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Journal of Materials Chemistry A

Materials for energy and sustainability

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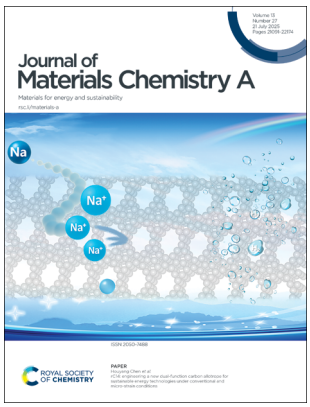
IN THIS ISSUE

ISSN 2050-7488 CODEN JMCAET 13(27) 21091–22174 (2025)



Cover
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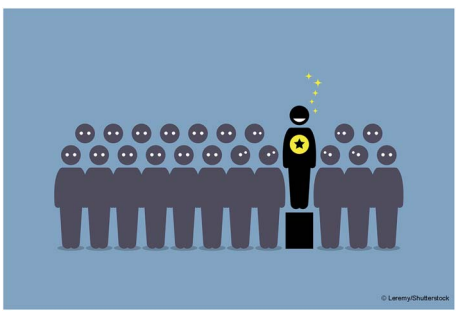
Inside cover
See Jin Kon Kim, Jeong Woo Han *et al.*, pp. 21462–21471. Image reproduced by permission of Jin Kon Kim, Jeong Woo Han from *J. Mater. Chem. A*, 2025, **13**, 21462.

EDITORIAL

21114

Outstanding Reviewers for *Journal of Materials Chemistry A* in 2024

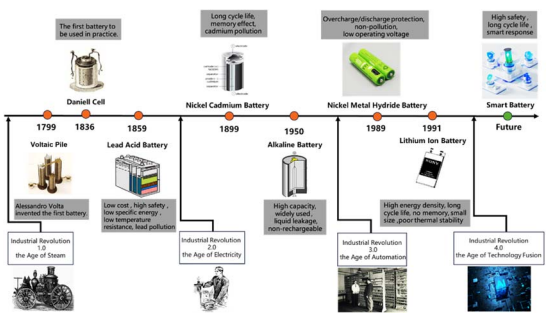


REVIEWS

21116

Recent status, key strategies and challenging perspectives of smart batteries for next-generation batteries

Lei Wang, Zhipeng Su, Rui Wang, Han Liang, Biao Fang and Runwei Mo*



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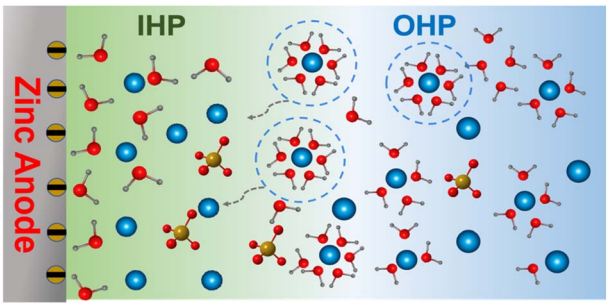
REVIEWS

21172

Helmholtz plane engineering for stable zinc anodes: from interfacial dynamics to long-cycle battery design

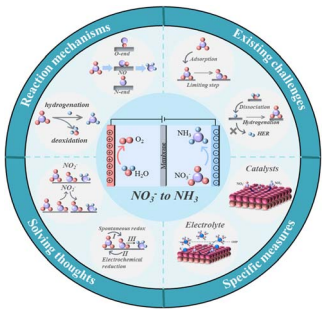
Junjie He, Pan Xu, Yifan Li, Jingjing Yuan,* Xu Liu, Xiao Qu,* Hui Xu, Guangyu He and Haiqun Chen*



21181

Recent advances in electrocatalytic reduction of nitrate to ammonia: current challenges, resolving strategies, and future perspectives

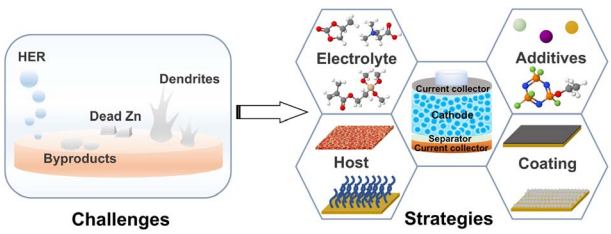
Yu Pan, Hui-Min Xu, Hong-Rui Zhu, Chen-Jin Huang, Zhi-Jie Zhang and Gao-Ren Li*



21233

Recent advances in material regulation and structure design for high-performance aqueous anode-free zinc batteries

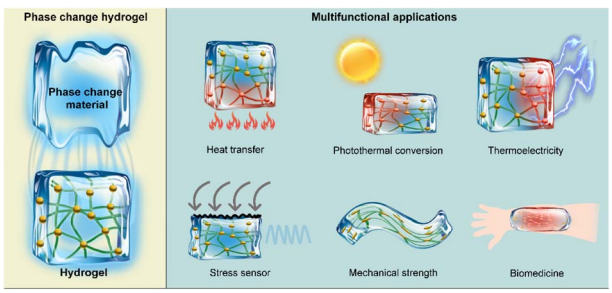
Xiaowei Yan, Wenzhan Zhang, Yaoxin Zhang and Ting Xiong*



21245

Solid–liquid phase change materials meet hydrogels: syntheses and multifunctional applications

Hongyang Li,* Mingrui Sun, Zhan Liu, Changda Nie, Chengzhi Hu, Dawei Tang and Zhonghao Rao*



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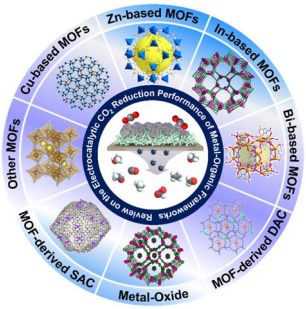
REVIEWS

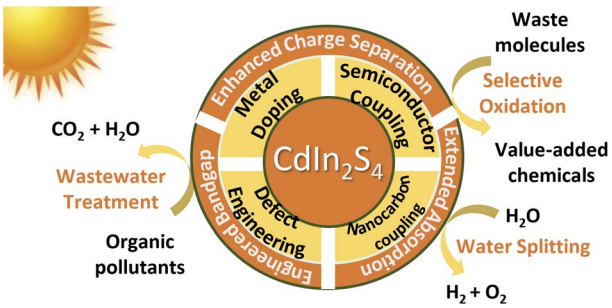
21268



Recent progress in metal–organic framework-based materials for electrocatalytic carbon dioxide reduction

Jiazheng Tian, Yichen Sun, Yashi Wu, Fen Wang, Yuchen Zhang, Dong Fu, Zhongshan Chen and Xiangxue Wang*

21292



Recent advances and future directions of $CdIn_2S_4$-based photocatalysts: properties, synthesis, and modifications for energy and environmental applications

Mahmoud Adel Hamza, Gregory F. Metha and Cameron J. Shearer*

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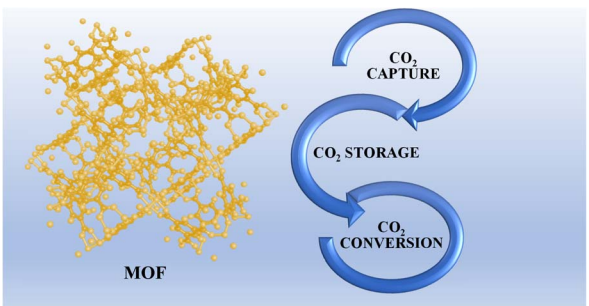

A critical review on recent advancements in metal–organic frameworks for CO_2 capture, storage and utilization

