

Journal of Materials Chemistry A

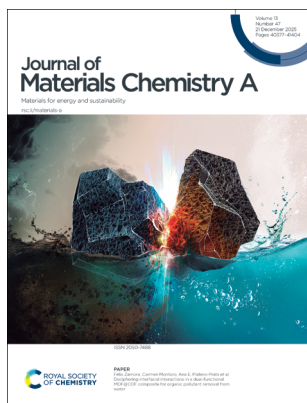
Materials for energy and sustainability

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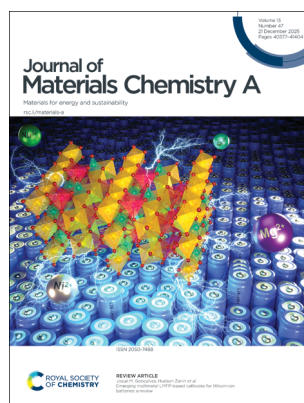
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ISSN 2050-7488 CODEN JMCAET 13(47) 40377–41404 (2025)



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See Félix Zamora, Carmen Montoro, Ana E. Platero-Prats *et al.*, pp. 40665–40671. Image reproduced by permission of Ana E. Platero-Prats from *J. Mater. Chem. A*, 2025, **13**, 40665.



Inside cover

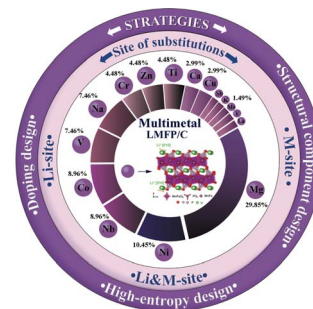
See Josué M. Gonçalves, Hudson Zanin *et al.*, pp. 40399–40429. Image reproduced by permission of Josué Martins Gonçalves from *J. Mater. Chem. A*, 2025, **13**, 40399.

REVIEWS

40399

Emerging multimetal LMFP-based cathodes for lithium-ion batteries: a review

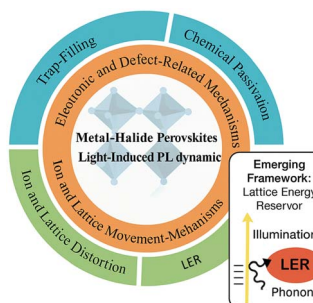
Josué M. Gonçalves,* Syra Mubarak, Gustavo T. M. Silva, Bruno Freitas, Benedito G. Aguiar Neto and Hudson Zanin*



40430

Illumination-induced photoluminescence enhancement in metal halide perovskites: revisiting mechanisms and emerging perspectives

Mehri Ghasemi, Jingwei Hou, Baohua Jia* and Xiaoming Wen*



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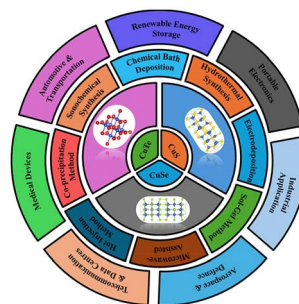
**Fundamental questions
Elemental answers**

REVIEWS

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A review on copper-based chalcogenide materials for supercapacitor application: exploring through experimental evidence and machine learning

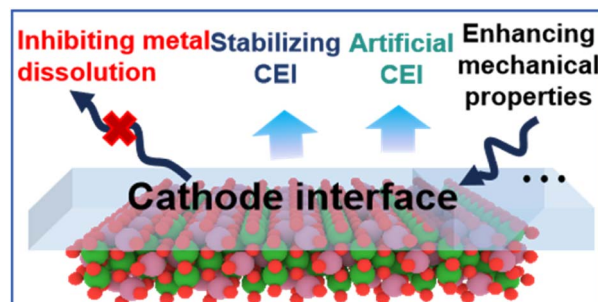
M. Mohan Ram, R. Sapna, Sachin R. Rondiya* and K. Hareesh*



40490

Tailored CEI architectures to boost high-performance solid-state Zn-ion batteries

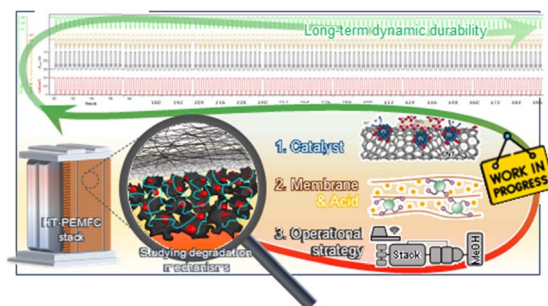
Yitao Zhao, Lingbiao Meng, Linhong Mao, Yan Nie, Siyao Jiang, Guosen Zhou and Jingjing Yuan*



40500

Advancing HT-PEM fuel cell technology: durability and performance under start–stop conditions

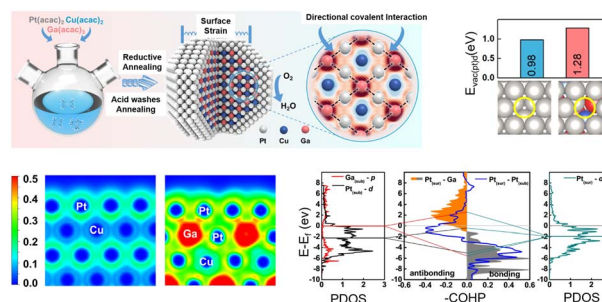
Nedjeljko Seselj, Lars N. Cleemann, Tomas Torres and Kobra Azizi*



40537

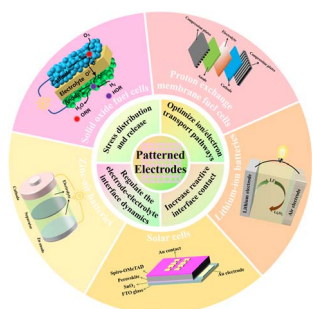
Recent advances in the orbital modulation of multi-element nanoparticles for boosted catalytic performance

Wail Al Zoubi,* Abdul Wahab Allaf, Khalid Aljohani and Nokeun Park*



REVIEWS

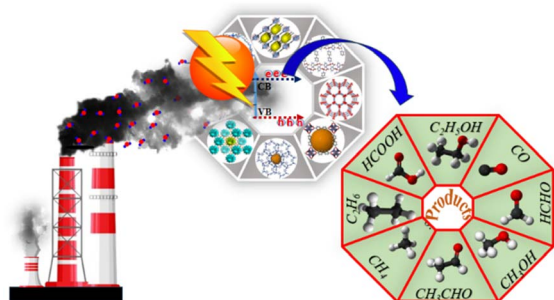
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Patterned electrodes for advanced energy conversion and storage: from precision engineering to practical applications

Ziheng Wang, Wenhui Li,* Yongxin Li, Wenxin Liu, Xixi Wang, Jie Miao, Yang Yang, Ran Ran, Wei Zhou* and Zongping Shao

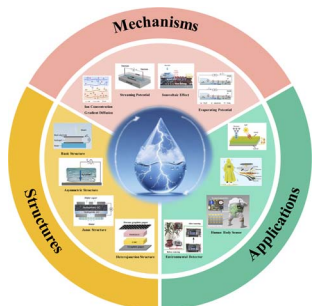
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Metal–organic frameworks for photocatalytic CO₂ conversion: bridging fundamental insights to practical solutions

