Peng Guan, Deshuang Xu, Yuehua Zhang, Qing Ye, Yanxia Zhao,* Zongmin Zheng* and Yongliang Cheng*



31089

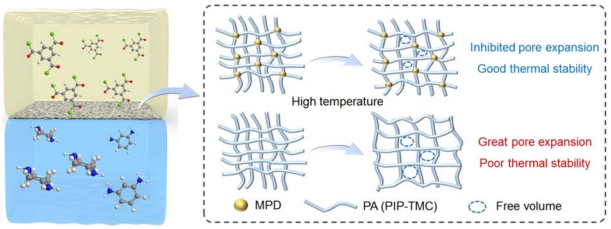
***In situ* engineered matched pockets for efficient substrate-selective catalysis in complex mixtures: synergistic binding-catalysis in magnetic imprinted nanoreactors**

Ya Liu, Yuanyuan Cheng, Jingang An, Yi Hao, Xuemeng Tian, Yue Wang, Xueyi Liu and Ruixia Gao*



PAPERS

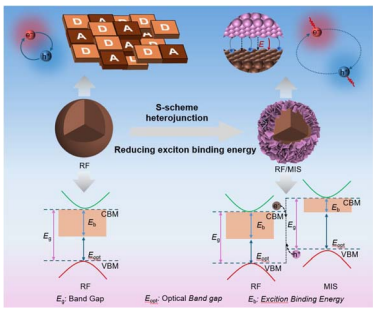
31101



Thermostable nanofiltration membranes *via* a co-monomer strategy for high-temperature separation

Zi-Lu Zhang, Jia-Hui Xin, Xiao-Wei Luo, Wan-Ting Lin, Wan-Long Li, Si-Yuan Zhang, Zi-Jun Zhang, Zhi-Kang Xu and Ling-Shu Wan*

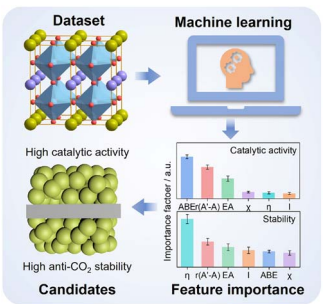
31112



Regulating exciton binding energy in resorcinol-formaldehyde resin *via* S-scheme heterojunction construction for efficient full-spectrum-driven H_2O_2 production

Lele Wang,* Weiran Wu, Wenpeng Zhang, Xinlei Ren, Xuan Liu, Wing-Kei Ho, Jie Hu* and Min Zhou*

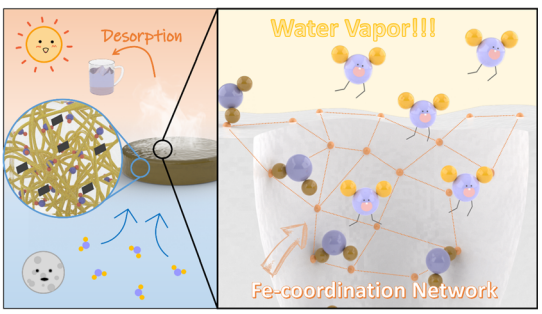
31122



Machine-learning-assisted prediction of highly active and stable $PrBaCo_2O_{5+\delta}$-based oxygen electrodes for solid oxide cells

Min Zhang, Jiayue Liu, Yaozong Yang, Xianyu Wang, Zhihong Du and Hailei Zhao*

31131



Harnessing metal–ligand complex and photothermal conversion in hydrogels for advanced atmospheric water harvesting

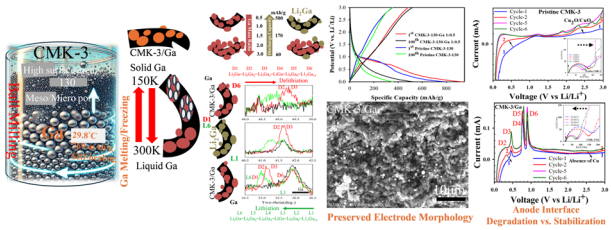
An Feng, Xin Stella Zhang, Shudi Mao, Casey Onggowarsito, Yihan Shi and Qiang Fu*

PAPERS

31139

Operando elucidation of all six reversible Li–Ga phase transitions, inverted hysteresis, and interfacial dynamics in a nanoconfined CMK-3/Ga anode

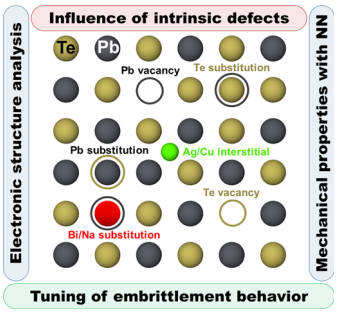
Mano Ajayan, Che-an Lin and Shih-kang Lin*



31170

Tuning of mechanical properties of doped PbTe-based thermoelectric materials driven by intrinsic defects

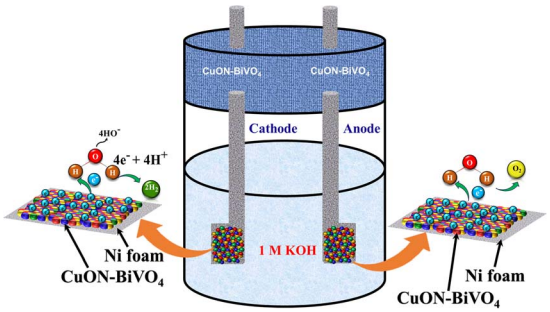
Ilya V. Chepkasov,* Aleksandra D. Radina, Viktor S. Baidyshev, Mikhail Polovinkin, Nikita Rybin, Alexander Shapeev, Artem A. Krikorov, Artem R. Oganov, Zinovi Dashevsky, Dmitry G. Kvashnin and Alexander G. Kvashnin