Swati Kumari, Mahek Gusain, Bhawna Yadav Lamba and Sanjeev Kumar*

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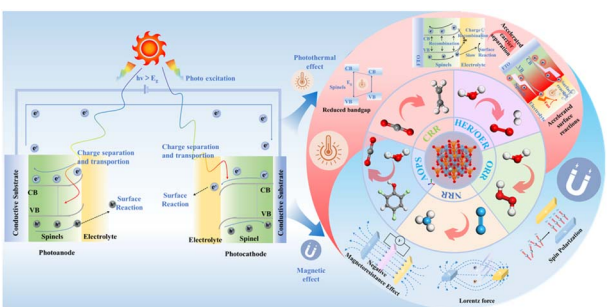

Spinel-structured photoelectrodes for photoelectrochemical energy and environmental applications: synergistic photothermal–magnetic effects

Wenfeng Li, Guocheng Lv,* Meng Liu, Fanyue Zhao, Zetian He, Guihong Li, Wenping Wang, Daimei Chen* and Libing Liao

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PERSPECTIVES

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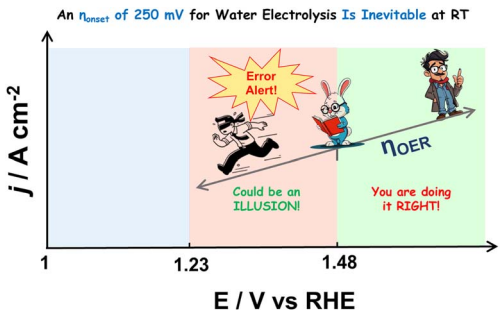
On the use of bioprecursors for sustainable silicon-based anodes for Li-ion batteries

M. Valeria Blanco* and M. Rosa Palacin

21436

How common is it to get an OER overpotential that is <250 mV?

Pracheta Trivedi, Neha Clare Minj, Sneha Mittal, Balakumaran Kamaraj, Sandeep Yadav and Anantharaj Sengeni*



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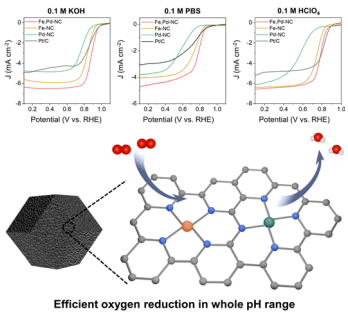
rC14: engineering a new dual-function carbon allotrope for sustainable energy technologies under conventional and micro-strain conditions

Yaru Wei, Baocheng Yang, Shouren Zhang and Houyang Chen*

21462

Synergistic Fe,Pd diatomic sites anchored on porous nitrogen-doped carbon for efficient oxygen reduction in the entire pH range

Yejung Choi, Byoung Joon Park, Yechan Lee, Kug-Seung Lee,* Jin Kon Kim* and Jeong Woo Han*



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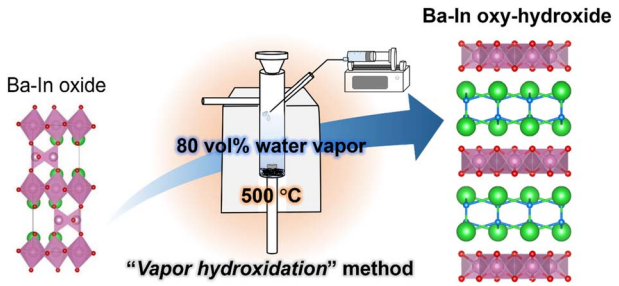
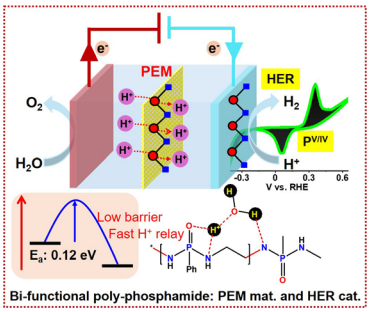


Thermally stable proton-conducting oxy-hydroxides synthesized in concentrated water vapor

Kenji Arai, Yoko Kokubo, Yusuke Asai, Satoshi Ogawa, Miwa Saito,* Maria Kirsanova, Iaroslava Shakhova, Artem Abakumov, Fumitaka Takeiri, Hiroshi Kageyama and Teruki Motohashi*

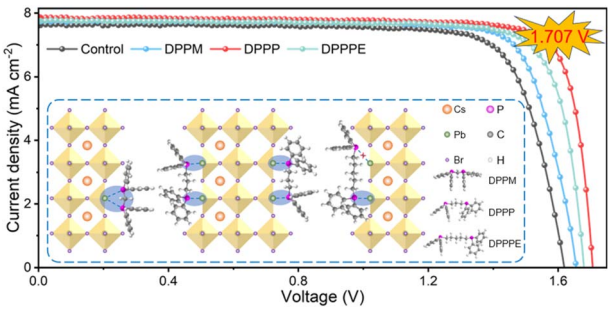
21480



Intrinsic proton relay in poly-phosphamides to bolster proton exchange membrane fabrication and electrocatalytic proton reduction

Anup Mahata, Laxmikanta Mallick, Isha Mehta, Nidhi Kumari, Sagarika Bhattacharya* and Biswarup Chakraborty*

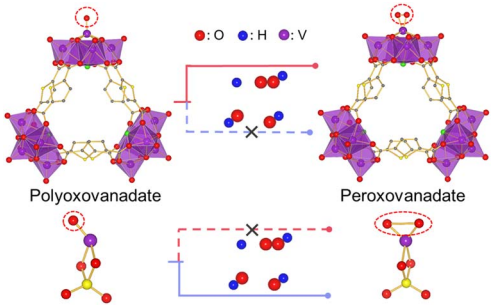
21493



Dual-site synergistic passivation for $CsPbBr_3$ perovskite solar cells with record 1.707 V V_{oc} and 11.23% efficiency

Yinping Teng, Yuanyuan Zhao,* Zhe Xin, Liqiang Bian, Qiyao Guo, Jialong Duan, Jie Dou, Yan Zhang, Qiang Zhang and Qunwei Tang*

21501



A theoretical study on the formation mechanism of peroxovanadate and the origin of its high activity for oxidation of sulfide

Wei-Xuan Shu, Lin-Yan Bao, Li-Li Wang, Xiao-Xia You, Xin Ma, Ya Wang,* Zhong-Min Su* and Rong-Lin Zhong*

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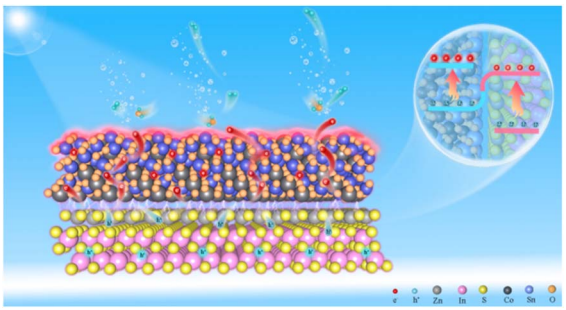
PAPERS

21513

A triple-functional Co_2SnO_4-enabled S-scheme heterojunction with photothermal promotion for efficient solar-driven hydrogen evolution

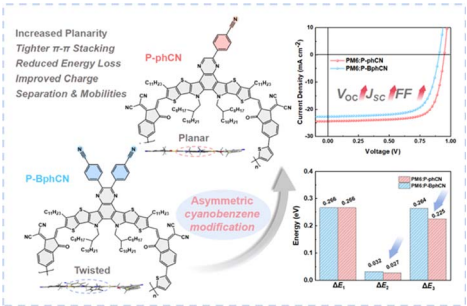
Kai Li, Zhaochao Yan, Shuhan Sun, Qianmin Fan, Huayue Zhu, Chenglin Wu,* Yanxian Jin, Sónia A. C. Carabineiro,* Ruiqiang Yan, Bingjing He and Xianqiang Xiong*



21526

Cyanobenzene-modified polymer acceptors for high-efficiency all-polymer solar cells with low energy loss

