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Journal of Materials Chemistry A

Materials for energy and sustainability

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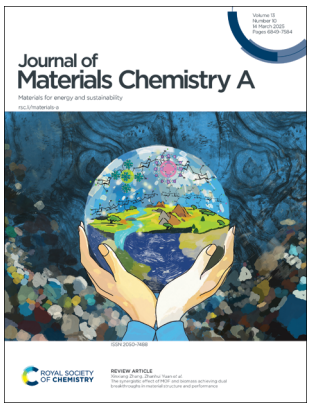
IN THIS ISSUE

ISSN 2050-7488 CODEN JMCAET 13(10) 6849–7584 (2025)



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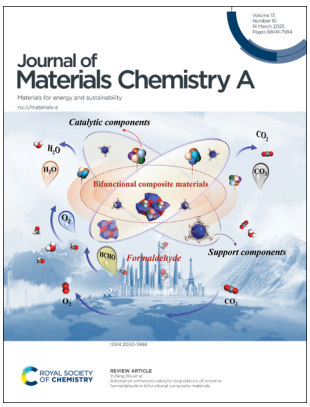
See Xinxiang Zhang, Zhanhui Yuan *et al.*, pp. 6866–6894. Image reproduced by permission of Xian Wang and Ran Li from *J. Mater. Chem. A*, 2025, **13**, 6866.



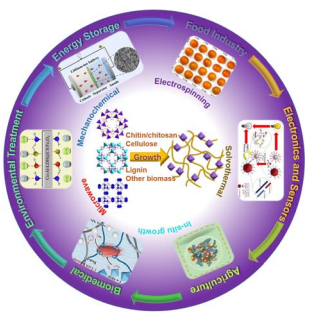
Inside cover
See Yufeng Wu *et al.*, pp. 6895–6918. Image reproduced by permission of Xiao-Min Liu from *J. Mater. Chem. A*, 2025, **13**, 6895.

REVIEWS

6866

The synergistic effect of MOF and biomass achieving dual breakthroughs in material structure and performance

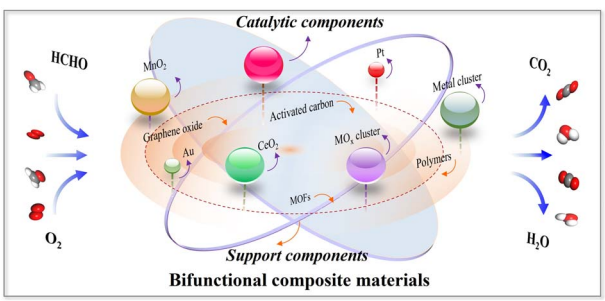
Ran Li, Xian Wang, Chengwei Lin, Xinxiang Zhang* and Zhanhui Yuan*



6895

Adsorption enhanced catalytic degradation of airborne formaldehyde in bifunctional composite materials

Xiaomin Liu, Wenjing Miao, Linhua Xie, Bin Li and Yufeng Wu*



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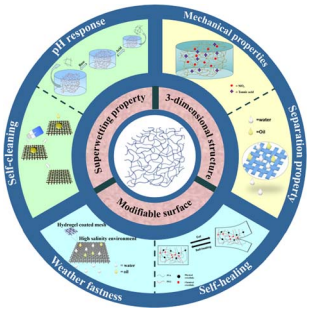
REVIEWS

6919

Hydrogels: a review on their versatile applications for efficient and stable oil–water separation

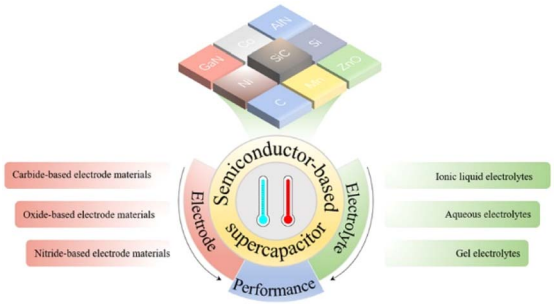
Yuxuan He, Jinxia Huang,* Zhiguang Guo* and Weimin Liu



6954

Novel semiconductor materials for advanced wide temperature range supercapacitors

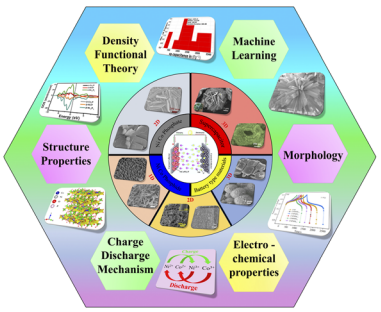
Lin Xu, Defu Sun, Songyang Lv, Ge Tian,* Guodong Wang, Benfa Wang, Lei Zhang* and Shouzhi Wang*



6993

Nickel cobalt phosphate/phosphide as a promising electrode material for extrinsic supercapacitors: machine learning analysis

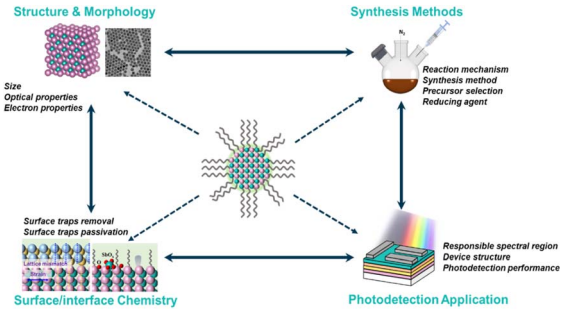
C. D. Chavare, D. S. Sawant, S. V. Gaikwad, A. V. Fulari, H. R. Kulkarni, D. P. Dubal* and G. M. Lohar*