31182

Rational design of Cu oxynitride–$BiVO_4$ composites as enriched bifunctional electrocatalysts for hydrogen and oxygen evolution reaction performances

Santhosh Kumar Jayaraj, Seungmin Yu, P. Muthu Austeria,* Sivaprakasam Radhakrishnan,* Arvind H. Jadhav, Sakar Mohan* and Byoung-Suhk Kim*



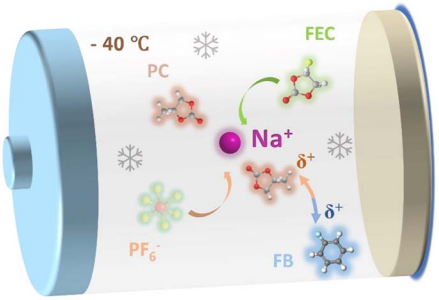
31202

Taming of 3,4-di(nitramino)furazan II:high-energy coordination complexes with exceptional catalytic activity for the thermal decomposition of ammonium perchlorate

Jizhou Dong, Jinchao Ma,* Shuyue Xu, Xingyang Cui, Hua Qian* and Jean'ne M. Shreeve*

PAPERS

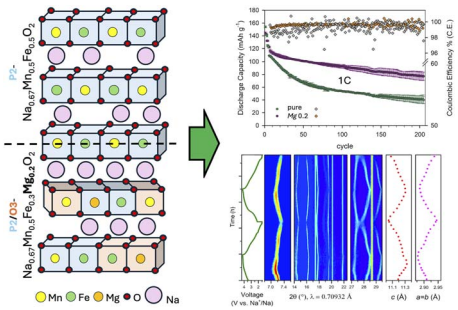
31211



Carbonate electrolyte structure engineering enabling ultrahigh-rate capability and long-term cycling stability of NFPP||Na batteries at −40 °C

Zhengnan Ke, Jianhui Zhong, Zihan He, Jiaguo Yu* and Tao Liu*

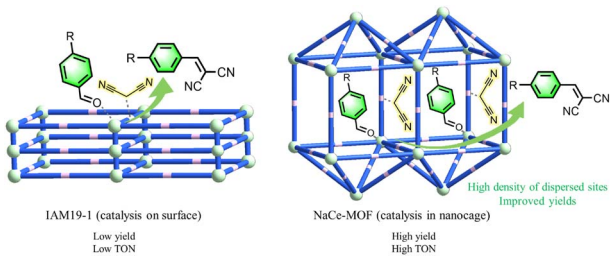
31221



Solid-state *vs.* spray-drying synthesis for Mg-doped P2–$Na_{0.67}Fe_{0.5}Mn_{0.5}O_2$ as a cathode material for sodium-ion batteries

Mattia Canini,* Daniele Callegari, Matteo Bianchini and Eliana Quartarone

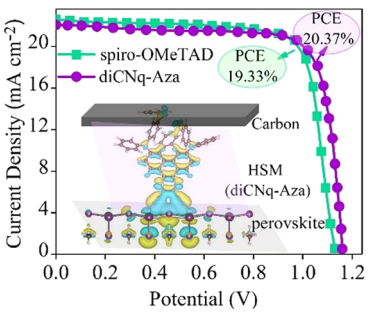
31236



Size-selective catalysis enhancement in a new nanocaged MOF through the synergistic Lewis acidic–basic sites

Weilinsen Ding, Yuanyuan Liu, Ronghua Dong, Xuan Yang, Lanhe Zheng, Munendra Pal Singh, Zhenqian Fu, Qiang Ju and Zhenlan Fang*

31247



Innovating carbon-based perovskite solar cells: the role of a CN-anchoring self-assembled molecular layer in efficiency and stability

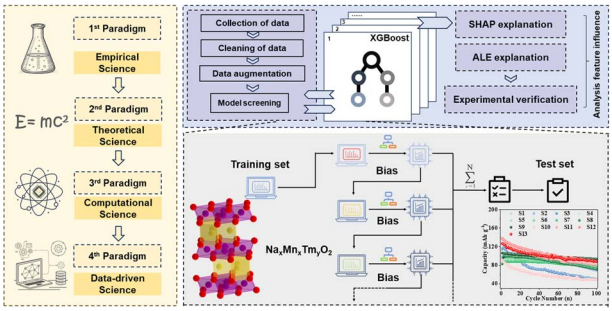
Sheida Rezakhani, Hashem Shahroosvand,* Peng Gao and Mohammad Khaja Nazeeruddin*

PAPERS

31264

An interpretable machine learning model for Mn-based cathode development: mapping synthesis parameters to cycling stability

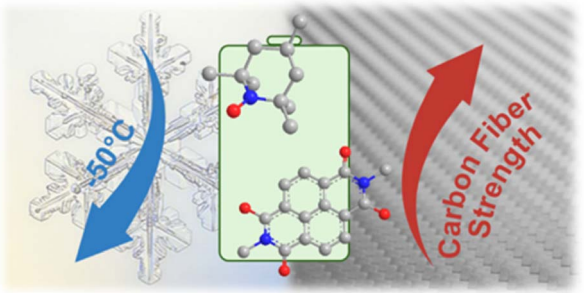
Cheng Wei, Zijin Cui, Haokun Li, Jingyuan Guo, Linzhuang Xing, Yihang Li, Hongyu Yang,* Zhimin Li* and Yue Hao



31279

Organic dual-ion batteries with low-temperature operability and structural reinforcement

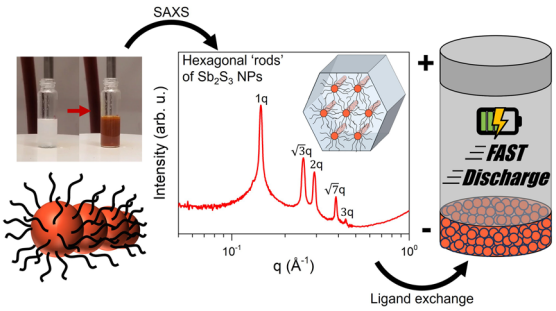
Chen Wang, Suyash Oka, Mohd Avais, Dimitris C. Lagoudas, James G. Boyd, Micah J. Green and Jodie L. Lutkenhaus*