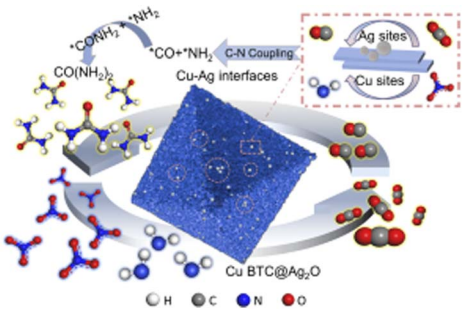
Xinya Ran, Dingding Qiu, Jianqi Zhang, Jing Li, Zhixiang Wei* and Kun Lu*



21535

Ag_2O-loaded Cu based metal–organic framework material as pre-electrocatalyst for efficient urea synthesis

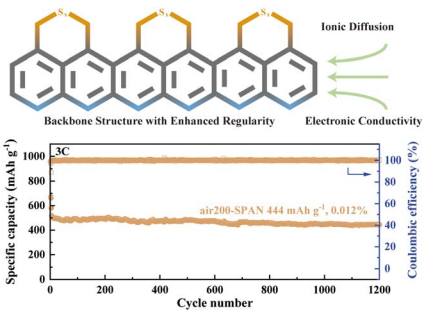
Xinyao Quan, Yulong Zhou, Ruiling Du,* Lian Duan, Gen Chen and Ning Zhang*



21545

Enhancing the backbone regularity of sulfurized polyacrylonitrile for long-life Li-SPAN batteries

Jiayu Wang, Zhen Du, Guijie Lv, Xiangyang Zhao, Chengming Li,* Xiaonong Chen* and Yaqin Huang*



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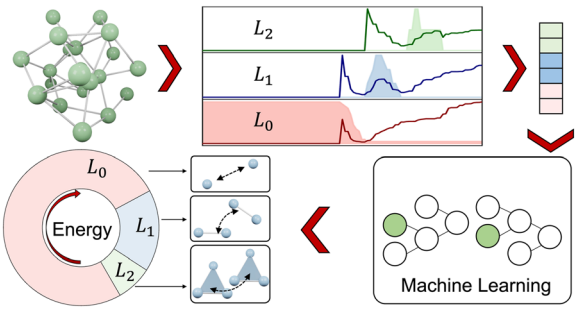
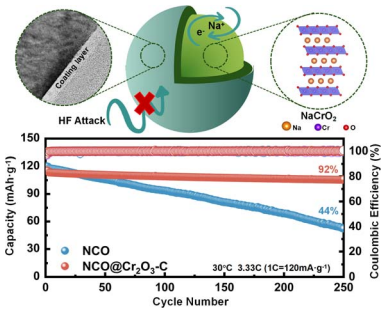


Enhancing energy predictions in multi-atom systems with multiscale topological learning

Dong Chen, Rui Wang, Guo-Wei Wei* and Feng Pan*

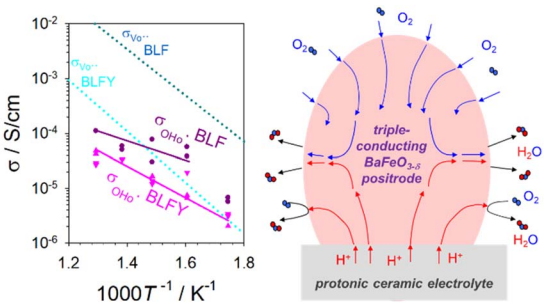
21564



A MOF-modified $NaCrO_2$ cathode for high-rate and wide-temperature applications in sodium-ion batteries

Yuxi Luo, Guojie Chen, Zhewen Ma,* Xiaoyu Gao, Wenguang Zhao, Wenxin Tong, Yuguang Pu, Pinyu Niu, Wenqing Yao, Hui Fang, Maolin Yang, Lei Cao, Wen Yin, Tingting Yang, Mihai Chu, Götz Schuck, Wenhai Ji,* Rui Wang* and Yinguo Xiao*

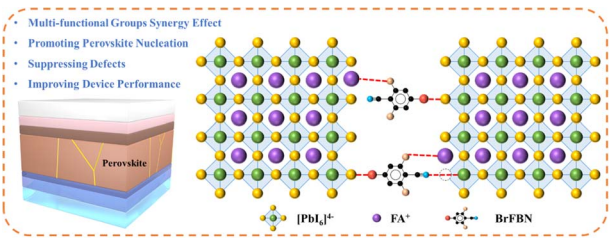
21575



Ion transport in dry and hydrated $Ba_{0.95}La_{0.05}(Fe_{1-x}Y_x)O_{3-\delta}$ and implications for oxygen electrode kinetics of protonic ceramic cells

Christian Berger, Tolga Acartürk, Ulrich Starke, Joachim Maier and Rotraut Merkle*

21589



Mitigating trap states in halide perovskite solar cells through the synergy of coordination, hydrogen and halogen types of bonding

Yuling Zhuo, Tongjun Zheng, Shuguang Cao, Shizi Luo, Zhuoneng Bi,* Yupeng Zheng, Biniyam Zemene Taye, Xiaoli Chen, Lavrenty G. Gutsev,* Victoria V. Ozerova, Nikita A. Emelianov, Sergey G. Vasil'ev, Alexander F. Shestakov, Hao Li, Chao Wang, Yanping Mo,* Gennady L. Gutsev, Balu R. Ramachandran, Ning Li, Eric N. Maluta, Sergey M. Aldoshin, Pavel A. Troshin* and Xueqing Xu*

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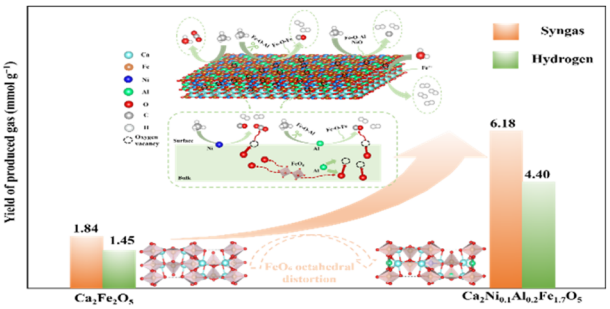
PAPERS

21601

Ni/Al co-doping induces FeO_6 octahedral distortion to activate lattice oxygen in $Ca_2Fe_2O_5$ for enhanced chemical looping hydrogen generation

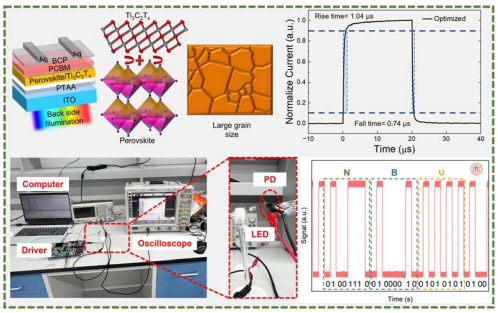
Yile Zou, Hui Liu,* Ruizhi Li, Jing Liu, Chenyao Wu, Zhao Sun* and Yaning Zhang*



21615

Realising ultrafast perovskite photodetectors *via* 2D synergy for optical communication and sensitive light detection

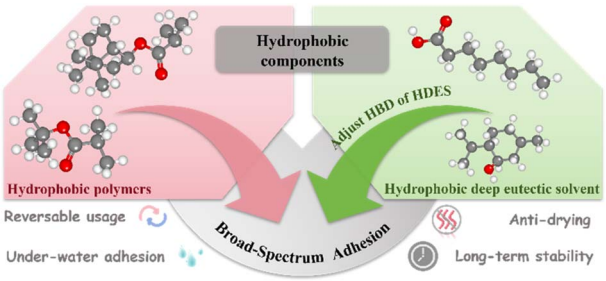
Shareen Shafique, Haodong Wang, Yuheng Wang, Akeel Qadir, Taimoor Iqbal, Cheng Yang, Feiyu Zhao, Zhenfu Zhao, Muhammad Salman, Fei Zheng, Xu Wang and Ziyang Hu*