Venkadeshkumar Ramar,* P. Sivakumar, Prabhu Sengodan and Shihua Huang*

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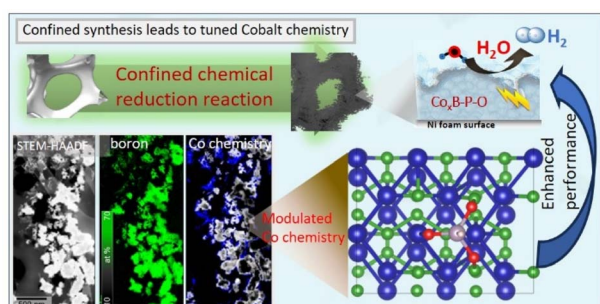


Energy harvesting from water's liquid–gas phase transition: mechanisms and structural designs

Hanyu Yang, Zhengnan Sun, Yuming Lan, Xiaosheng Zhang* and Yi Zhang*

COMMUNICATION

40655



A phosphite-incorporated crystalline–amorphous cobalt-based electrocatalyst *via* surface-confined chemical reduction for efficient hydrogen evolution reaction

Jean Marie Vianney Nsanzimana,* Charles Otieno Ogolla,* Muhammed Fasil Puthiyaparambath, Nastaran Farahbakhsh, Yilmaz Sakalli, Marco Hepp, Jonas Frohne, Walter Sebastian Scheld, Ranjit Thapa,* Manuela S. Killian and Benjamin Butz

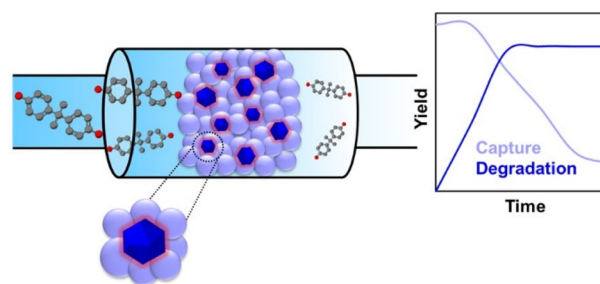


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40665

Deciphering interfacial interactions in a dual-functional MOF@COF composite for organic pollutant removal from water

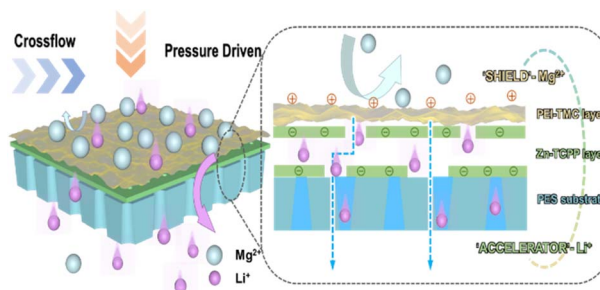
Isabel del Castillo-Velilla, Celia Castillo-Blas, Thomas D. Bennett, Beatriz Cuadrado-Benavent, Félix Zamora,* Carmen Montoro* and Ana E. Platero-Prats*



40672

Heterogeneous charge membranes with a sub-10-nanometer polyamide/Zn-TCPP dual-layer for lithium extraction

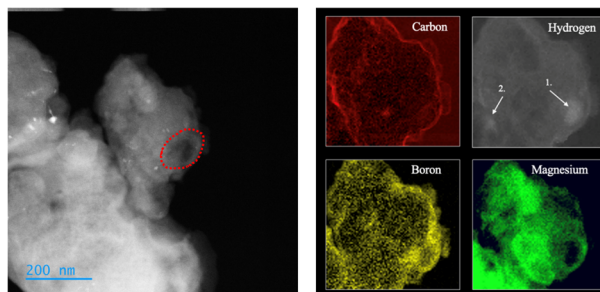
Fei Guo, Lingfeng Wang, Huixin Dong, Pengyu Yan, Shishuo Wang, Qingquan Li, Shaohua Yin, Guoli Zhou, Ning Zhang, Wu Xiao, Yuandong Jia,* Gaohong He and Xiaobin Jiang*



40683

Observation of giant 3D graphenic vesicles encapsulating hydrogen

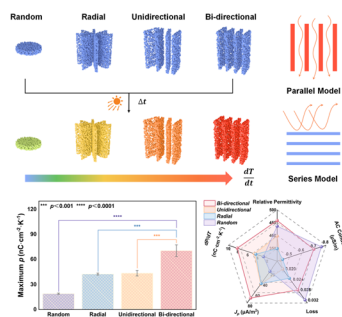
Cody Sugai, John P. Bradley, Hope A. Ishii, Brendan C. Davis, Wesley Y. Yoshida, Vitalie Stavila and Craig M. Jensen*



40689

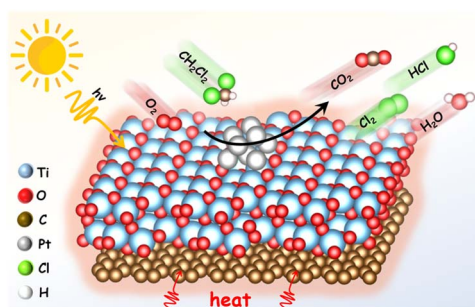
Pore structure-dependent pyroelectric properties of porous PZT ceramics fabricated by template method

Xiang Zhou, Hanyu Gong, Jianxun Zhang, Jianling Liu,* Dou Zhang and Yan Zhang



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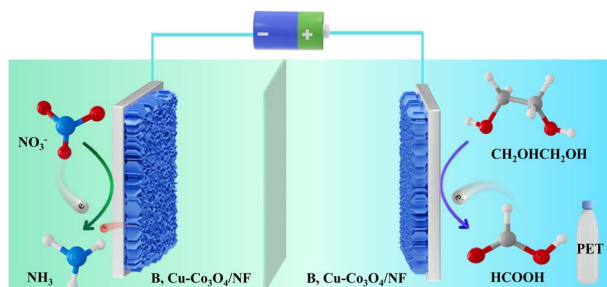
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Accelerating chlorine desorption from metal active sites in thermal catalytic oxidation of dichloromethane *via* UV-vis assistance for persistent and complete mineralization

Maosen Xu, Xin Wang, Shanshan Zhao, Weiping Zhang, Meicheng Wen and Hongli Liu*

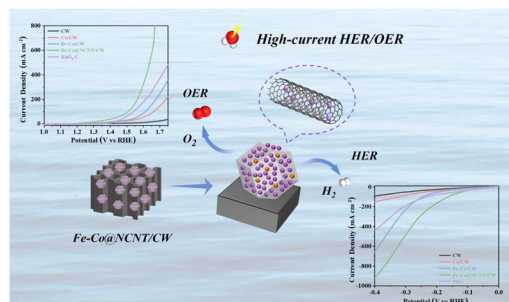
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Hierarchical B and Cu co-doped Co_3O_4 nanoarrays for nitrate reduction coupled with polyethylene terephthalate plastic upcycling

Jing Miao,* Xin-Long Guo, Chen Tan, Yu-Xing Niu, Peng Zhang, Peng-Ju Zhang, Feng Shi* and Yu Chen*

40718

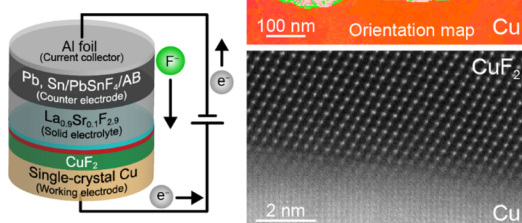


Synergistic Fe and nitrogen-doped carbon nanotubes boost bifunctional water splitting of wood-derived Co electrocatalysts at high current density