31292

Synthesis, assembly, and electrochemical performance of ultrasmall Sb_2S_3 nanoparticles

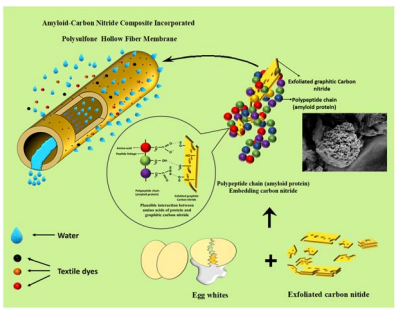
Zachery R. Wylie, Guesang K. Lee, Soohyung Lee, Abdul Moeez, Guodong Ren, Juan-Carlos Idrobo, Peter J. Pauzauskie, Lilo D. Pozzo* and Vincent C. Holmberg



31304

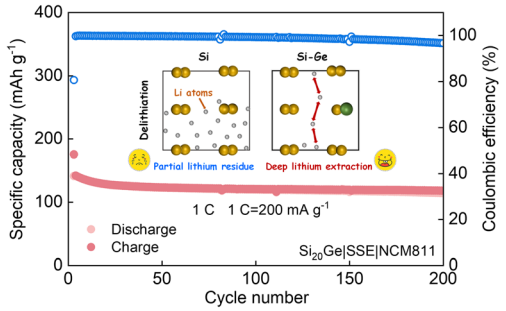
A chicken egg white-based amyloid–graphitic carbon nitride composite-incorporated hollow fiber membrane for efficient removal of dyes and heavy metal ions present in water

Sooraj S. Nayak, Arun M. Isloor* and Ahmad Fauzi Ismail



PAPERS

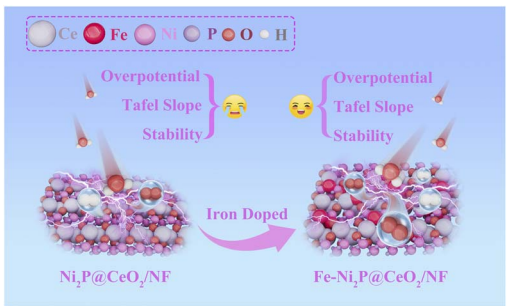
31319



Optimized micro-silicon structure enabling ultrahigh initial coulombic efficiency and fast reaction kinetics for advanced lithium-ion batteries

Xin Qin, Yafei Wang, Zhenyu Tian, Zuqiang Ge, Lu Zhao, Junwei Han,* Debin Kong and Linjie Zhi*

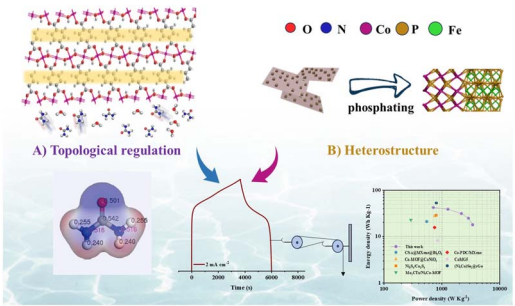
31329



CeO$_2$ facilitates electron transfer at the Fe-Ni$_2$P heterointerface, enhancing the overall process of water splitting

Luo Zhao, Li Wang, Jie Zhou, Hao Xu, Zikang Wang, Yuping Liu,* Xiaoqin Liao* and Ming Nie*

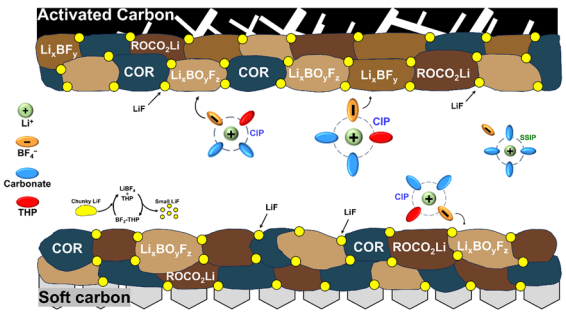
31341



Engineering CoP/FeP$_4$ heterostructures on epitaxially grown ultra-thin two-dimensional MOFs *via* competitive coordination for high-durability electrochemical supercapacitors

Chenyong Wang, Wenqiang Sun, Yingjie Li, Xingjia Liu, Ziyang Liu, Yulan Meng, Lizhao Liu, Xue-Zhi Song,* Xiaofeng Wang* and Zhenquan Tan*

31353



Combining LiBF$_4$ with a donor solvent to optimize Li$^+$-solvation and reinforce interphases for lithium ion capacitors

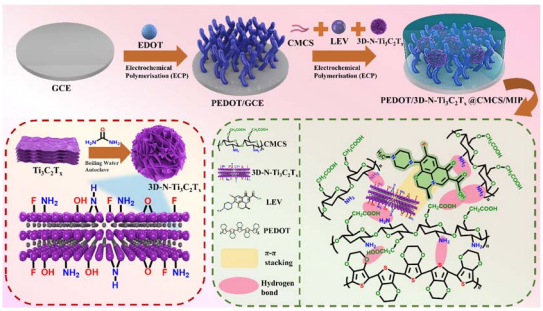
Ching-Yu Hu, Li-Jia Lin, Van-Can Nguyen, Hao-Lun Juan, Yi-Chen Chan, Chi-Cheng Chiu, Yuh-Lang Lee and Hsisheng Teng*

PAPERS

31371

A PEDOT/3D-N-$Ti_3C_2T_x$ nanoflower hydrophilic regulation molecular imprinting electrochemical sensor for ultrasensitive detection of levofloxacin