21629

Hydrophobic deep eutectic solvent-based hydrophobic polymer adhesive with on-demand detachability and strong broad-spectrum adhesion in air/aquatic environments

Haoran Wu, Ning Gao, Jiaxin Song, Xuelei Pang,* Yajuan Li, Zhice Xu and Xudong Yu*



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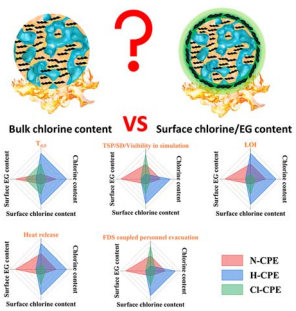
Fire hazard mitigation in bi-continuous phase polymer composites: surface *vs.* bulk and experimental *vs.* computational

Han Zhang, Tingting Chen, Ruiqi Zhang, Shenyu Zhang, Jun Zhang,* Zhen Zhang* and Noureddine Abidi



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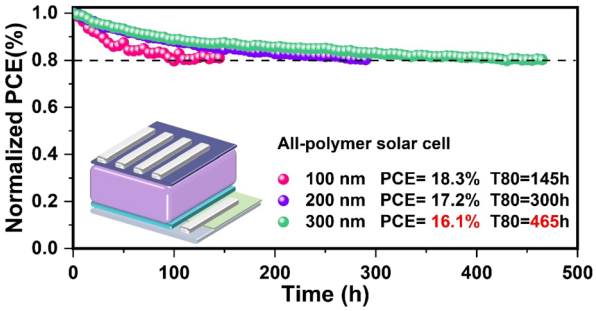

Thick-film all-polymer organic solar cells: non-halogen solvent processing for efficient and stable photovoltaics

Jianan Zheng, Chuanlin Gao, Yitian An, Kangbo Sun, Yajie Wang, Liangxiang Zhu, Guoping Zhang, Chen Xie, Qing Bai, Peng You, Tong Shan, Lu Chen, Mingxia Qiu, Yufei Wang,* Zhenghui Luo,* Shunpu Li* and Guangye Zhang*

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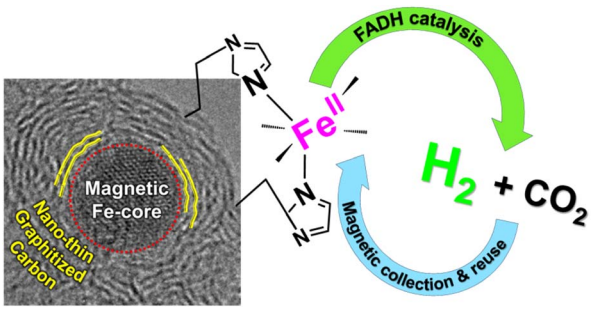

{Fe^{2+}–imidazole} catalyst grafted on magnetic {Fe@Graphitized C} nanoparticles: a robust hybrid–catalyst for H_2 production from HCOOH

Christos Gkatziouras, Christos Dimitriou, Szymon Smykała, Yiannis Deligiannakis* and Maria Louloudi*

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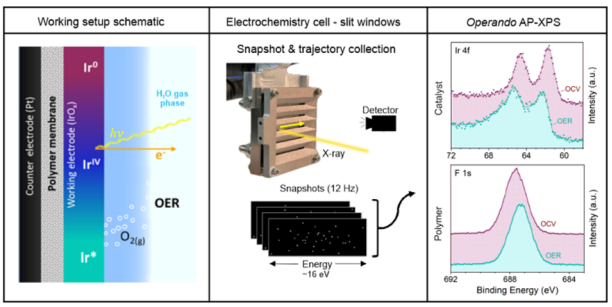

Challenges and strategies for probing the composite interface of PEM electrolyzers and fuel cells using *operando* AP-XPS

Rebecca Hamlyn, Johannes Mahl, Xueqiang Zhang, Damon English, Terry McAfee and Ethan J. Crumlin*

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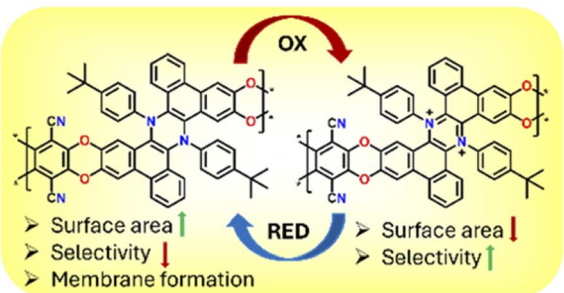

π-Extended dihydrophenazine based redox responsive polymers of intrinsic microporosity

Grazia C. Bezzu, Beatrice Bartolomei, Yue Wu, Martina Vaccaro, Mariagiulia Longo, Maria Penelope De Santo, Alessio Fuoco,* Maurizio Prato,* Mariolino Carta* and Jacopo Dosso*

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PAPERS

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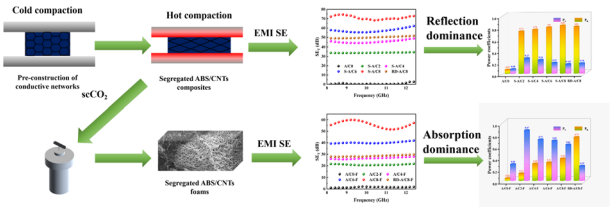
Facile and green fabrication of segregated ABS/CNT foams with superior electrical conductivity and ultrahigh EMI shielding performance

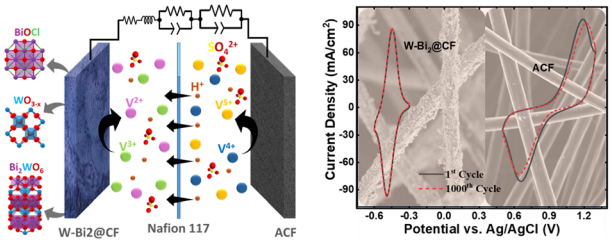
Hui Ma, Xin He, Yu Xue, Bianying Wen, Xiangdong Wang and Hongfu Zhou*



21707

Carbon felt coated with tungsten–bismuth-based oxides as highly active and selective negative electrodes for high power density all-vanadium redox flow batteries

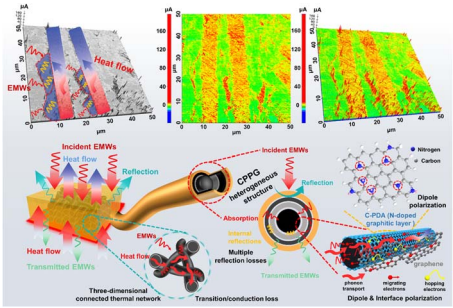
Mostafa M. Omran, Taher Al Najjar, Nageh K. Allam* and Ehab N. El Sawy*



21725

A graphene/C-PDA/carbon fiber ternary heterostructure network enables lightweight polyimide composites with enhanced electromagnetic shielding and thermal management capabilities

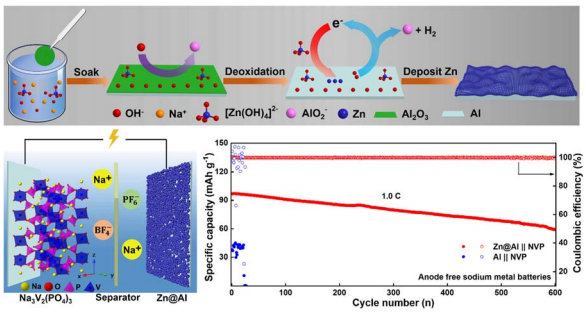
Xiong Li, Wenjing Cao, Xiaohui Yang, Menghuan Wang, Yiyuan Chen, Tongle Xu, Yu Zhang, Na Song, Sheng Sun and Peng Ding*