7055

Advances in defect modulation strategies of indium antimonide semiconductor colloidal quantum dots for infrared photodetection

Yixiao Huang, Qinggang Hou, Jiahua Kong, Keke Wang, Linjun Huang, Zhonglin Du* and Jianguo Tang*



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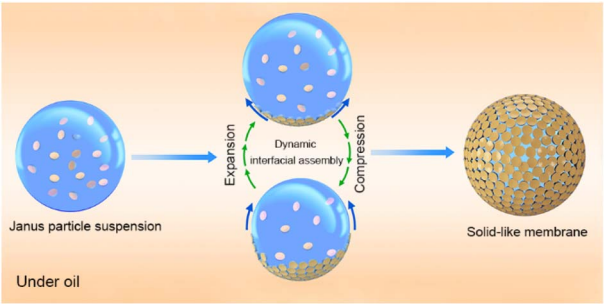
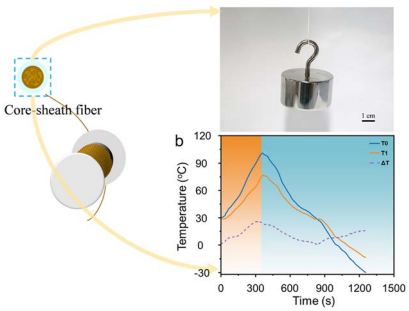
7073



Structured droplets dominated by interfacial self-assembly of topology-tunable Janus particles towards macroscopic materials

Wenzhong Zhai, Xubo Liu, Jiajia Zhou, Qi Yu, Miao Liu, Jingxin Meng, Lu Zhang, Jun-Bing Fan* and Shutao Wang*

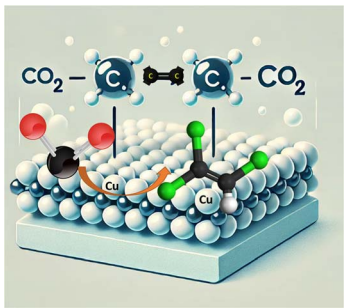
7081



Fabrication of graphene oxide/silk protein core-sheath aerogel fibers for thermal management

Wenjing Xu, Chencheng Ren, Zhe Wang, Bimlesh Lochab, Jian Liu,* Yuanyuan Zhang* and Limin Wu

7091



Geminal-Cu catalysts drive efficient C–C coupling to boost ethylene production *via* electrochemical CO_2 reduction

Hisham G. El-Aqapa, Ghada E. Khedr, Ibrahim M. Badawy, Ahmed M. Agour, Abdelrahman M. Abdelmohsen and Nageh K. Allam*

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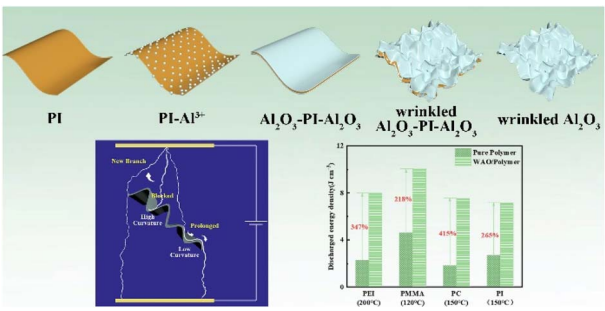

Pinning and elongating of electric treeing induced by wrinkled nanosheets in polymer dielectrics towards significantly enhanced high-temperature energy storage performance

Xuyuan Fan, Linwei Zhu, Zelong Chang, Qingyang Tang, Davoud Dastan, Runhua Fan and Zhicheng Shi*

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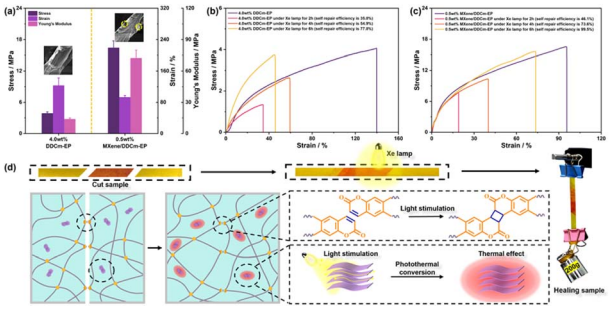
7108

Self-healing epoxy resin film enabled by the synergetic effect of coumarin and MXene

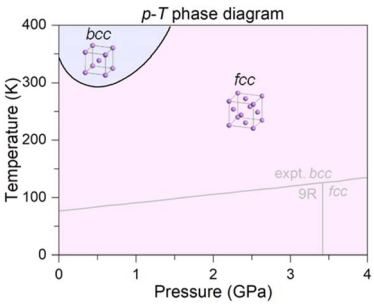
Bingrui Shi, Kaiming Yang, Yifeng Zhang, Feifei Wang, Wenyan Liu, Yekun Zhang and Hongxia Yan*



7119

Decoding lithium's subtle phase stability with a machine learning force field

Yiheng Shen and Wei Xie*



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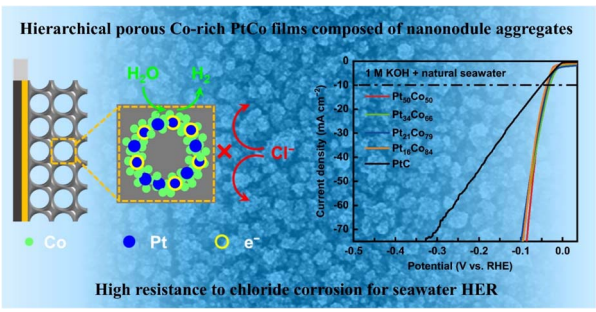
Hierarchical porous Co-rich PtCo thin films for alkaline seawater hydrogen evolution with chlorine corrosion resistance