Qianqian Zhao, Honglei Chen,* Guijuan Wei, Xixia Zhao, Junyu Wang, Yuanrong Ye, Zongshun Zhang and Xin Zhao*

40731

Fluoride-ion battery using single-crystal



Fluorination of single-crystal copper electrodes in fluoride-ion batteries

Shunsuke Kobayashi,* Kazuyuki Sato, Hsin-Hui Huang, Daisaku Yokoe, Takafumi Ogawa, Yuichi Ikuhara, Takeshi Abe and Akihide Kuwabara

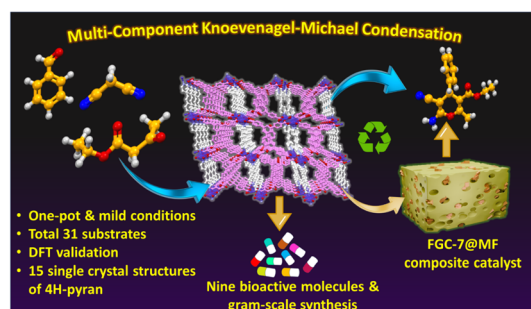


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Free COOH-tethered layered Co(II) framework and flexible composite as a size-reliant, tandem and robust catalyst for mild and scalable synthesis of bioactive molecules

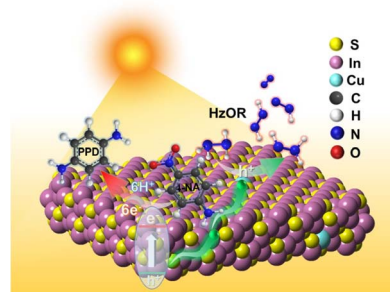
Rudra Chand, Partha P. Mondal, Devaraj Muthukumar, Renjith S. Pillai and Subhadip Neogi*



40757

Photocatalytic hydrazine-assisted reduction of nitroarenes promoted by Cu dopant modulated In_2S_3 under ambient conditions

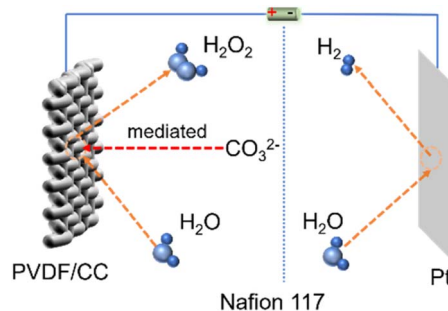
Xiaorui Zhang, Jianguo Chang, Zikang Zeng, Laiqing Zhang, Wenxuan Wang, Xiaohe Jiang, Xingwei Ge, Yujun Liang,* Gui Yang,* Lan Yuan and Chuang Han*



40767

Water oxidation to H_2O_2 on surface-modified carbon cloth electrodes

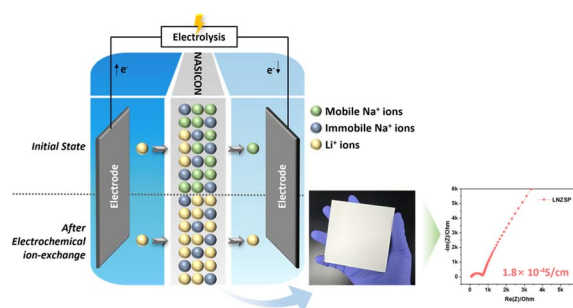
Xuefei Zhao, Chenwei Ni, Qingbo Chang, Ben Chang, Pengfei Zhang, Fusai Sun, Jingying Shi and Can Li*



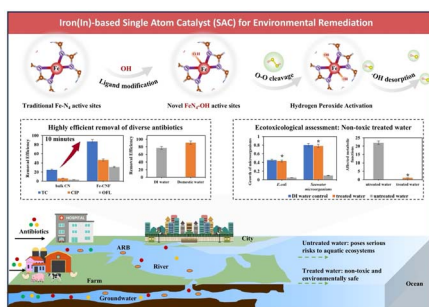
40776

Novel electrochemical ion-exchange of $\text{Li}_x\text{Na}_{3-x}\text{Zr}_2\text{Si}_2\text{PO}_{12}$ (LNZSP): a Li-ion conducting solid electrolyte for battery applications

Jongwoo Kim, Youngjin Kim, Youngsik Kim* and Yongil Kim*



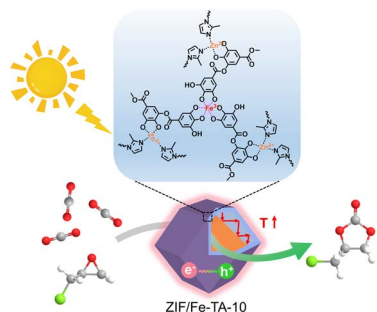
40788



Asymmetric coordination in iron single atom catalysts enables rapid hydroxyl radical turnover and sustainable water purification

Jingjing Zhang, Xuan Yang, Guofang Xu and Rajasekhar Balasubramanian*

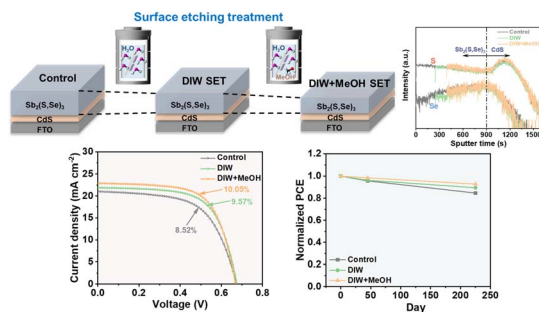
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An etching-coordination strategy to construct yolk-shell structured ZIF/Fe-tannic acid composites for enhancing photothermal catalytic CO₂ cycloaddition

Xiaotong Fu, Meili Ding,* Yang Wang, Jiani Chen and Jianfeng Yao*

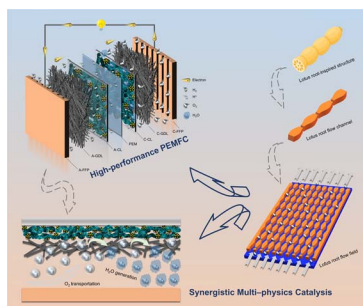
40808



Over 10% efficiency Sb₂(S,Se)₃ solar cells by enhancing the depletion width and interface passivation via methanol-assisted surface treatment

Yazi Wang, Seunghwan Ji, WooKyung Jeon, Yohan Yoon* and Byungha Shin*

40821



Synergistic multi-physics catalysis enabled by lotus-root-inspired flow fields in proton exchange membrane fuel cells

Yu Zhou, Zhengpei Miao,* Hao Li,* Kai Meng, Ben Chen, Min Chen, Hongxian Luo, Yichi Guan, Yuxian Duan, Qinglong Ding, Daoxiong Wu, Jing Li and Xinlong Tian*

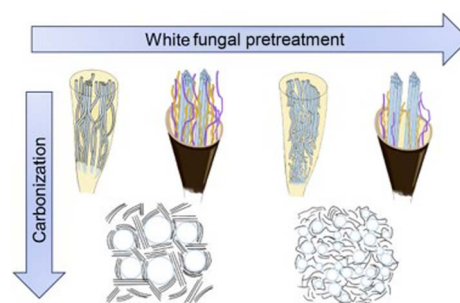


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Biological pretreatment of bamboo biomass toward hierarchical carbon architectures for high-rate sodium storage