21738

A micro Zn-modified Al current collector inducing uniform sodium nucleation for anode-free sodium batteries

Xiaoyi Huangyang, Jingan Zhou, Xiongwei Gong, Yilong Hu, Yi Shuai,* Jinqi Huang, Lan Geng and Ming Li*



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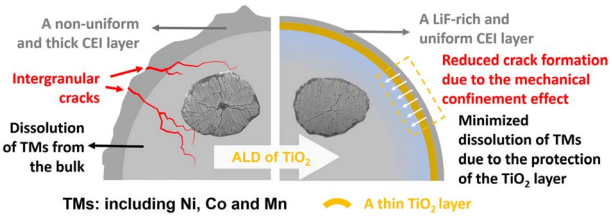
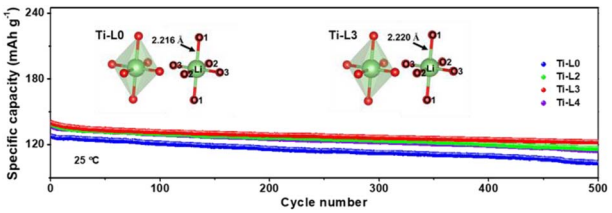
21748



Atomic layer deposition of a thin TiO_2 layer on nickel-rich cathode NCM83 for improved cycling stability

Can Liu, Danyang Li, Shu Zhao, Hao Li, Fujie Li, Guangrong Zeng, Hai Chao Chen, Chao Wang* and Xiu Song Zhao*

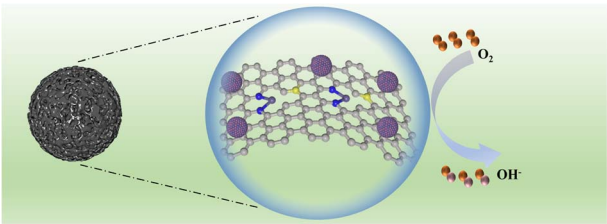
21760



Modulating the discharge capacity and cycling performance of the $LiMn_{0.6}Fe_{0.4}PO_4$ cathode for lithium-ion batteries *via* titanium introduction

Jing Han,* Weiling Jiang, Qihang Wang, Huichao Lu, Weiqin Wang and Shiqiang Luo*

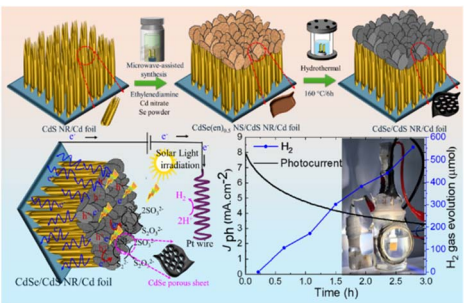
21772



Decorating unsaturated iron–nitrogen coordination sites with small-sized iron selenide nanoparticles for highly efficient oxygen reduction catalysis

Weicheng Zhang, Xinzhu Li, Shunhua Guo, Zixiang Wan, Le Huang, Zhicong Shi and Naiguang Wang*

21782



Fabrication of CdSe nanosheet/CdS nanorod heterojunctions through topotactic transformation of self-template photoanode for enhanced photoelectrochemical hydrogen production

Ruturaj P. Patil, Weon-Sik Chae, Hyun Gyu Kim* and Jum Suk Jang*

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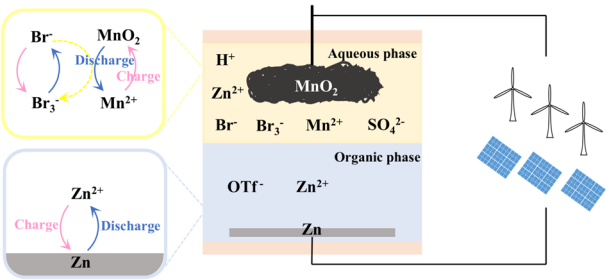
21790

Acidic–neutral decoupled biphasic electrolytes enhance deposition–dissolution chemistry in Zn–Mn batteries

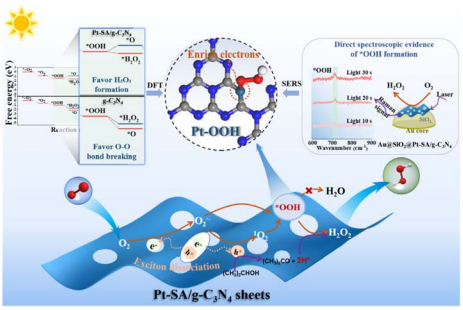
Yidan Cui, Qingyun Dou,* Jiewen Yang, Jingke Yang, Xiaoxi Zhao, Guosheng Li, Pengwei Jing, Qingyue Yin, Caihong Tao* and Xingbin Yan



21797

Enhanced photocatalytic H_2O_2 yield by single-atom Pt decorated carbon nitride sheets *via* boosting *OOH intermediate generation

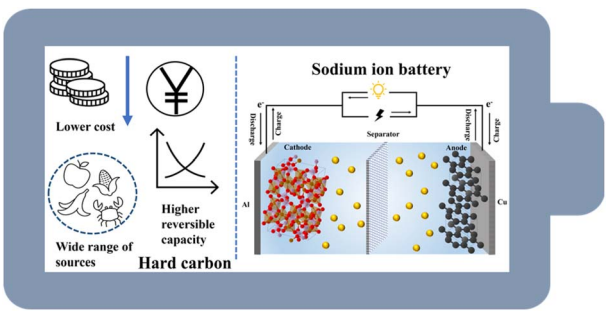
Jinghua An, Zhaohui Wang, Guanyun Liu, Lu Li* and Bo Tang



21808

N/P co-doping regulates the local microcrystalline structure of hard carbon to facilitate sodium-ion storage

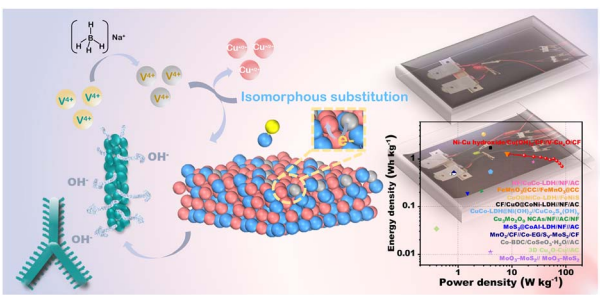
Yujie Guo, Ke Liu, Xue Li, Xiaoyuan Zeng,* Shun Ji, Yanjia Zhang, Peng Dong,* Ziyi Zhu* and Yingjie Zhang



21819

A vanadium-doped Cu_xO nanorod array with modulated electronic structure for enhanced aqueous energy storage

Jiaxin Luo, Yang Qin, Meina Tan, Shengtong Lv, Fazhi Zhang, Xuhui Zhao, Yiping Wang,* Gareth R. Williams and Xiaodong Lei*



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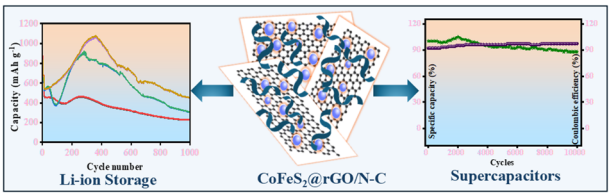
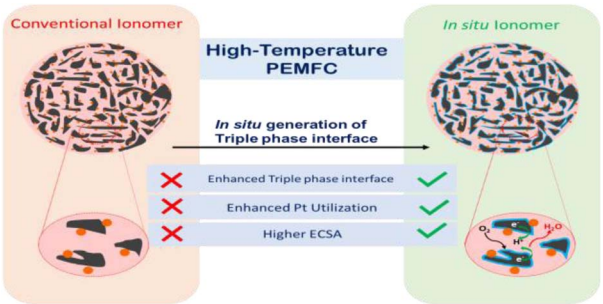
21830