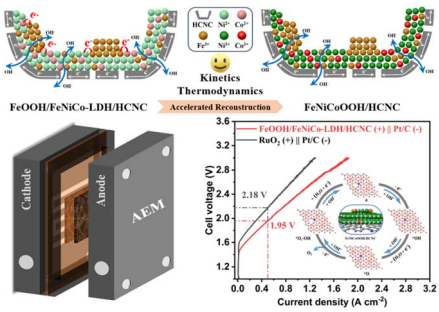
Meilin Zhang, Hanzhong Cui, Zhou Yang, Jie Yan, Jin Zhang,* Huan Ma and Renguo Guan*



7136

Collaborative reconstruction of FeOOH/FeNiCo-LDH heterogeneous nanosheets for enhancing anion exchange membrane seawater electrolysis

Yixing Luo, Yang Yang, Yakun Tian, Qingsheng Wu, Wen-Feng Lin and Ming Wen*



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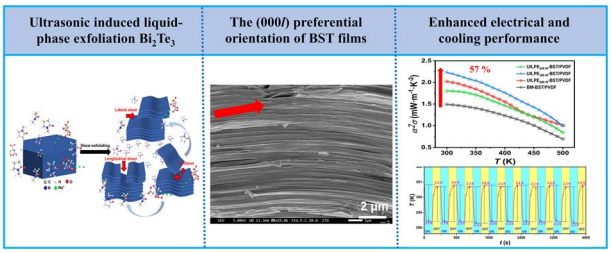

Ultrasonically induced liquid-phase exfoliation boosts excellent performance of $Bi_{0.5}Sb_{1.5}Te_3$/PVDF thermoelectric films

Haotian Li, Shaoqiu Ke, Xiaoxiao Yu, Haojun Zhang, Xinyang Zhang, Xiaolei Nie,* Wanting Zhu, Ping Wei,* Wenyu Zhao and Qingjie Zhang

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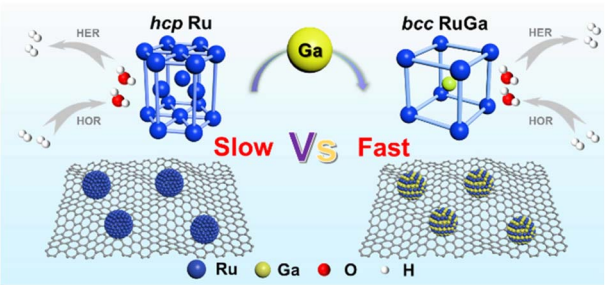

Unconventional-phase engineering of RuGa intermetallics for boosting alkaline hydrogen-electrode reactions

Chang Yang, Lulu An, Zhensheng Mi, Guangzhe Wang, Chenhao Zhang, Weijie Kong, Junhao Yang, Li Xiao, Lin Zhuang and Deli Wang*

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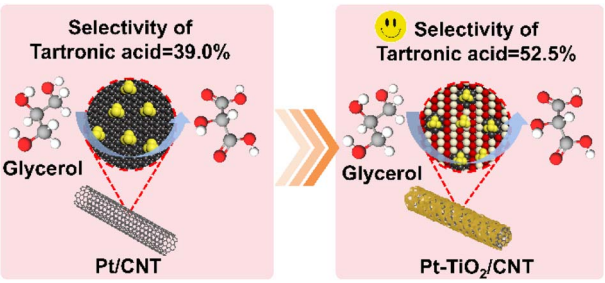
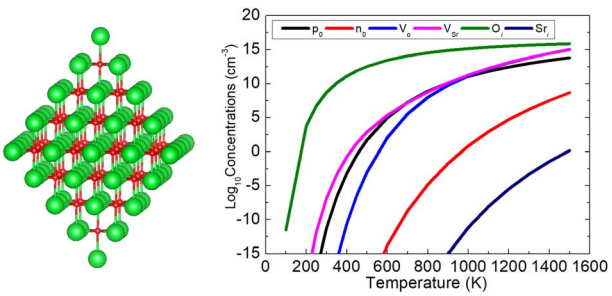


Pt nanoparticles supported on porous sheath TiO_2 wrapped carbon nanotubes for selective glycerol electro-oxidation into tartronate

Chaohui Guan, Jiefei Li, Tao Chen, Liang Lv, Junfeng Du, Shuai Zhang, Hang Wei and Haibin Chu*

7176



Origins of intrinsic p-type conductivity, p–n transition and substoichiometry in SrO

Taifeng Liu,* Xingfan Zhang, Jingcheng Guan, Xuebo Chen,* You Lu, Thomas W. Keal, John Buckeridge, C. Richard A. Catlow and Alexey A. Sokol*

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PAPERS

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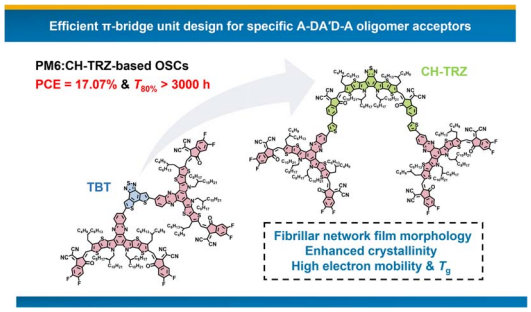
Effect of π-bridge lengths in oligomerized fused-ring electron acceptors on the photovoltaic performance of organic solar cells

Mingxin Sun, Jianxiao Wang, Cheng Sun,* Bin Tang, Xiaofei Qu,* Shuguang Wen and Xichang Bao*