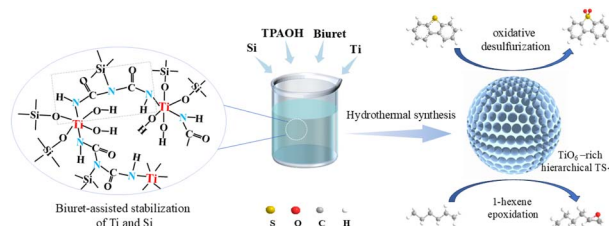
Dan Lu, Suxiang Li, Wang Wang* and Yuxiang Huang*



40842

Constructing TiO₆-rich hierarchical TS-1 zeolites via biuret-assisted synthesis for improved selective oxidation catalysis

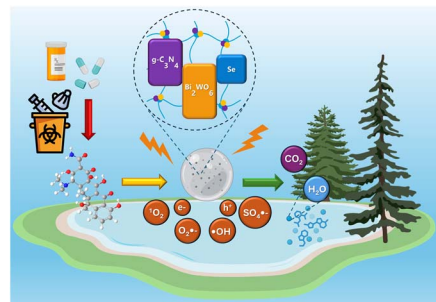
Yumeng Hu, Yulin Yao, Zhenheng Diao,* De Sun and Yuanyuan Dong*



40850

Improved tetracycline degradation via integrated peroxymonosulfate activation and photocatalytic self-Fenton using hybrid Type-II/Z-scheme Se/g-C₃N₄/Bi₂WO₆ carboxymethyl cellulose hydrogels

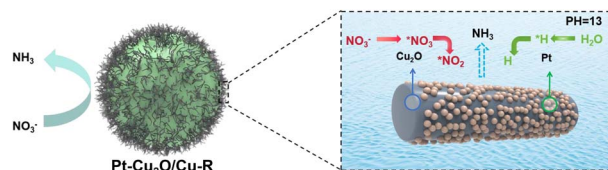
Emmanuel Sebastian Kunnel, Sanmitra Ajay Manker, Ashish Kumar, Akash Balakrishnan, Chandra Shekhar Pati Tripathi, Brajesh Kumar Dubey* and Suverna Trivedi*



40863

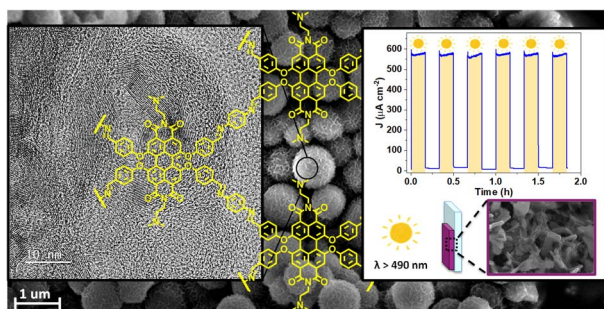
Balancing atomic hydrogen supply and nitrate electroreduction for enhanced ammonia synthesis on Pt-Cu₂O/Cu electrocatalysts

Xiaolong Zhu, Rong Chen, Jiahao Tao, Siyi Liang, Kai Zhang* and Wenzheng Yu*



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Organic semiconductor frameworks integrating bay-substituted perylene bisimides as screw dislocation units in onion-like π - π stacked architectures

Leonardo Cognigni, Jintao Liu, Stefano Magliocco, Gloria Berlier, Silvia Bordiga, Silvia Bracco, Angiolina Comotti, Francesco Rigodanza, Thomas Gobbato,* Daniele Rosa-Gastaldo* and Marcella Bonchio*

40886

Raman Analysis (UV ON + LASER ON)

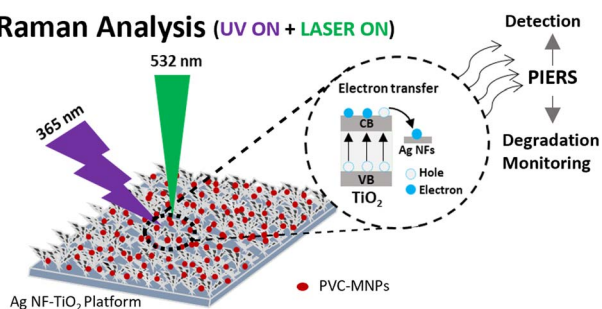
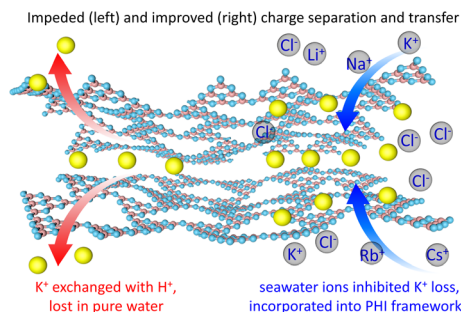


Photo-induced Raman amplification for detecting and monitoring degradation of micro- and nano-sized PVC plastics

Olugbenga Ayeni, Josiah N. Shondo, Tim Tjardts, Sinan Şen, Franz Faupel, Salih Veziroglu,* Oral C. Aktas* and Tayebbeh Ameri*

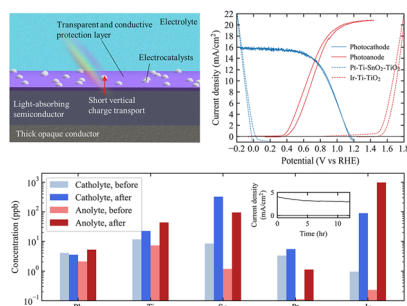
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Mechanism insights for efficient photocatalytic seawater splitting in poly(heptazine imide): inhibited ion exudation and improved charge separation

Wenbin Wang, Gui Yang, Xue Wen, Kai Wang, Jun Zhou and Zhu Shu*

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Halide perovskite stabilized in a photoelectrochemical environment by impermeable single crystal TiO_2 for semi-artificial photosynthesis

Choongman Moon, Chang Hyun Kim, Jihong Min, Jaehyuk Koh, Passarut Boonmongkolras, George Kwesi Asare, Frank Hollmann, Helen Hejin Park,* Chan Beum Park* and Byungha Shin*

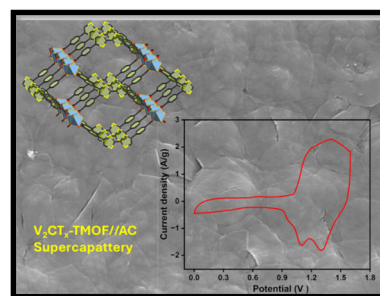


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A MXene-derived tetrathiafulvalene metal–organic framework for ultra-long supercapattery

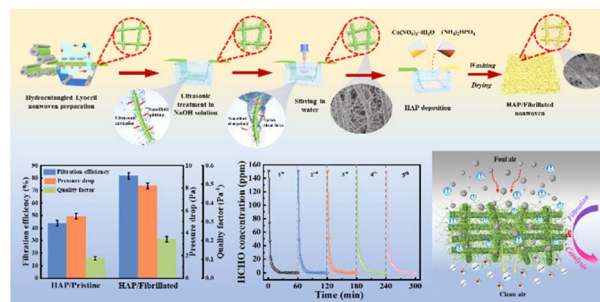
Nasrin Kabeer, Yusuf Khan, Mostafa Zeama, Jehad K. El-Demellawi, Anita Justin, Sharath Kandambeth, Vinayak S. Kale, Osama Shekhah, Husam N. Alshareef* and Mohamed Eddaoudi*