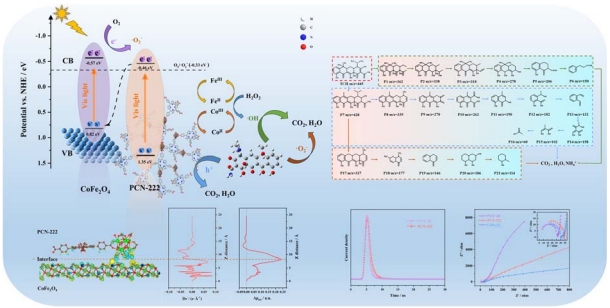
Zhigang Wang, Guoliang Zhang, Ruxangul Jamal,* Tursun Abdiryim,* Feng Xu, Yanqiang Zhou, Kai Song, Lirong Ma, Jing Tan, Luyao Wan and Yiwu Zhu



31385

Construction of a Z-scheme PCN-222/$CoFe_2O_4$ heterojunction for efficient photo-Fenton tetracycline hydrochloride degradation: mechanism and pathways

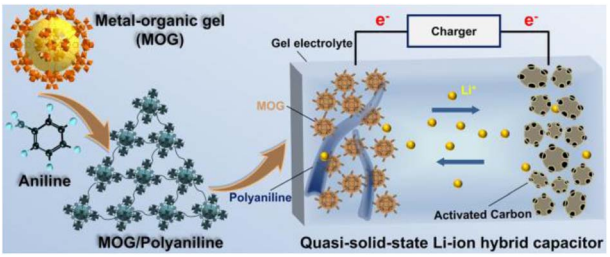
Jiaxin Li, Jingchao Liu, Jiawei Li, Yaping Li, Ziyang Zhu, Zirui Wang, Yilin Yin* and Zenghe Li*



31395

A quasi-solid-state Li-ion hybrid capacitor based on a colloidal metal–organic framework interwoven by *in situ* polymerized PANI

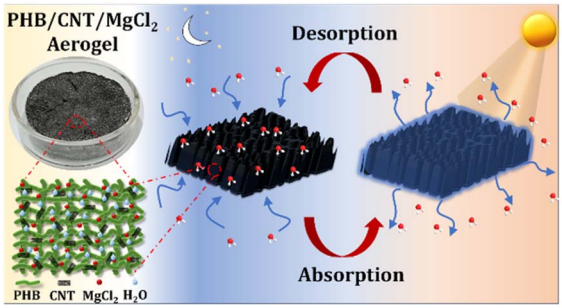
Jiale Liu, Hui Cao, Yidong Zhang,* Jianfei Ding* and Yuan Wang*



31408

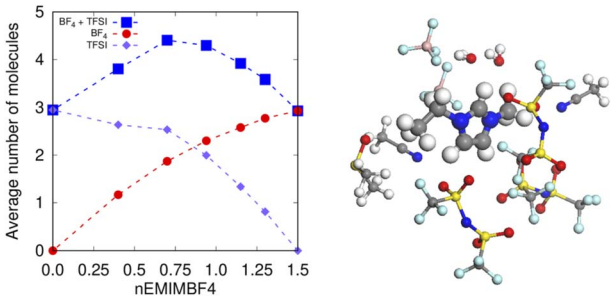
Efficient solar-driven atmospheric water harvesting in arid regions using a recyclable and biodegradable composite aerogel

N. S. Akhila and E. Bhoje Gowd*



PAPERS

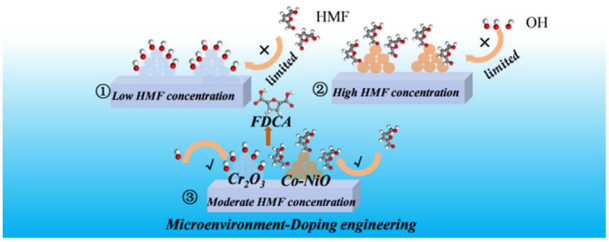
31421



Anion-rich solvation structures in high entropy aqueous electrolytes for supercapacitors with enlarged potential windows and superior rate capabilities

Laura González-Aguilera, José Manuel Vicent-Luna, Paula García-Balaguer, Sofia Calero, Rafael M. Madero-Castro, Encarnación Raymundo-Piñero, Xuejun Lu, María C. Gutiérrez, M. Luisa Ferrer* and Francisco del Monte*

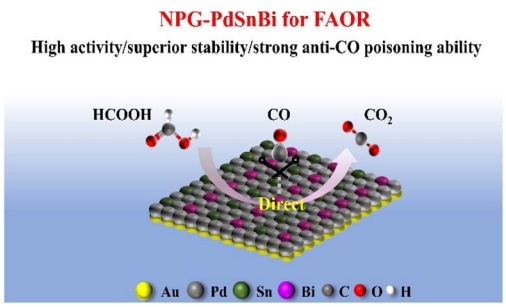
31435



Synergistic doping and microenvironment engineering enable efficient electrocatalytic oxidation of 5-hydroxymethylfurfural

Shuai Liu, Wenting Cai, Tongxue Zhang, Ke Fan, Xijun Liu, Xubin Zhang* and Fumin Wang*

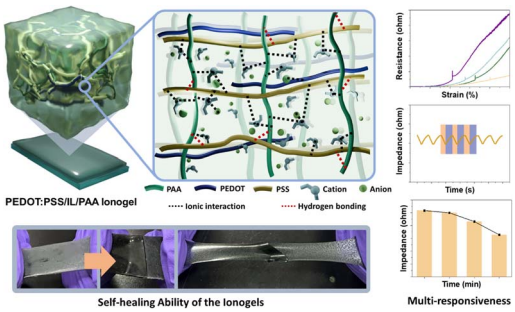
31448



Nanoporous PdSnBi alloys for superior formic acid oxidation electrocatalysis

Jun Li, Zetao Mou, Panmei Liu, Hongyan Liang, Yuan Huang, Yongchang Liu and Zumin Wang*