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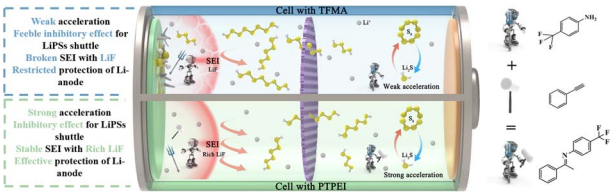
Fluorinated imine modulating efficient sulfur redox kinetics and a stable solid electrolyte interphase in lithium–sulfur batteries

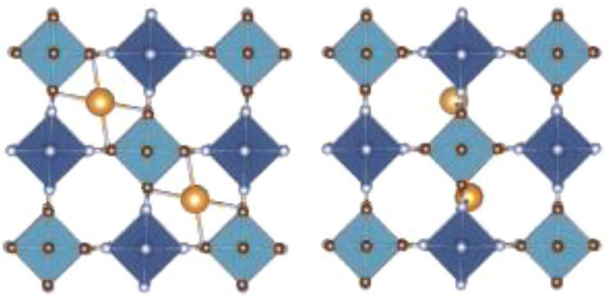
Tong Wu,* Mingxun Jia, Ye Lu, Jinting Ye, Daotong Yang, Yingying Zhang, Shuyuan Xie, Dawei Kang, Limei Duan, Haiming Xie* and Jinghai Liu*



7207

Structural evolution of Prussian blue analogues $A_xMFe(CN)_6$ upon intercalation of Na and K

Mingrui Li and Furio Corà*



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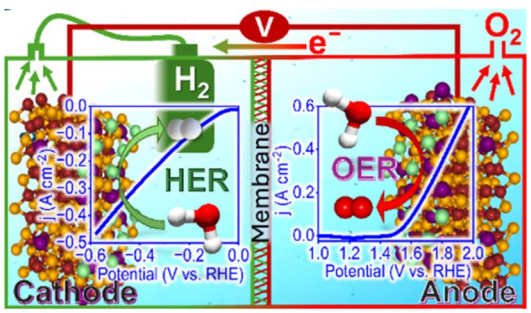
Synergistically enhanced electronic modulation in trimetallic Cu–Co–Mo-based heterostructured nanomaterials for green H_2 production *via* efficient alkaline electrolysis

Apurba Borah, Pooja, Ravinder Pawar and Gaddam Rajeshkhanna*



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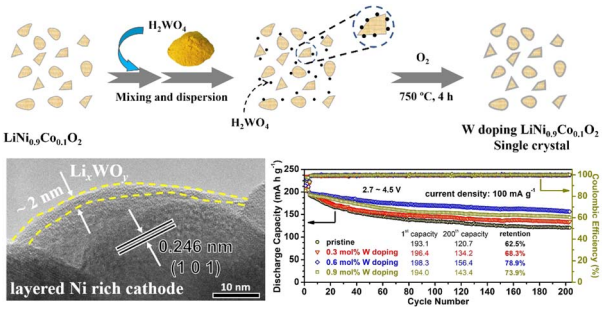
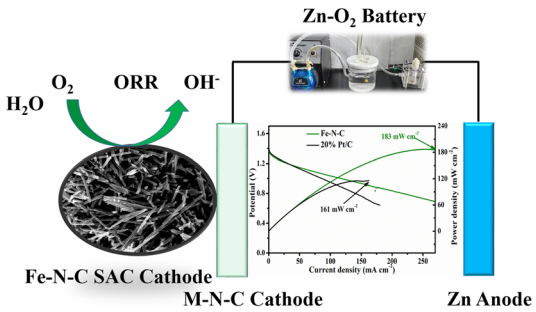


Tungsten doping reinforced structural stability of single-crystal nickel-rich $LiNi_{0.9}Co_{0.1}O_2$ cathodes

Zhen Xiao,* Anqi Chen, Ruojian Ma, Yongquan Zheng, Xiao-Dong Qi, Yu-Jie Guo,* Ruyi Fang, Yongping Gan, Xinping He, Xiaoxiao Lu, Jianping Xu, Hui Huang, Jun Zhang, Xinhui Xia, Wenkui Zhang, Sen Xin* and Yang Xia*

7237



Single-atom catalyst with a hollow rod/plate-like structure for enhanced oxygen reduction reaction performance in zinc–air batteries

Muhammad Arif Khan, Guopu Cai, Rida Javed, Daixin Ye,* Hongbin Zhao* and Jiujun Zhang

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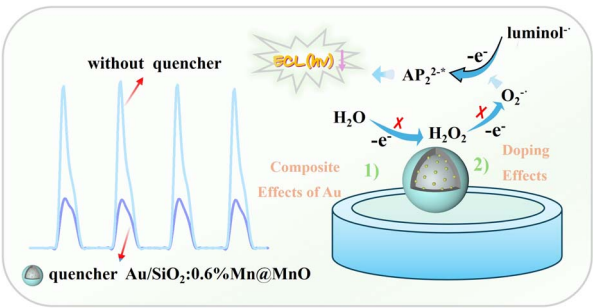

Modulation of electron transfer in electrochemiluminescence: synergistic utilization of doping effects in the material and composite effects of Au in the core–shell structure

Shaopeng Zhang, Mingzhe Jiang, Hongling Li, Wenjin Liang, Wenjing Lai, Haoyi Ren, Chenglin Hong* and WeiHua Xu*

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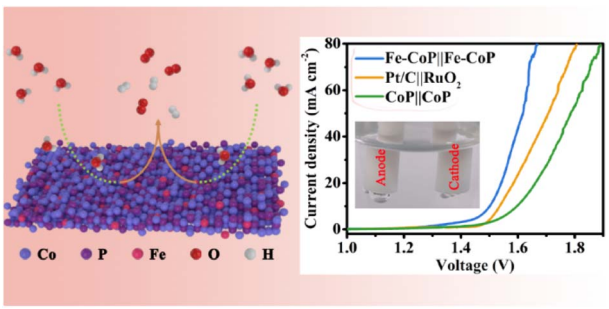