Fabrication of N-doped carbon coated $CoFeS_2$ anchored rGO nanosheet composites: a twin carbon design for Li-ion storage and high energy density supercapacitor applications

Johnbosco Yesuraj, Perumal Naveenkumar, Munisamy Maniyazagan, Hyeon-Woo Yang, Sun-Jae Kim* and Kibum Kim*

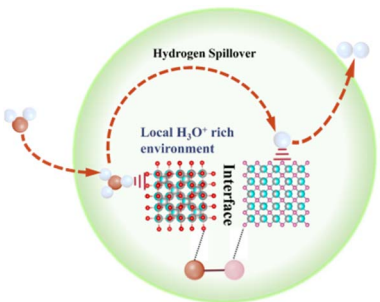
21847



***In situ* engineered triple phase boundary enhancement in 3D structured carbon supported catalyst for high-temperature PEMFC**

Ajmal Pandikassala, Swapnil D. Jadhav, Maria Kurian and Sreekumar Kurungot*

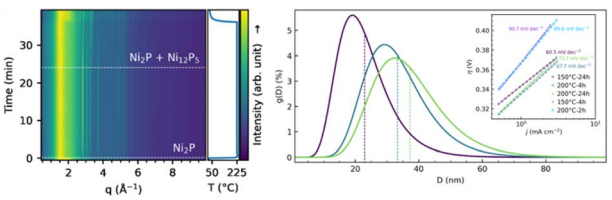
21864



Covalent sulfur–oxygen linkages enhanced the localized acidic environment coupled with the hydrogen spillover effect for boosting hydrogen evolution reaction kinetics

Xiao Zhang, Guimeng Peng, Xuewen Deng, Yaoyao Wang, Sunpeng Shan, Yuhong Bian, Zhiwei Shu, Jianrong Chen,* Jian Yang* and Yang Jiao*

21876



***In situ* X-ray diffraction guided synthesis of Ni_2P nanoparticles for the oxygen evolution reaction**

Anders Bæk Borup, Nhu-Quynh Thi Phan, Magnus Kløve, Andreas Dueholm Bertelsen, Lise Joost Støckler and Bo Brummerstedt Iversen*

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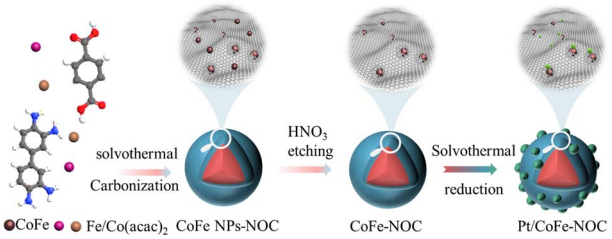
21888

High-performance of ultra-low Pt-loaded PEMFCs: carbon-encapsulated CoFe alloy supported Pt nanoparticles as high-efficiency electrocatalysts

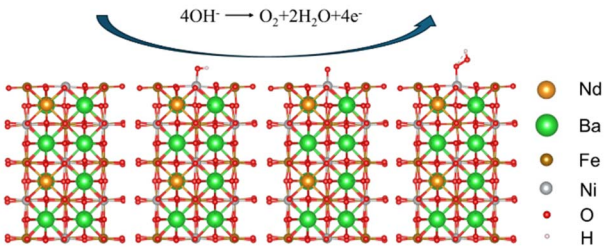
Jingjing Zhang, Kechuang Wan, Xue Xu, Qiong Xue, Zhijia Jin, Zenghai Shan, Pingwen Ming, Jia Wang,* Bing Li* and Cunman Zhang*



21898

Achieving high-performance OER catalysis with dual-site modulated Fe-based perovskites

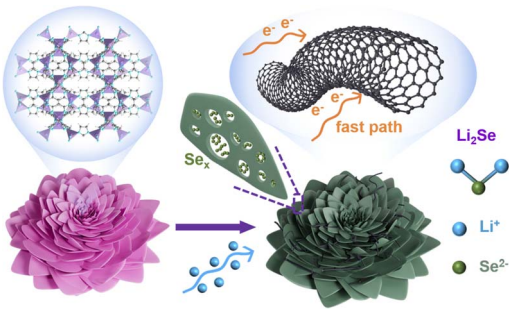
Yixin Bi, Yuhao Wang, Yufei Song, Qing Chen* and Francesco Ciucci*



21908

A ZIF-L derived carbon flower with *in situ* grown CNTs accelerates the reaction kinetics of Li–Se batteries

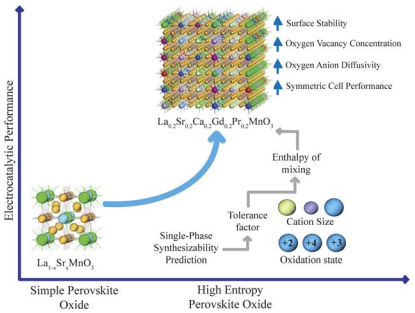
Jiale He, Liang Wu, Qianyu Gao, Meitong Wei, Yixun Liu, Zhi-Yi Hu, Jing Liu, Yu Li* and Bao-Lian Su*



21916

***In silico* design and experimental validation of a high-entropy perovskite oxide for SOFC cathodes**

Jyotsana Kala, Vicky Dhongde, Subhrajyoti Ghosh, Madhulika Gupta,* Suddhasatwa Basu, Brajesh Kumar Mani* and M. Ali Haider*



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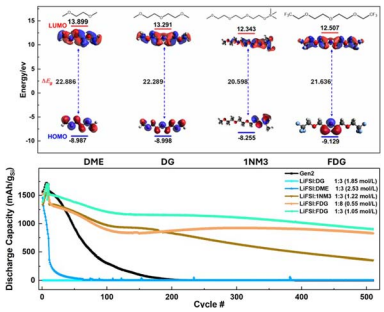
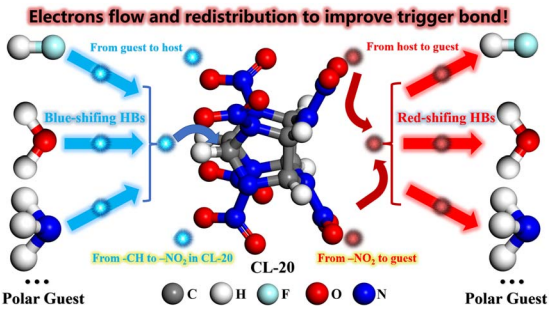
21929



Molecular engineering of ethereal electrolyte for ultrastable Si-based high voltage full cells

Xianyang Wu, Chi-Cheung Su, Xinlin Li, Jiayi Xu, Khalil Amine, Dezhen Wu, Tianyi Li, Zhenzhen Yang* and Brian J. Ingram

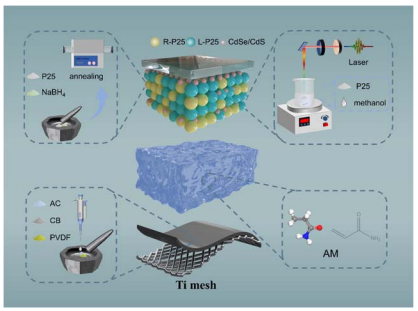
21942



Synergistic effects of red- and blue-shifting hydrogen bonds in CL-20 host–guest systems: counteracting hyperconjugation to enhance stability

Zihuan Peng, Xiuyuan Li, Chongwen Jiang, Zhihong Huang and Nan Li*

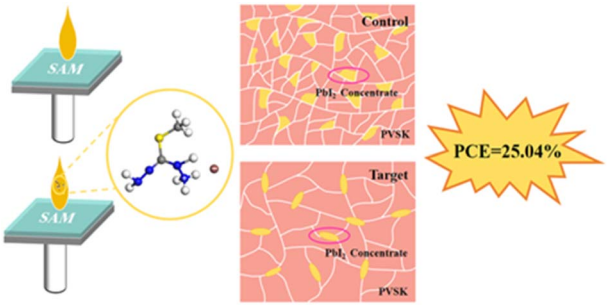
21952



High-efficiency solid-state quantum dot sensitized solar cells based on black TiO_2 and an activated carbon electrode