31456



Enhanced stretchability and conductivity in self-healing ionogels: a hybrid PEDOT:PSS/IL/PAA composite

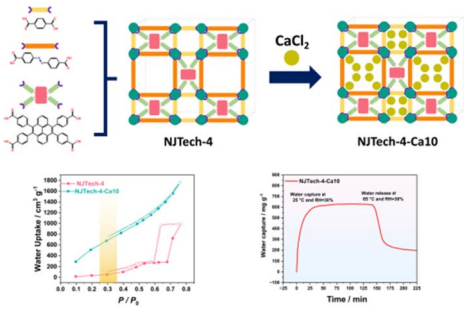
Huan-Wei Lin, Chia-Wei Chang, Chun-Chi Chang, Tse-Yu Lo, Tsung-Hung Tsai, Chia-Ti Wu, Heng-Hsuan Su and Jiun-Tai Chen*

PAPERS

31469

Hygroscopic salt in a mesoporous zirconium metal–organic framework for atmospheric water harvesting

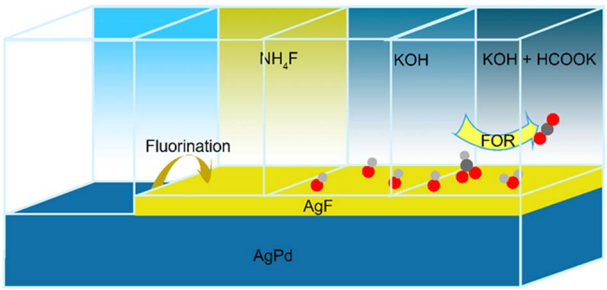
Yingpeng Jiang, Hao Tan, Banghao Wei, Liting Du, Jianfeng Zhang* and Zhiyong Lu*



31477

Elucidating the active motifs in a reconstructed AgPdF nanoalloy for the formate oxidation reaction

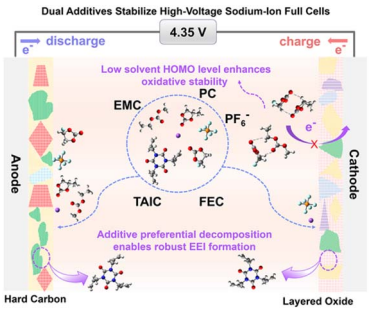
Zhen Li, Fuyi Chen,* Junpeng Wang, Chongyang Wang, Shuang Shan and Longfei Guo



31488

Theoretical calculation assisted design of dual additives enables robust electrode/electrolyte interphases for high-voltage sodium ion full cells

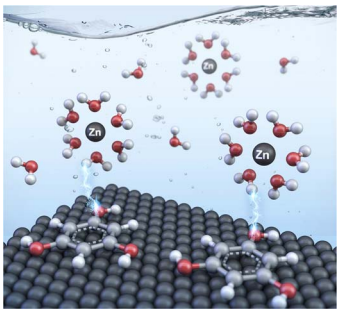
Peng-Tao Guo, Wensha Niu, Ling-Yun Li, Tao Wu and Wen-Cui Li*



31497

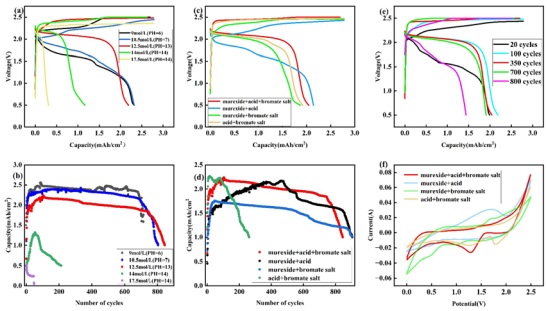
Water-attracting adsorbates for enhancing the cyclability of Zn anodes in aqueous Zn-ion batteries

Hana Lim, Dongju Kim, Jiwoo Oh, Eunseo Yoo, Junyoung Mun,* Minho Kim* and Myung Jun Kim*



PAPERS

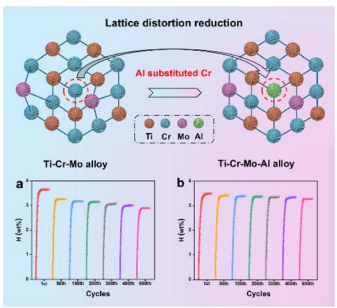
31509



A nontoxic, high-voltage zinc–bromine battery utilizing multi-oxidation-state bromine ($Br^-/BrO^-/BrO_3^-$) redox chemistry

Mingyang Cao, Mingqiang Li,* Weiye Bai, Godlaveeti Sreenivasa Kumar, Ning Wang and Yanheng Yin

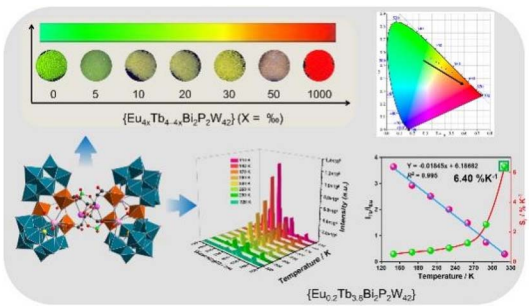
31519



Tuning atomic mismatch with trace Al for enhanced long-term hydrogen storage performance of TiCrMo alloy

Yang Liu, Chaojie Li, Huazhou Hu,* Songsong Li, Xiaoxuan Zhang, Liqing He, Lei Liu and Qingjun Chen*