Exquisite restructuring of the electronic structure of cobalt phosphide *via* rationally controlling iron induction for water splitting under industrial conditions

Ziting Li, Peng Zhou, Mingyan Zhang, Haochen Zhang, Yongyi Zhang, Dan Han and Xiaoshuang Chen*

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PAPERS

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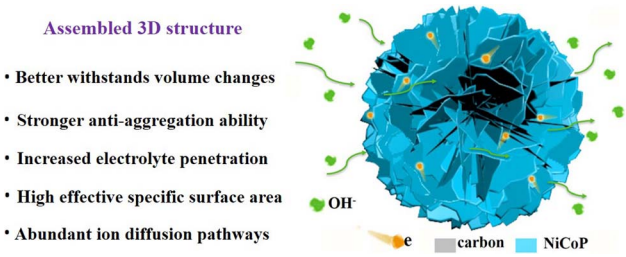
3D NiCoP flowers assembled by 2D carbon-coated nanosheets as an efficient and stable positive electrode for supercapacitors

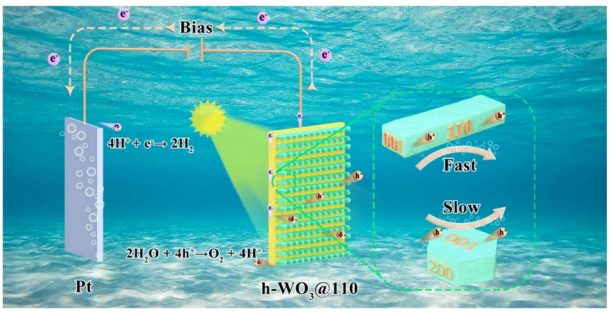
Xiaomeng Zhang, Xiaofeng Zhao, Buhe Bateer, Yanqing Jiao, Aiping Wu, Haijing Yan, Dongxu Wang, Jiaming Wang and Chungui Tian*



7284

Controlling crystallographic orientation in h-WO_3 films to maximize photoelectrochemical water splitting efficiency

Wenhao He, Wenzhang Li, Jianye Liu, Ge Lou, Chenyu Zhang, Yang Liu* and Jie Li*



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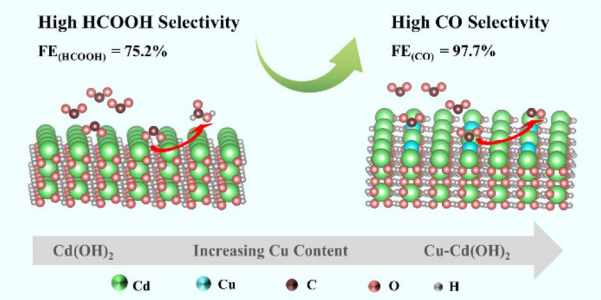
Switching between HCOOH and CO in electrochemical CO_2 reduction by doping Cu into $Cd(OH)_2$ catalysts

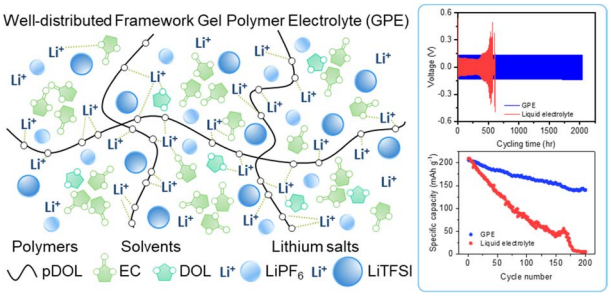
Mi Long, Xian Liu, Mingda Wang, Minxing Shu, Wenzhe Shan* and Hongming Wang*



7302

***In situ* polymerization of an electrochemically stable dual-salt gel polymer electrolyte for lithium ion batteries**

Yen-Shen Kuo, Jhang-Yao Hong, Wei-Lung Chou* and Yi-Hung Liu*



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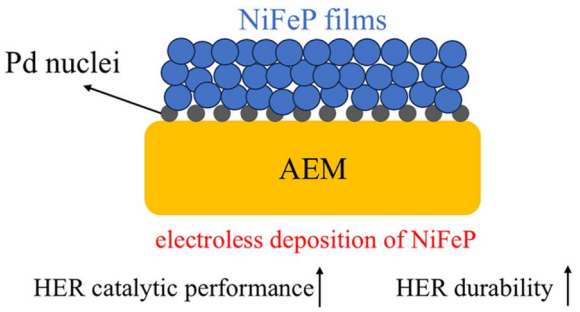
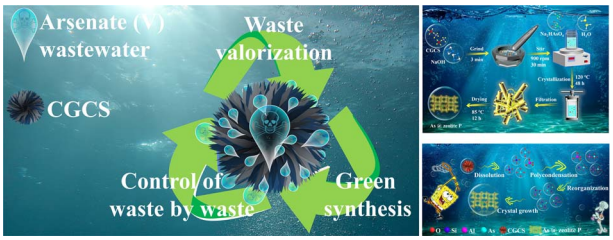


Electroless-deposited NiFeP catalyst-coated-membrane cathodes for anion exchange membrane water electrolysis

Kaiming Guo, Masahiro Kunimoto and Takayuki Homma*

7324



Lattice-trapping synthesis enhances fixation of As(v) in As@zeolite P

Lu Ma, Yu Li, Qi Wang, Ning Feng, Ruyang Wang, Mei Yang, Qian Ma, Yuanyuan Li, Yulong Ma, Yonggang Sun, Xiaoxia Ma and Wenxin Ji*