40930

An eco-friendly, dual-dimensional and multi-functional fibrous filter enables efficient indoor air purification

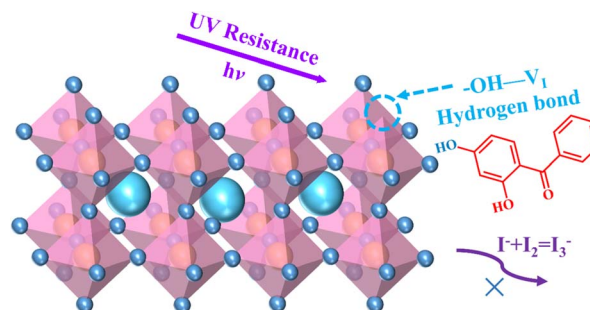
Kangli Xu, Zhengshun Zhang, Yu Song, Qinfei Ke, Suxuan Liu* and Chen Huang*



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Dual passivation and UV shielding by bifunctional UV0 Molecule for high-performance and stable perovskite solar cells

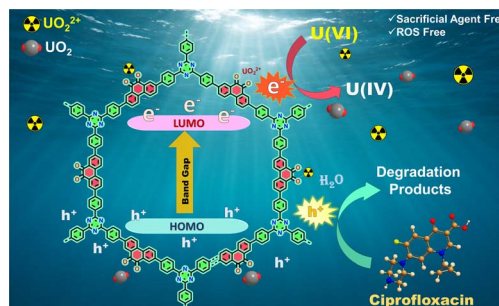
Zuwang Liu, Xiaochun Wei and Huangzhong Yu*



40951

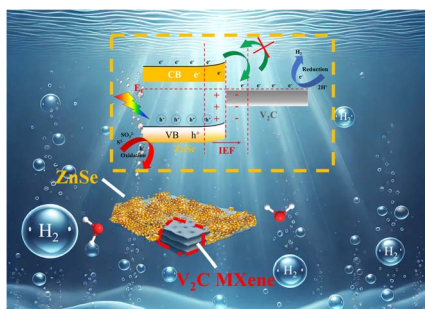
Efficient exciton dissociation and harvesting for the sacrificial agent- and ROS-free simultaneous photoredox removal of uranium(vi) by e^- and ciprofloxacin by h^+ using triazine-based CMPs

Suman Karmakar, Soumitra Sau, Shubhangi Majumdar, Primit K. Chowdhury and Suman Kalyan Samanta*



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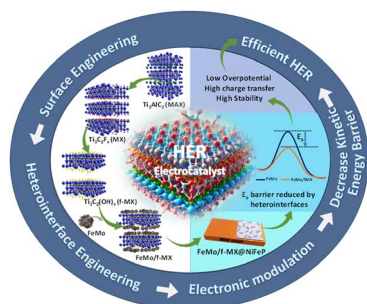
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ZnSe/V₂C MXene Schottky junction: mechanism of interface barrier promoting carrier directional separation and enhancing photocatalytic hydrogen evolution

Xiaoli Ma,^{*} Ming Su and Zhiliang Jin

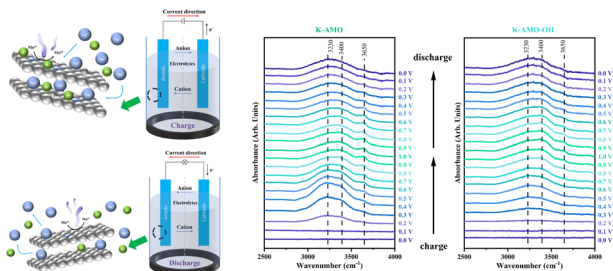
40978



Interface-driven kinetic energy barrier modulation in Fe–Mo derivative-supported surface and heterointerface engineered MXene hybrids for alkaline hydrogen evolution

Sarika Sasidharan, Sneha George, Anoop Ajayakumar Nair, Anjana Ratheesh, Mohammed Aysha Shafna and Sheikh Muhammadhu Aboobakar Shibli^{*}

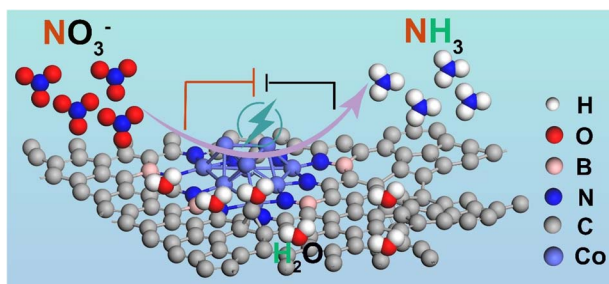
40998



Surface pH modulation of amorphous manganese oxide for enhanced supercapacitor performance

Qishen Hou, Zihao Zhou,^{*} Longmeng Wei, Jiafen Liang, Yifen Zou, Kangdi Lin, Kai Yan, Ming Sun^{*} and Lin Yu^{*}

41010



Co nanoparticles on B, N–Co-doped sp²/sp³ carbon: a synergistic catalyst design for sustainable ammonia production from nitrate

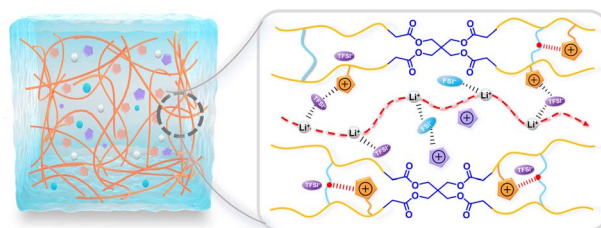
Yuying Zhao, Tianjin Li, Zhiguo Dong, Bari Wulan, Shuangxia Yang, Laizhi Sun, Mengmeng Fan, Lei Chen,^{*} Dongliang Hua^{*} and Jianchun Jiang

PAPERS

41019

Multiple-crosslinking-reinforced ionogel electrolytes for safe and high-performance quasi-solid-state lithium metal batteries

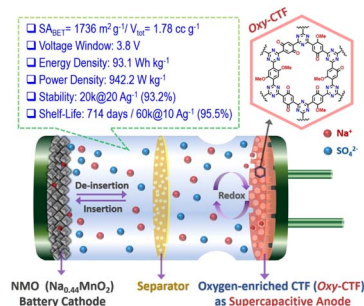
Jiaqi Huang, Yin Hu, Qingwei Gao, Yupu She, Jiajia Li, Haiman Hu, Huaiyang Zheng, Feng Yan* and Xiaoyan Ji*



41030

Thermally tuned oxygenated covalent triazine framework *via* self-templating for a durable 3.8 V aqueous supercapacitor with record energy and power density

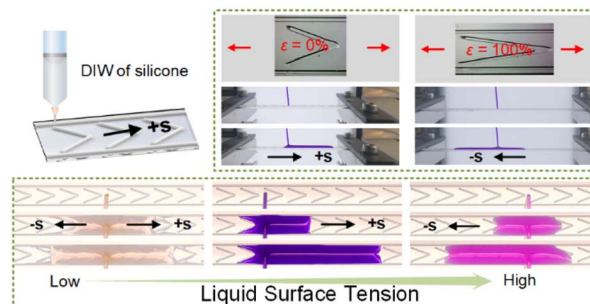
Ashish Kumar Maharana, Sourav Kumar Sarkar, Rahul Sarkar, Matthew A. Addicoat, Gugulothu Rambabu, Mrutyunjaya Majhi and Sanjib Das*