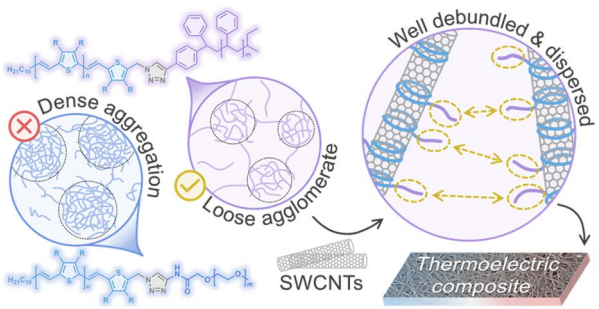
31530



First phosphite-bridging lanthanide–bismuth heterometallic selenotungstates and their ratiometric-temperature luminescence sensing properties

Shuo Wang, Tiantian Gong, Zhihan Wen, Lijuan Chen* and Junwei Zhao*

31542



Tuning the nano-scale aggregate structure of conjugated block copolymers for enhanced single-walled carbon nanotube dispersion and thermoelectric applications

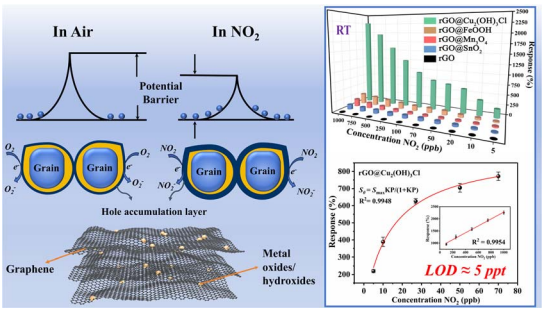
Wei-Ni Wu, Koya Nishiyama, Chun-Yu Chen, Jhih-Min Lin, Shih-Huang Tung, Tomoya Higashihara* and Cheng-Liang Liu*

PAPERS

31553

Trace NO_2 sensors based on reduced graphene@metal oxide/oxyhydroxide/hydroxychloride with ultrahigh sensitivity and good selectivity at room temperature *via* modulation of the nanograin boundary

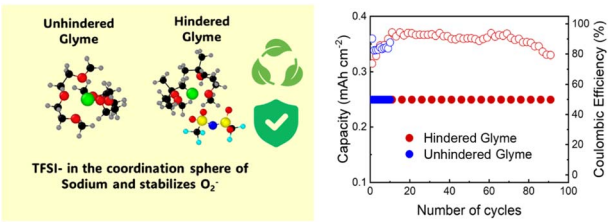
Xiaohang Ji and Yang Li*



31569

Exploring hindered glymes as electrolyte solvents for sodium–oxygen batteries: impact on electrochemical performance and discharge product stability

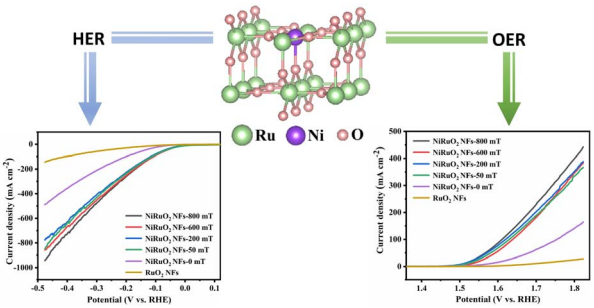
Marina Enterría, Sergio Rodriguez-Peña, Idoia Ruiz de Larramendi, Rosalia Cid, Shanmukaraj Devaraj, Javier Carrasco, Michel Armand and Nagore Ortiz-Vitoriano*



31585

Effects of steady magnetic fields on $NiRuO_2$ nanofibers for the electrocatalytic hydrogen evolution reaction and oxygen evolution reaction

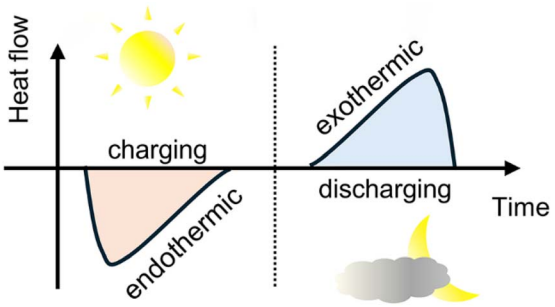
Lingyun Li, Jin-Hua Liu, Shumeng Li, Wen-Hua Yang,* Wenyue Wang, Kai Li,* Yu-Ze Sun, Wenpeng Han, Ru Li, Jun Zhang* and Yun-Ze Long*



31592

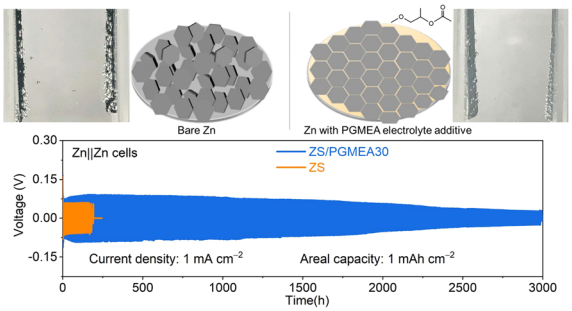
Investigating structural and morphological transformations of strontium chloride for thermochemical energy storage

Jungho Shin, Madeline R. Morrell, Erik Barbosa, Akanksha K. Menon* and Matthew T. McDowell*



PAPERS

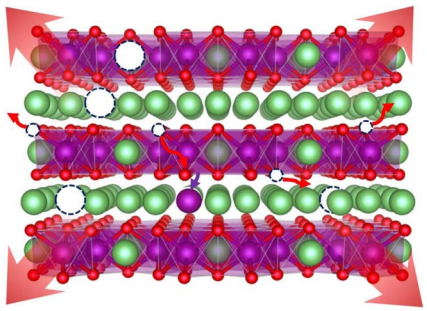
31604



Electrolyte additive for improving anodic stability in aqueous Zn-ion batteries

Yuanyuan Guo, Yu Zhe Lye, Ian P. Seetoh, Guo Yao Lim, Wei Xin Tan and Chang Quan Lai*