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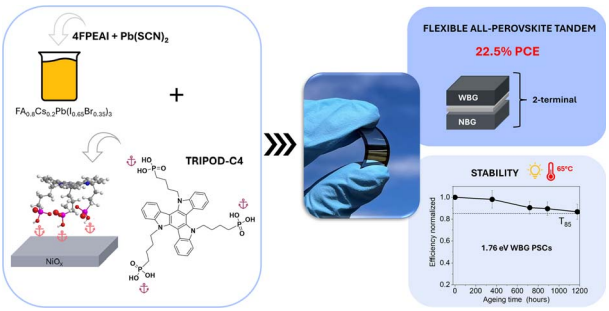
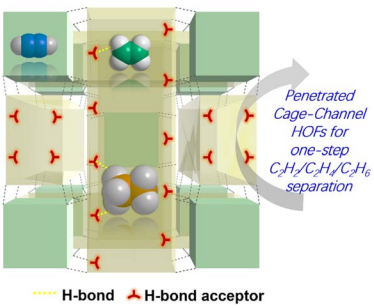


Compositional and interfacial engineering for improved light stability of flexible wide-bandgap perovskite solar cells

Anna Wąsiak-Maciejak, Łukasz Przypis, Wiktor Żuraw, Kinga Rycek, Patrycja Janicka, Mateusz Ścigaj, Konrad Dyk, Huagui Lai, Adrianna Piejko, Damian Pucicki, Fan Fu, Vasyl Kinzhybalo and Konrad Wojciechowski*

7347



Scalable reflux synthesis of a bimicroporous hydrogen-bonded framework with specific molecule recognition ability for one-step ethylene purification

Jiao Lei, Wenyu Yuan, Ying-Ying Xue, Libo Li, Tianhao Lan, Yan-Fei Li, Zhang-Lei Zhong and Quan-Guo Zhai*

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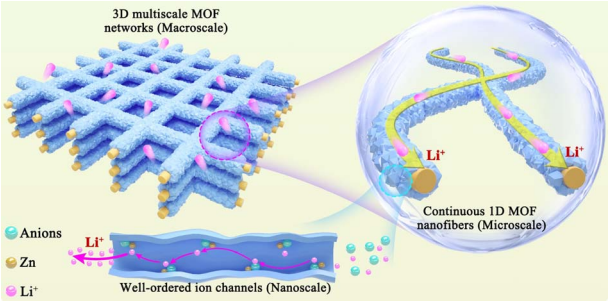
PAPERS

7357

A thermomechanically stable nanofiber separator with multiscale MOF networks towards high-efficiency ion transport

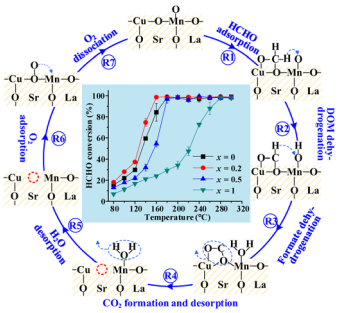
Feifei Lan, Huijuan Zhao,* Yu Jiang, Cancan Jin, Guodong Zhao* and Lin Li*



7371

Unraveling the role of a Cu dopant in formaldehyde catalytic oxidation over a $La_{0.8}Sr_{0.2}Mn_{1-x}Cu_xO_3$ perovskite: an experimental and theoretical study

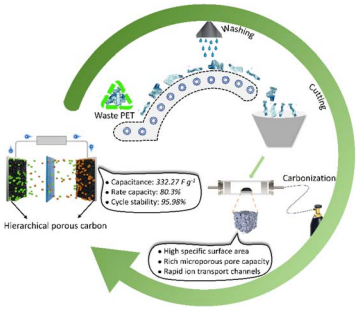
Junyan Ding, Liming Zhao, Yingju Yang and Jing Liu*



7381

Converting waste poly(ethylene terephthalate) into hierarchical porous carbon towards a high-performance supercapacitor

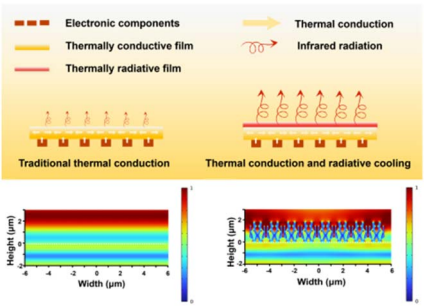
Kaile Wang, Ruiyang Li, Xuesen Zeng, Pingan Song,* Jisheng Sun and Rongjun Song*



7392

Asymmetric structure endows thermal radiation and heat conduction in graphene films for enhancing dual-mode heat dissipation

Ruo-Han Niu, Ye-Wen Li, Shi-Long Ma, Zong-Lin Yi, Li-Jing Xie, Fang-Yuan Su, Hui Jia* and Cheng-Meng Chen*



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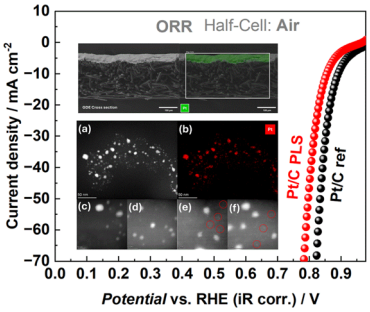
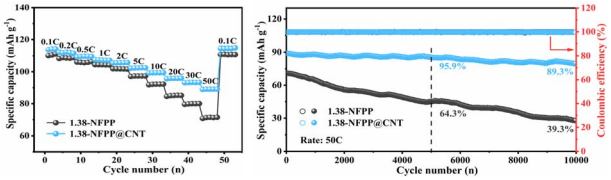
7403