41045

A printable asymmetrical surface pattern for responsive directional liquid transport

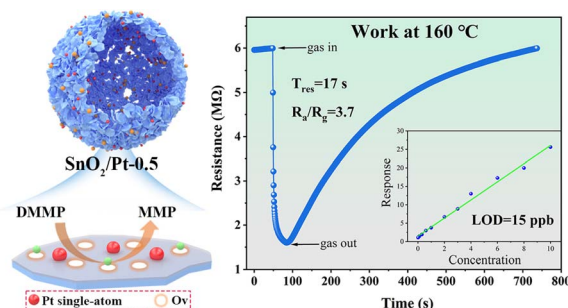
Yi Zhang, Danfeng Pei, Mingjie Li and Chaoxu Li*



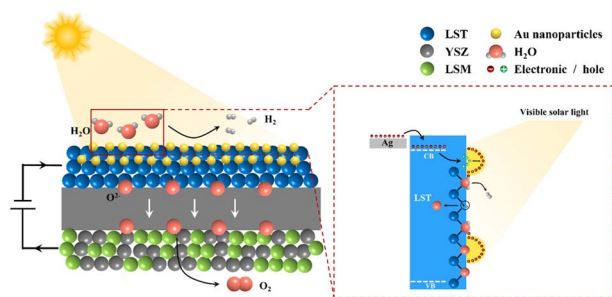
41053

Synergistic oxygen vacancy and Pt single-atom engineering in hollow SnO₂ nanospheres for ultrasensitive ppb-level DMMP detection

Haizhen Li, Gang Wu, Jun Shen, Likun Chen, Yan Cui, He Zheng, Maolin Zhang,* Qingyu Ma* and Yongchao Zheng*



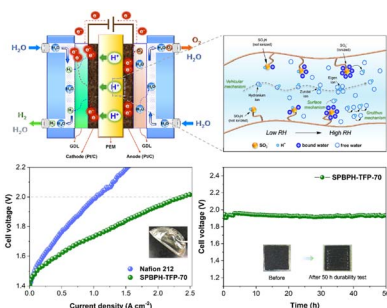
41064



Boosting oxygen migration via plasmons of Au nanoparticles in solar-driven solid oxide photoelectrolysis cells

Jinhao Mei, Guangyu Deng, Chen-Ge Chen, Shiyao Wu, Yanwei Zhang* and Chenyu Xu*

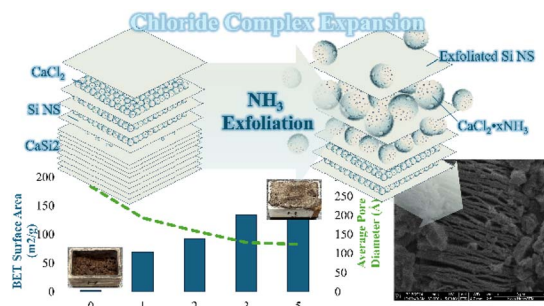
41075



Microphase-optimized sulfonated poly(biphenyl-piperidine-alkylene)-co-poly(biphenyl-trifluoroacetophenylene) proton exchange membranes with enhanced proton conductivity and oxidative stability for water electrolysis

Thi Cam Thach To, Anh Le Mong and Dukjoon Kim*

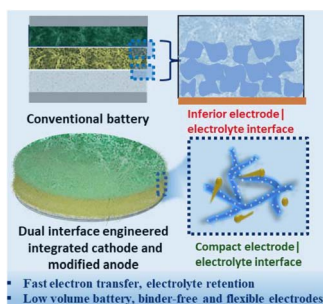
41090



Turning residual chlorides into exfoliation agents: fully gas-phase exfoliation of silicon nanosheets via amine-driven expansion for lithium-ion batteries

Victor Lau, Jr and Chung-Wen Lan*

41105



Anode|electrolyte|cathode interface engineering to develop a robust zinc metal hydrogel battery

Swati Dilwale, Athira Babu, Fayis Kanheerampockil, Arun Torris, Priyanka Pandinhare Puthiyaveetil, Suresh Bhat and Sreekumar Kurungot*

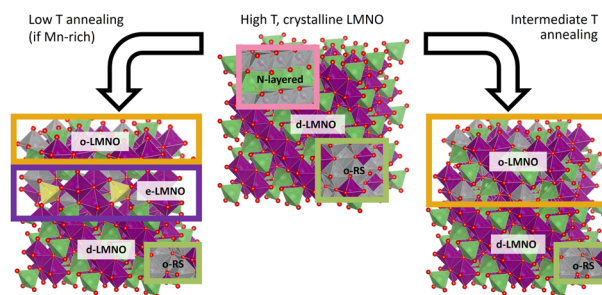


PAPERS

41122

Tracking phase transformations in $\text{LiMn}_{1.5+x}\text{Ni}_{0.5-x}\text{O}_4$ by high resolution X-ray diffraction

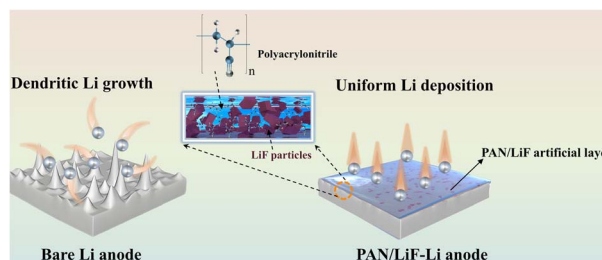
Halvor Høen Hval* and Helmer Fjellvåg*



41144

A synergistic PAN/LiF hybrid layer enabling highly stable lithium metal anodes *via in situ* interface engineering

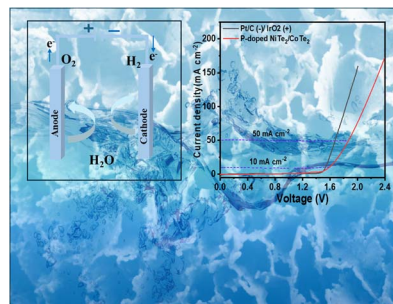
Xianchao Zhao, Weimin Chen,* Kang Huang, Lanying Chen, Hong Chen, Yuyu Li, Liang Wang* and Faquan Yu*



41156

Anion-modulated bifunctional electrocatalytic activity of nickel telluride/cobalt telluride mesoporous nanosheets for high-efficiency and stable overall water splitting

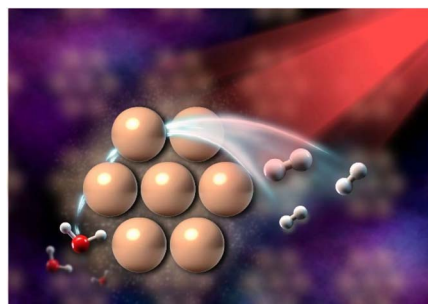
Yagya Raj Rosyara, Ishwor Pathak, Alagan Muthurasu, Debendra Acharya, Kisan Chhetri, Taewoo Kim, Milan Babu Poudel, Gunendra Prasad Ojha, Tae Hoon Ko* and Hak Yong Kim*