Yin Peng, Rui Zhou, Liying Wang, Yang Gao, Xuesong Li, Xijia Yang* and Wei Lü*

21963



Modulation of crystallization dynamics *via* multifunctional additive engineering to achieve high-performance perovskite solar cells

Ling Han, Hongbing Ran, Yujun Liu, Xinbo Ai, Chao Zhou, Fei Wang, Xianfang Zhou, Junsheng Wu, Yonglei Han, Qi Cao, Yuxuan Feng, Hai-lun Xia, Kang Zhou, Jingbai Li, Hanlin Hu,* Wang-Ting Lu,* Shiyu Wang* and Haoran Lin*

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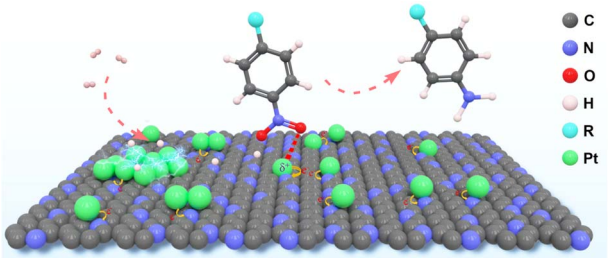
PAPERS

21971

Synergistic effect of Pt single atoms, clusters and nanoparticles on carbon doping with nitrogen for highly efficient and selective hydrogenation of nitroaromatics

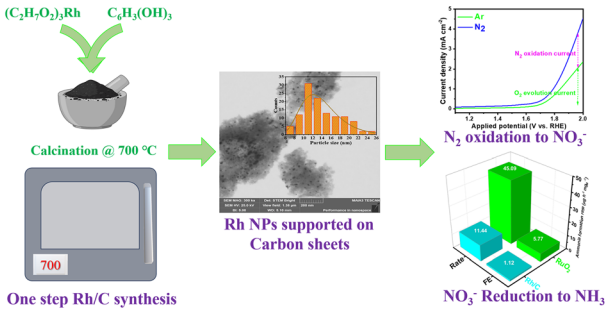
Yu Fang, Qingqing Liu, Min Tian, Luna Ruan, Kai Chen, Huan Zhang, Zhiqing Yang,* Hengqiang Ye and Lihua Zhu*



21979

A sustainable two-step electrochemical conversion of N_2 to ammonia using rhodium nanoparticles on carbon nanosheets

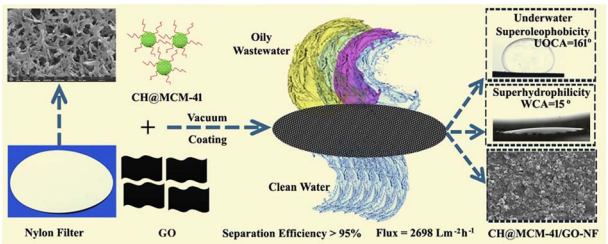
James Ebenezer, Parthiban Velayudham and Alex Schechter*



21993

Facile modification of nylon filter *via* vacuum coating with chitosan@MCM-41/GO for efficient oily wastewater treatment

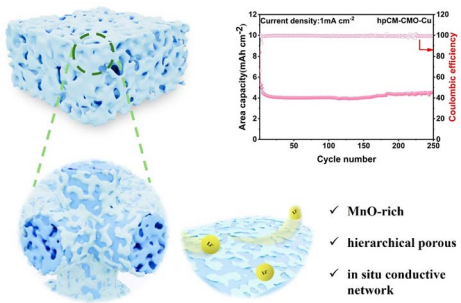
Naseer Ahmad, Tooba Ali, Muhammad Ikram Nabeel, Khalid Ahmed,* Hani Baggash, Muhammad Hasnain and Dilshad Hussain*



22009

Synergistic optimization of composition–structure–conductive network for high-performance integrated transition metal oxide anodes for lithium-ion batteries

Qiang Ma, Junwei Sha, Biao Chen, Enzuo Liu, Chunsheng Shi, Liying Ma, Fang He, Chunnian He, Naiqin Zhao and Jianli Kang*



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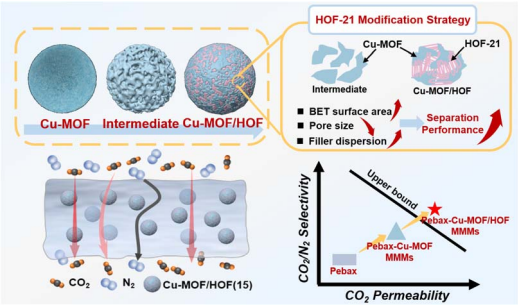
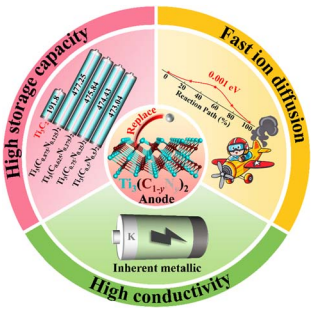
22020



Pebax mixed matrix membranes based on novel HOF/MOF nanofiller with simultaneous improvement in CO_2 permeability and CO_2/N_2 selectivity

Zikang Qin, Jing Wei, Wen Hou, Zhuo Chen, Min Deng, Lu Yao, Dengrong Sun, Lin Yang, Wenju Jiang, Junfeng Zheng, Yutian Li, Qiang Jing* and Zhongde Dai*

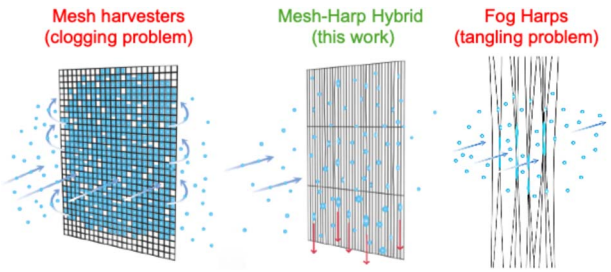
22031



Optimizing the energy storage performance of titanium carbonitride MXenes for potassium-ion batteries by modulating nitrogen content

Jingguo Wang, Wenyuan Zhang, Yanling Si* and Guochun Yang*

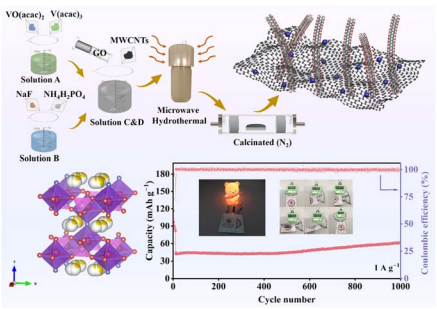
22039



Anti-clogging and anti-tangling fog harvesting with 3D-printed mesh-harp hybrids

Jimmy K. Kaindu, Lilly E. Olejnicki, Brook S. Kennedy and Jonathan B. Boreyko*

22047



Robust cross-linked $Na_3V_2O_{1.6}(PO_4)_2F_{1.4}$@rGO&MWCNTs as a high-performance cathode for aqueous zinc-ion batteries

Rui Jiang, Jiarui Lin, Xiaoyan Shi, Botao Zheng, Qiaofeng Huang, Junling Xu, Lianyi Shao,* Zhipeng Sun,* Qingqing Zhang* and Lifeng Hang*