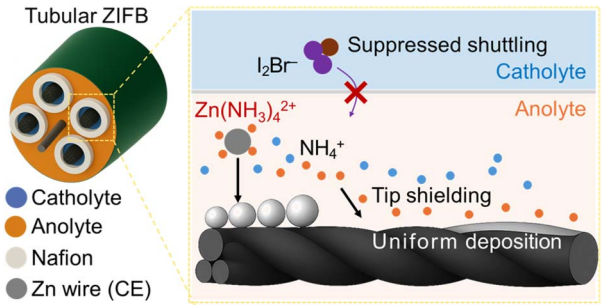
31614



Strain regulation of microscopic processes in lithium-rich cathodes: thermodynamics and kinetics

Jinwei Li, Fei Han and Dajun Shu*

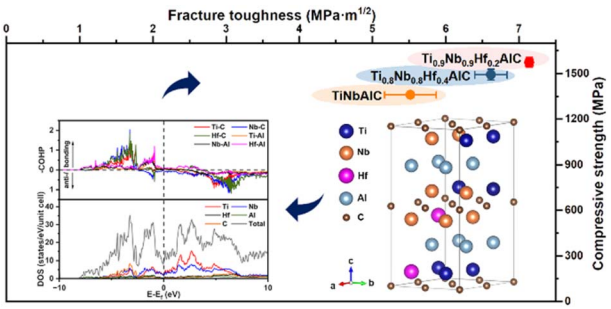
31623



A dual-stabilization strategy for tubular zinc-iodine flow batteries

Ifeanyi Emmanuel Udom, Yan Yao* and Lihong Zhao*

31632



Synthesis, chemical bonding, and mechanical properties of Ti–Nb–Hf ternary solid solution MAXs

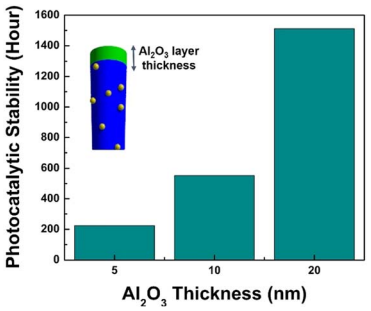
Conghui Meng, Mengfei Xu, Shiyao Lei, Yifei Xiao, Cheng-Feng Du,* Linze Fan, Weihong Qi,* Long Wang and Hong Yu*

PAPERS

31642

Long-term stability of GaN-based photocatalyst nanostructures through dynamic oxide protection

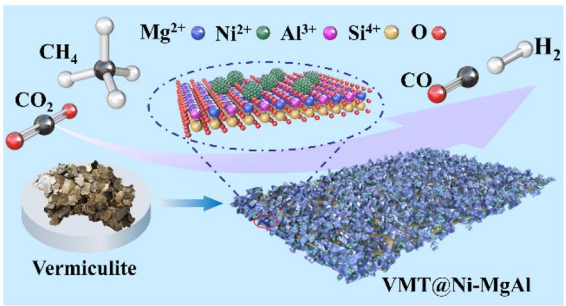
Ishtiaque Ahmed Navid, Zhengwei Ye, Yuyang Pan, Yifan Shen, Theodore Norris and Zetian Mi*



31654

Vermiculite reshaped nickel-based hydrotalcite derived composites efficiently drive methane dry reforming

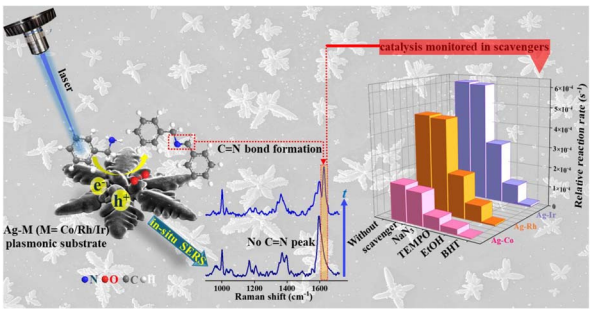
Qinrui Wang, Lu Yan, Shengwei Yuan, Zijun Wang* and Feng Yu



31672

Bimetallic Ag–M (M = Co, Rh, Ir) alloy microflowers as high-performance plasmonic catalysts for visible-light-driven imine formation: a comparative study *via in situ* SERS

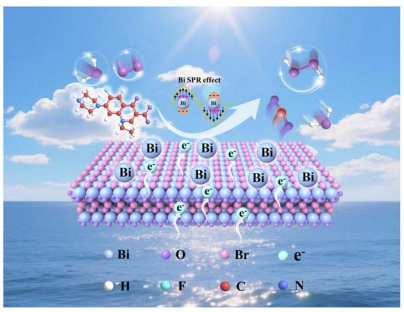
Shreya Sarkar, Mark Easton and Amit Nag*



31684

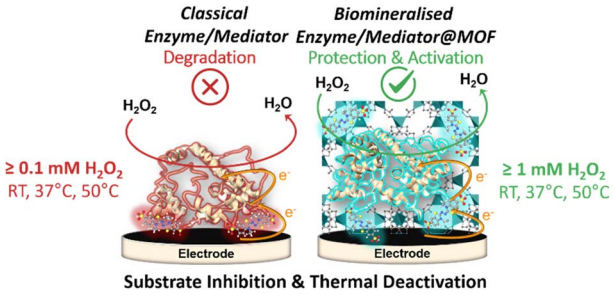
***In situ* constructed Bi/BiOBr nanoflower for synergistic H_2O_2 generation and pollutant degradation: coupling built-in electric field with SPR effect and environmental risk assessment**

Shuo Song, Zilong Meng, Anqi Du, Ping Liu, Kelong Li, Xinyu Zhang, Weifeng Kong, Qianwei Liang* and Jianrong Chen*