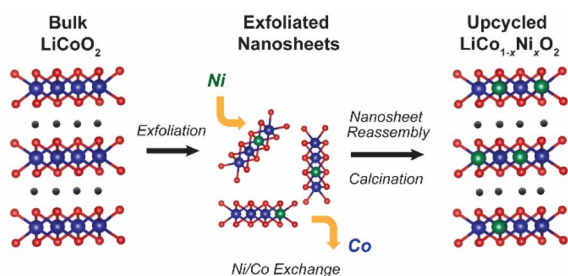
41170

Plasmonic copper nanoparticle aggregates for near-infrared light-driven hydrogen evolution

Qiufen Wang, Jie Wang,* Hongxia Zhang, Jianghong Zhao,* Hu Shi* and Pengju Yang*



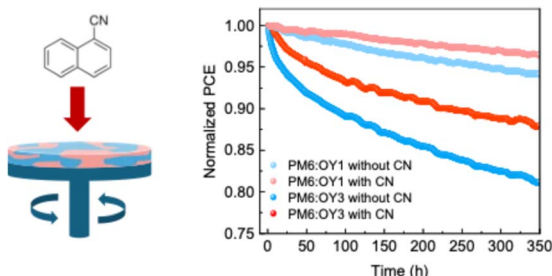
41180



Demonstration of Co/Ni exchange in exfoliated LiCoO_2 nanosheets: a new approach for upcycling spent Li-ion battery cathodes

Hsin-Juei Wang, Yuwei Zhu, Lingqin Mu, Dennis Nordlund, Clare Davis-Wheeler Chin, Kevin Leung, Paul G. Kotula, Peng Zuo, Winson Kuo, John Watt and Candace K. Chan*

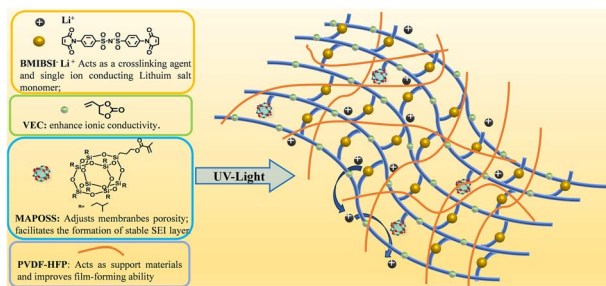
41191



Stabilization of the nanoscale blend morphology in organic solar cells using solvent additives

Xianzhao Liu, Nan Zhang, Yu Guo, Ziming Chen, Youcai Liang, Mengyang Wang, Wei Ma, Hin-Lap Yip, Fei Huang and Philip C. Y. Chow*

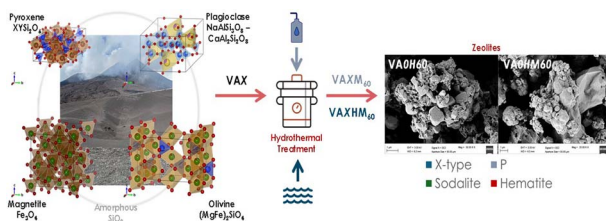
41200



Design of novel bismaleimide-based single-ion conducting hybrid electrolytes for high ionic conductivity and extended cycling stability lithium-metal batteries

Yu Ding, Shicheng Zhang, Xiao Wang, Puyan Huang, Yuwei Zhong and Jifang Fu*

41215



From volcanic ashes to magnetic zeolites: unravelling the iron oxide phase transitions by magnetic and advanced structural characterization

Maryam Abdolrahimi, Pierfrancesco Maltoni, Gianni Barucca, Claudia Belviso, Carlo Meneghini and Davide Peddis*

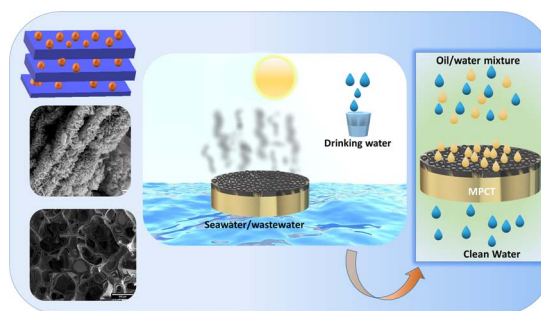


PAPERS

41229

All-in-one solar-activated MXene@CuS membrane for advanced water purification

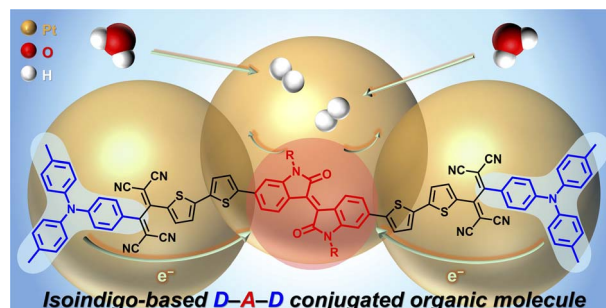
Bibek Chaw pattnayak, Priyadarshini Pradhan and Sasmita Mohapatra*



41242

Synthesis, properties, and photocatalytic hydrogen evolution of isoindigo-based conjugated molecules

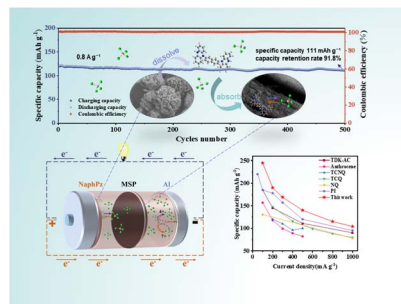
Yen-Yu Chen, Yen-Chih Chen, Hsuan-Chih Tsai and Yu-Ying Lai*



41251

A dihydroquinoline-conjugated polymer cathode with a hierarchical structure and abundant redox-active sites for aluminum-ion batteries

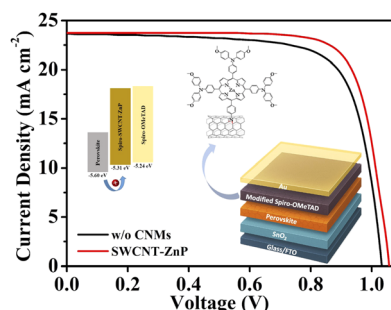
Zirui Li, Mingyue Kang, Chuanyi Li, Tianliang Tan, Zhicheng Wu, Hongyu Fan,* Xuejing Shen, Tao Sun* and Zhanjun Wu*



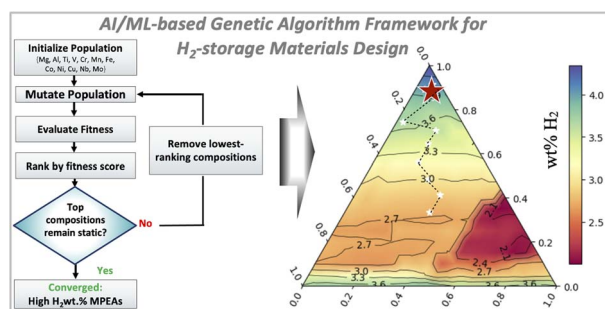
41260

Integration of p-type-doped carbon nanostructures as additives for boosting spiro-OMeTAD performance in perovskite solar cells

Abbas Ahmad Khan, Helena Uceta, Javier Urieta-Mora, Manuel Pérez-Escribano, Sara Abdollahzadeh, Myriam Barrejón, Joaquín Calbo, Enrique Orti,* Fernando Langa* and Nazario Martín*