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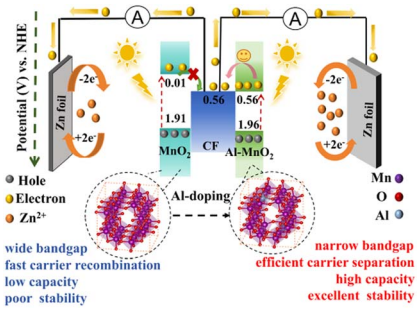
22057

An optimized MnO_2 photocathode by doping engineering for high capacity and stability photo-assisted zinc-ion batteries

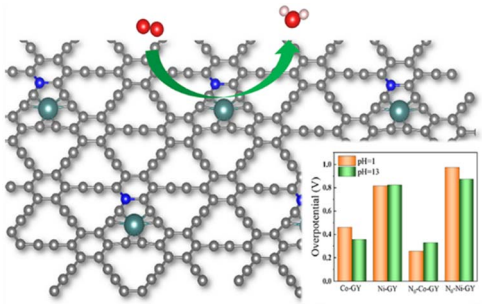
Dongyue Tian, Xinyu Gao, Jiayu Wang, Ruyu Sun, Jiaming Liu, Jingjing Cao* and Wei Feng*



22066

Graphyne-based single atom catalysts for the oxygen reduction reaction: a constant-potential first-principles study

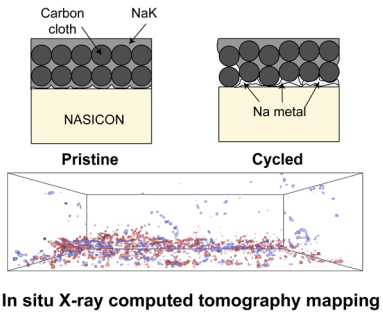
Mengmeng Shao and Yangfan Shao*



22074

Phase separation dynamics in sodium solid-state batteries with Na–K liquid anodes

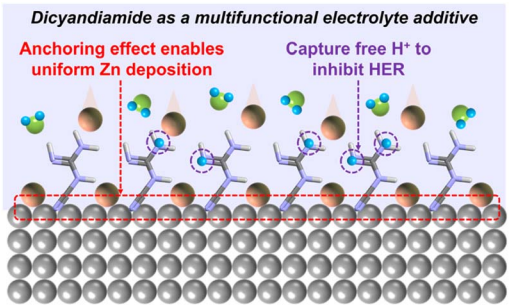
Daren Wu, Zhuo Li, Michael Drakopoulos, Nghia T. Vo, Zhong Zhong and Kelsey B. Hatzell*



22086

Molecular anchoring-induced proton adsorption effect achieves stable zinc metal anodes

Dajin Liu,* Bangdi Lv, Zihao Liu, Lu Cheng, Yu Deng, Xinchun Song and Zhipeng Jiang*



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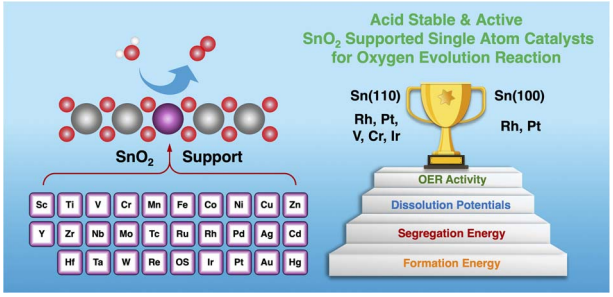
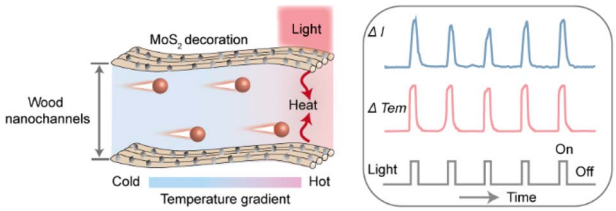
22093



Analysis of tin oxide supported transition metal single-atom catalysts for oxygen evolution reaction

S. A. Keishana Navodye and G. T. Kasun Kalhara Gunasooriya*

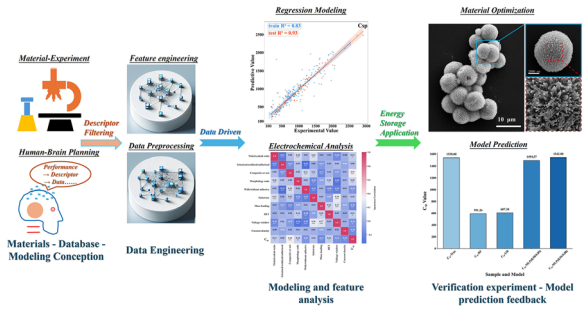
22109



Highly sensitive ion regulation enabled by photothermal wood nanochannels

Suling Liu, Jianfu Tang, Xueqi Li, Quankuo Zhang, Xiaofei Dong, Yingying Liu, Xinyuan Zhang, Ran Yin, Yanjun Xie and Wentao Gan*

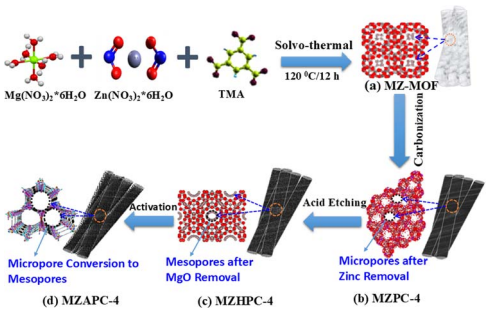
22120



Data-driven design and experimental validation of high-precision Ni–Co bimetallic compound-based pseudocapacitor models

Li Zhang,* Zhuo Zhao, Tianhui Dang, Xiao Yang, Yongzhi Lan and Rui Cao

22142



Precisely controlling the nanostructure of bimetallic Mg/Zn MOFs to construct a high-performance material for supercapacitors and sodium-ion batteries

Uzair Ahmed Kolachi, Nadeem Hussain Solangi, Yanzhi Sun,* Rajapriya Andavar, Iza Shahid, Jianjun Zhao and Junqing Pan*

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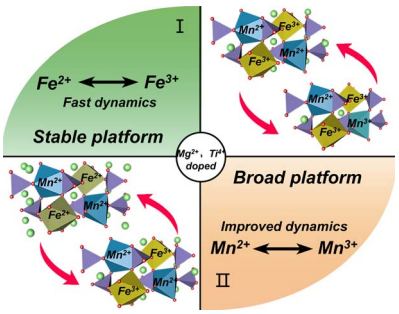
22155

Broadening the Mn^{2+}/Mn^{3+} redox plateau in $LiMn_{0.6}Fe_{0.4}PO_4$ cathodes for high-power and long-life Li-ion batteries

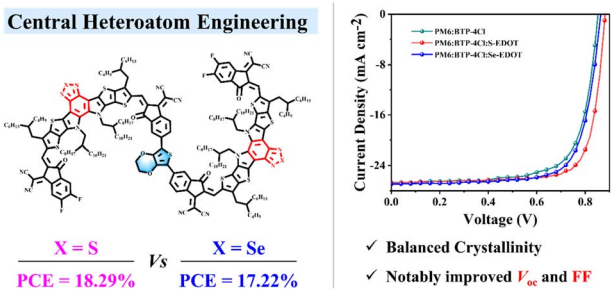
Pengxu Wang, Yaoguo Fang, Erdong Zhang, Ling Chen, Haifeng Yu,* Qian Cheng* and Hao Jiang*



22163

Regulating the crystallinity of dimeric acceptors *via* central core engineering for efficient ternary organic solar cells

Bigui Zhou, Binhang Shao, Bin Fan, Weikun Chen, Qinhao Shi, Yijie Nai, Hui Yang, Jun Yuan and Yingping Zou*



CORRECTION

22171

Correction: Unlocking the potential of selenium solar cells for indoor and tandem photovoltaics through theoretical and photoelectric simulations

Haoyun Dou, Tingfeng Wang and Hong-En Wang*