Print-light-synthesis of electrocatalytically active gas diffusion electrodes for fuel cell applications

Wanderson O. Silva,* Alexandre Mabillard, Mathieu Soutrenon, Grégoire Gschwend, Yorick Ligen, Steve Joris, Luc Bondaz, Kumar Varoon Agrawal and Hubert H. Girault

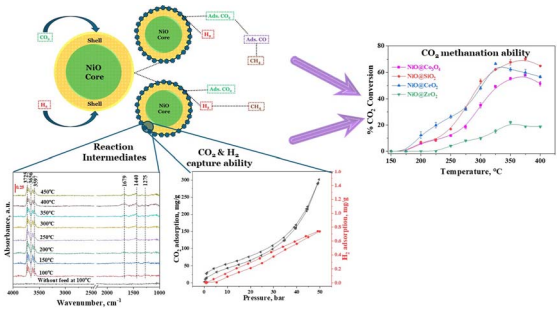
7413



Preparation and application of the high-performance sodium-ion battery cathode material $Na_{3.6}Fe_{2.6}(PO_4)_{1.6}P_2O_7$@CNT with dual-carbon coating

Binghan Dai, Tianming Lu, Jinhan Teng, Junjie Huang, Enmin Li, Kaibo Zhang, Qiang Wang, Dongdong Yin, Sicheng Liu, Luyu Lei, Xin Tang* and Jing Li*

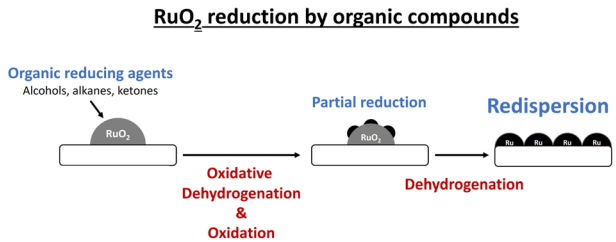
7422



Unraveling the CO_2 methanation and capture ability of NiO@metal oxides

Huldah Suharika Chitturi, Yalagandula Lavanya, Yaddanapudi Varun, Anurag Ramesh, Sri Himaja Pamu, I. Sreedhar and Satyapaul A. Singh*

7445



Reduction of RuO_2 nanoparticles supported on silica by organic molecules: a strategy for nanoparticle redispersion

Gabriel Fraga, Muxina Konarova, Laurence Massin, Athukoralalage Don K. Deshan, Darryn Rackemann, Bronwyn Laycock, Steven Pratt and Nuno Batalha*

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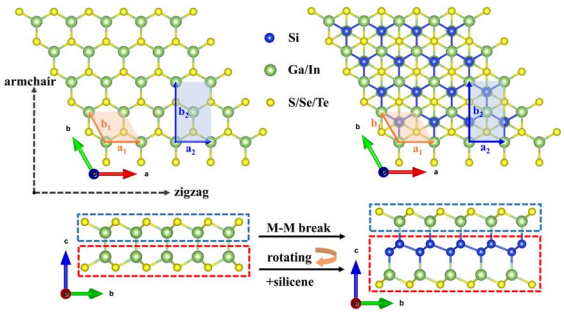
7461

Single-layer group III-IV-VI semiconductors: potential photocatalysts for water splitting with high carrier mobilities

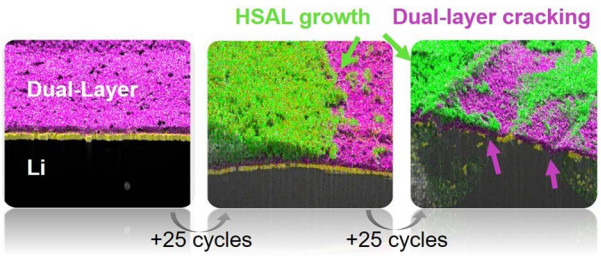
Qiu Yang, Qi-Dong Hao, Cui-E Hu,* Hua-Yun Geng and Xiang-Rong Chen



7476

Dual protective layer on lithium metal anodes for improved electrochemical performance – in-depth morphological characterization

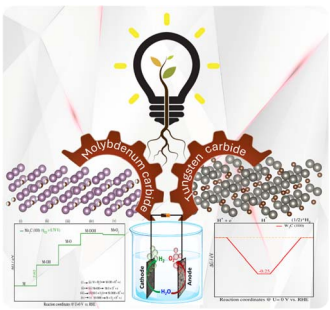
Marlena M. Bela, Maximilian Mense, Sebastian Greiwe, Marian C. Stan, Simon Wiemers-Meyer, Martin Winter and Markus Börner*



7488

Exploring structural and electronic properties of transition metal carbides (T = Ti, V, Mo, & W) as efficient catalysts for overall water splitting with the DFT study

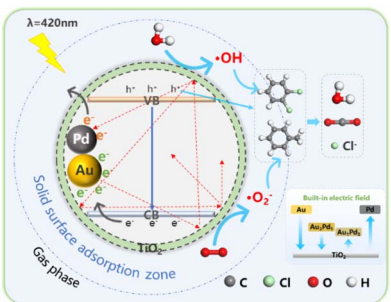
Tata Sanjay Kanna Sharma, Jayasmita Jana, Beena Mol Babu, Mohamed A. Ghanem, K. C. Bhamu, K. S. S. V. Prasad Reddy, Kuo-Yuan Hwa, Sung Gu Kang, Jin Suk Chung, Seung Hyun Hur* and Won Mook Choi*



7503

Enhancing photocatalytic activity through the manipulation of intrinsic electric fields in yolk–shell hollow AuPd@TiO_2 structures