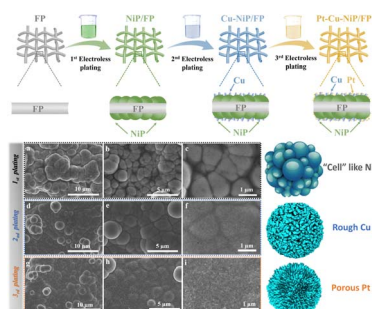
41274



Design of lightweight BCC multi-principal element alloys with enhanced hydrogen storage using a machine learning-driven genetic algorithm

Kevin Ji, Tanumoy Banerjee, Matthew D. Witman, Mark D. Allendorf, Vitalie Stavila and Prashant Singh*

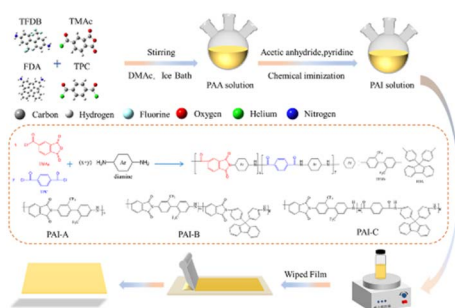
41290



Construction of a multi-layer Pt-based self-supporting catalyst for high-current-density hydrogen evolution reaction

Suhui Chen, Bowen Lu, Wei Wang, Siyu Yang, Haohao Gao, Haiwei Xu, Bingxin Li, Zile Hua and Jian Huang*

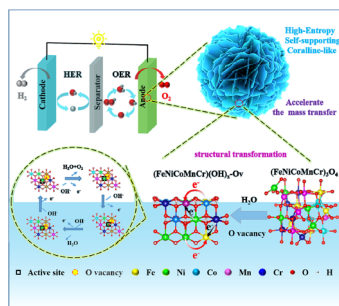
41300



Molecular engineering of polyamide-imide copolymers for high-temperature energy storage

Yu Zhang, Xiaolong Wu, Lian Xia, Jinjun Liu,* Lingmin Yao,* Hongzhen Xie, Junfei Luo and Zhongbin Pan*

41310



Defect-enriched, active, self-supporting, coralline-like, high-entropy spinel oxide $(\text{FeNiCoMnCr})_3\text{O}_4$ electrodes for high-stability oxygen evolution reaction

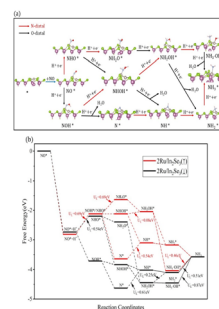
Lei He, Huiyang Zhao, Hongjun Kang,* Hengjia Liu, Kai Cui, Jiaqi Chen, Wei Qin* and Xiaohong Wu*



41321

Tunable ferroelectric diatomic catalysis on In_2Se_3 monolayers for NO reduction

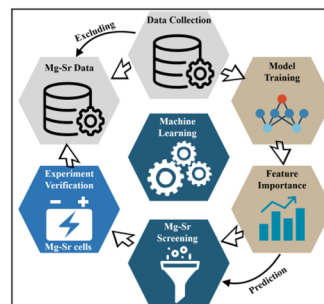
Mingjuan Lu, Ting Hu* and Erjun Kan*



41333

From alloy composition to battery performance: a machine learning strategy for the design of Mg–air battery anodes

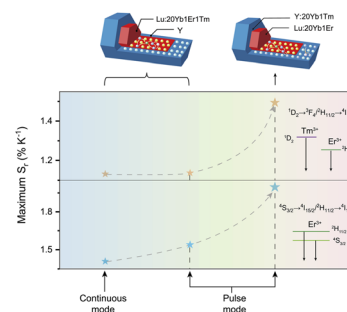
Yingying Wang, Rujuan Xu, Hui Sun, Shanshan Song, Xinke Qi and Li Wang*



41344

Enhancing fluorescence thermo-sensitivity in Er–Tm dual-activator microrods via cooperation of partitioned doping and excitation control

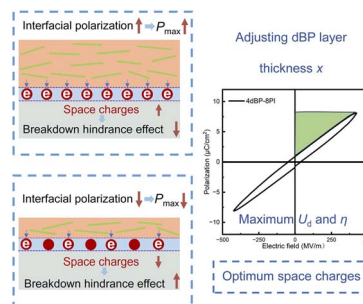
Xingxing Zhang, Xiaoqing Gao, Xiaohong Wang, Yu Ma, Jia Li, Yingdong Han,* Chao Gao,* Shuang Wang and Tong Wei*



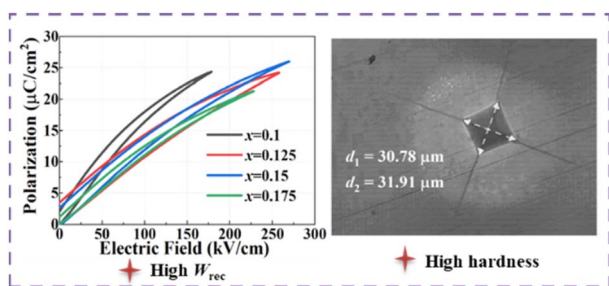
41354

Significantly enhanced capacitive energy-storage performance of a flexible P(VDF-CTFE)-polyimide bilayer by optimizing the interface effect

Shaoyan Zhang, Bing Xie,* Haishan Xu, Jinqiao Yi,* Kun Guo, Haibo Zhang and Tianyu Li*



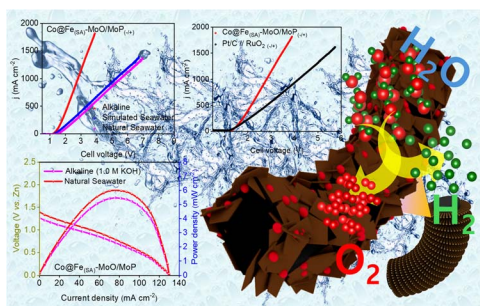
41365



Simultaneous enhancement of the energy storage, transparency, and hardness properties of $K_{0.5}Na_{0.5}NbO_3$ -based ceramics via a synergistic optimization strategy

Chenxi Liu, Zhonghua Dai,* Yuanyuan Zheng, Xujun Li, Ruijian Dai, Yuxing Liu, Weiguo Liu, Shun Zhou,* Shuitao Gu,* Minxia Fang and Xiaobing Ren

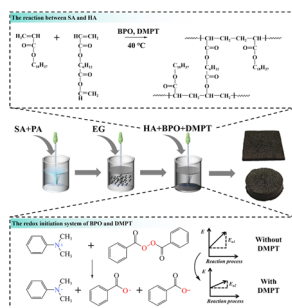
41375



Hierarchically structured $Co@Fe_{(SA)}-MoO/MoP$ electrocatalyst with tuned electronic states for thermodynamically optimized hydrogen adsorption in chloride-rich media

Muhaiminul Islam, Jongwoo Hong, Kanguk Park, Amar M. Patil, Taehyeon Kim, Sushanta K. Das, Seungho Yu and Seong Chan Jun*

41390



A new strategy for balancing thermal stability and latent heat of solid–liquid PCMs via a solid–solid PCM as a supporting skeleton

Zhubin Yao, Xiaoqing Yang,* Xiaodong Lin, Guoqing Zhang and Jingwen Weng*