PAPERS

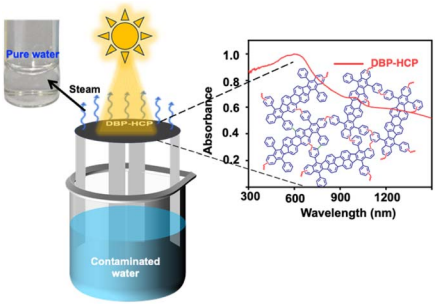
31699



Redox-active biomineralised zeolitic imidazolate frameworks enable peroxidase bioelectrocatalysis with shielding against substrate inhibition and thermal inactivation

Monika Joharian, Alexandre Uzel, Abir Elloumi, Yannig Nedellec, Thierry Encinas, Serge Gambarelli and Andrew J. Gross*

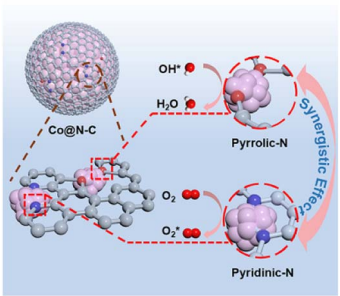
31714



A rational approach for the synthesis of near-infrared absorbing porous hypercrosslinked polymers for solar steam generation

Soujanya H. Goudar, Dhiraj Siddhartha Ingle, Girada Narendrakumar, Deepu J. Babu and Kotagiri Venkata Rao*

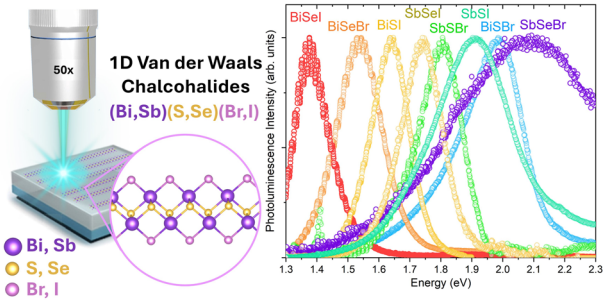
31720



Synergistic pyridinic-N/pyrrolic-N coordination tailors cobalt electronic states for high-efficiency oxygen reduction in Zn-air batteries

Chengxiang Hong, Yiming Zhang, Shijie Huang, Linna Sha,* Meiling Xu,* Yujie Ma, Yilin Li and Xiguang Han*

31727



Parallel exploration of the optoelectronic properties of (Sb,Bi)(S,Se)(Br,I) chalcohalides

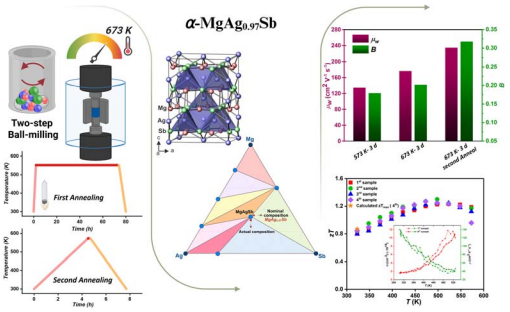
Rasmus S. Nielsen,* Ángel Labordet Álvarez, Axel G. Medaille, Ivan Caño, Alejandro Navarro-Güell, Cibrán L. Álvarez, Claudio Cazorla, David R. Ferrer, Zacharie J. Li-Kao, Edgardo Saucedo and Mirjana Dimitrievska*

PAPERS

31740

Reproducible synthesis of α-MgAgSb with optimized carrier transport for low-temperature thermoelectric applications

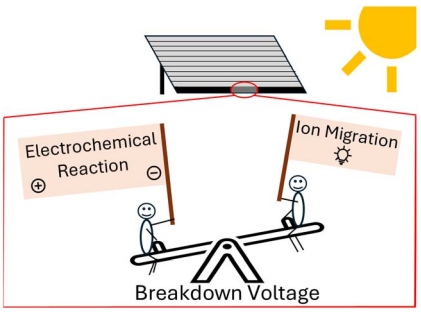
Saba Sepahban Shahgoli, Melis Ozen, Duncan Zavanelli, Gulchin Aliyeva, Arda Baran Burcak, Ulrich Burkhardt, Eleonora Isotta, G. Jeffrey Snyder and Umut Aydemir*



31755

The impact of low-intensity illumination on the reverse bias behavior of perovskite solar cells

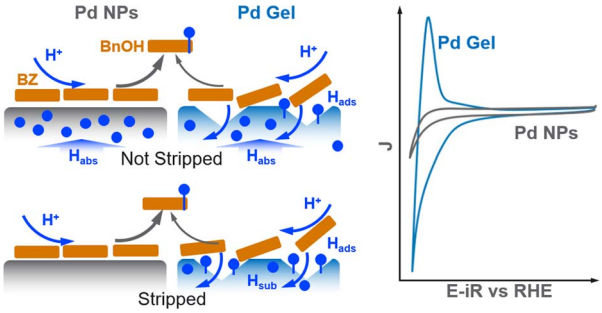
Jonathan Henzel,* Klaas Bakker, Sjoerd Veenstra, Olindo Isabella, Luana Mazzarella, Arthur Weeber and Mirjam Theelen



31770

Subsurface hydrogen, curvature, and strain: lessons from electro-reduction of benzaldehyde on nano-structured Pd catalysts

Sri Krishna Murthy Padavala, Sumudu Nimasha, K. A. U. Madhushani, Long Luo, Dongsheng Li, Hyoju Park, Hua Zhou, Nanjun Chen, Qin Pang, Peter V. Sushko* and Kelsey A. Stoerzinger*



31781

Synthesis of carbon quantum dots decorated titanium disilicide: a novel hybrid solar-driven photocatalyst for sustainable wastewater treatment

Sarfaraz Mahmood, Arisha Bi, Sneha Shukla, Samina Husain, Jai Prakash* and Saif Ali Chaudhry*