Shan Jiang, Yihang Zhang, Yunyang Wang, Yanrong Zhang, Yong Chen, Jiakuan Yang, Yoon-Seok Chang, Ericson Escobedo and Jianyu Gong*



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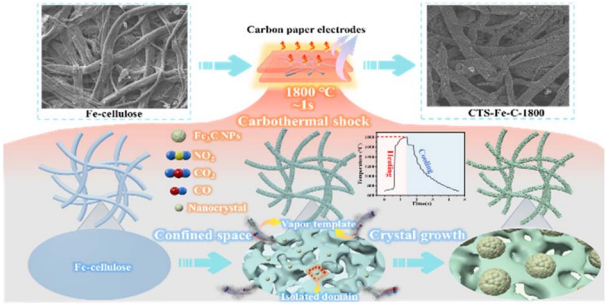
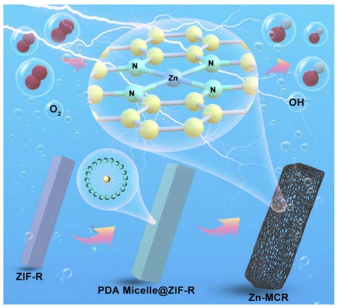
7515



Ultrafast synthesis of porous Fe_3C/carbon hybrid materials *via* a carbothermal shock reactor for advanced energy storage applications

Jun Cao, Kai-Yue Ji, Ming-He Du, Chi Zhang, Qi Sun, Ying Yi, Ze-Fan Chai, Chun-Jie Yan and Heng Deng*

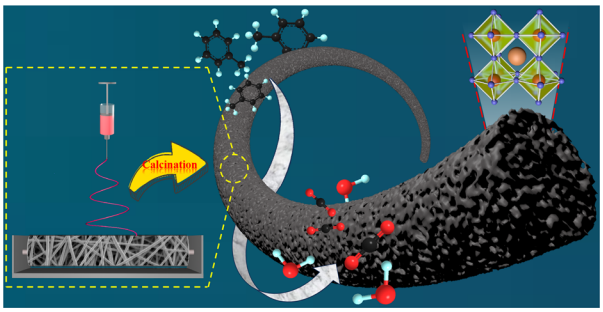
7529



Single Zn atoms anchored in mesoporous N-doped carbon rods derived from metal–organic frameworks for enhanced electrocatalytic oxygen reduction reaction

Mengxue Ma, Zhuoya Pei, Yuxin Peng, Rong Hua, Yuxing Ma, Weilong Wang, Xiaoxiang Xu,* Xuepeng Zhang and Haoquan Zheng*

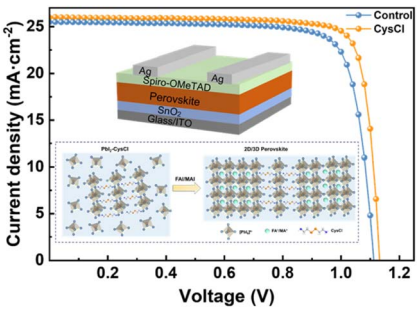
7539



Engineering surface-exposed $LaCoO_3$ perovskite nanotubular catalysts for catalytic combustion of toluene through acid etching

Shixing Wu, Zhan Shi, Fang Dong, Xin Song, Weiliang Han,* Weigao Han, Haitao Zhang, Xiuyan Dong and Zhicheng Tang*

7554



Controlled crystal orientation and reduced lattice distortion with a cystamine dihydrochloride spacer for efficient and stable 2D/3D perovskite solar cells

Shunhui Liu, Xueying Wang, Yang Zhong,* Xiao Luo, Yikun Liu, Binlou Gao, Licheng Tan* and Yiwang Chen*

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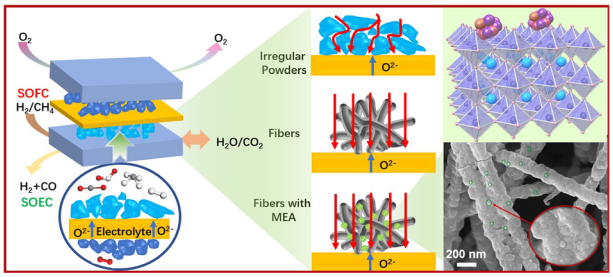
7563

Exsolved medium-entropy alloy FeCoCuNi in titanate fibers enables solid oxide cells with superb electrochemical performance

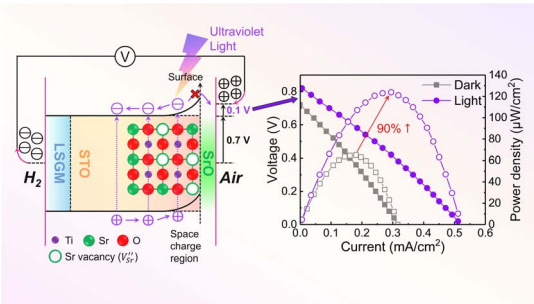
Zilin Zhou, Jiajia Cui,* Zhengrong Liu, Jiaming Yang, Yueyue Sun, Chaofan Yin, Zixuan Xue, Jiaxi Niu, Jingze Liu, Kai Wu* and Jun Zhou*



7573

Modulation of the photo-response of $SrTiO_3$: influence of surface defects on solid oxide photoelectrochemical cells

Luyao Wang, Jifang Zhang, Xinyu Zhang, Guijun Ma* and Nan Yang*



CORRECTION

7582

Correction: Enhancing the thermoelectric figure of merit of BiN *via* polymorphism, pressure, and nanostructuring

Elena R. Remesal, Victor Posligua, Miguel Mahillo-Paniagua, Konstantin Glazyrin, Javier Fdez. Sanz, Antonio M. Márquez and Jose J. Plata*