

Journal of Materials Chemistry A

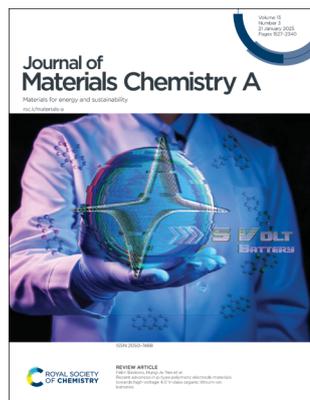
Materials for energy and sustainability

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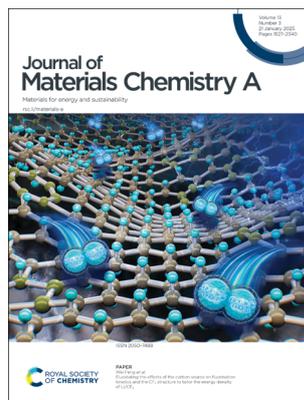
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See Febri Baskoro, Hung-Ju Yen *et al.*, pp. 1552–1589. Image reproduced by permission of Hung-Ju Yen from *J. Mater. Chem. A*, 2025, 13, 1552.



Inside cover

See Wei Feng *et al.*, pp. 1820–1829. Image reproduced by permission of Wei Feng from *J. Mater. Chem. A*, 2025, 13, 1820.

EDITORIALS

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2024 *Journal of Materials Chemistry* Lectureship winner: Raphaële Clément, University of California, Santa Barbara, United States



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2024 *Journal of Materials Chemistry* Lectureship runners-up: Maxx Arguilla, University of California, Irvine, United States, and Phillip Milner, Cornell University, United States



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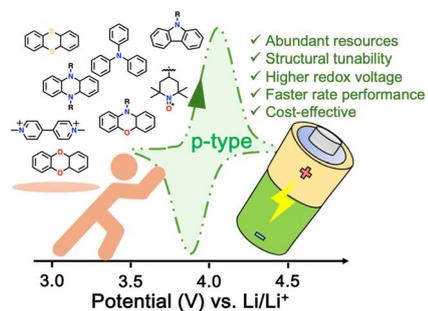
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Fundamental questions
Elemental answers

1552

Recent advances in p-type polymeric electrode materials towards high-voltage 4.0 V-class organic lithium-ion batteries

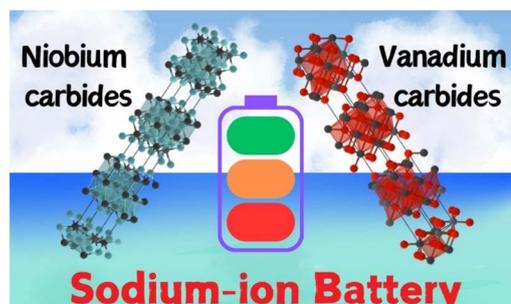
Febri Baskoro,* Santosh U. Sharma, Andre Lammiduk Lubis and Hung-Ju Yen*



1590

Unlocking recent progress in niobium and vanadium carbide-based MXenes for sodium-ion batteries

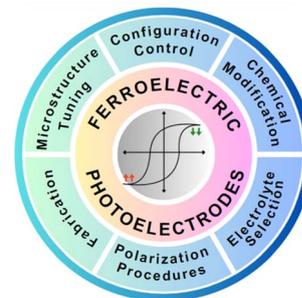
K. Karuppasamy, Ganesh Kumar Veerasubramani, Vishwanath Hiremath, Dhanasekaran Vikraman, P. Santhoshkumar, Georgios N. Karanikolos, Ali Abdulkareem Alhammadi,* Hyun-Seok Kim and Akram Alfantazi*



1612

Ferroelectric materials as photoelectrocatalysts: photoelectrode design rationale and strategies

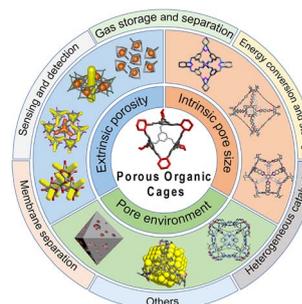
Michael Gunawan, Shujie Zhou, Denny Gunawan, Qi Zhang, Judy N. Hart, Rose Amal, Jason Scott, Nagarajan Valanoor* and Cui Ying Toe*



1641

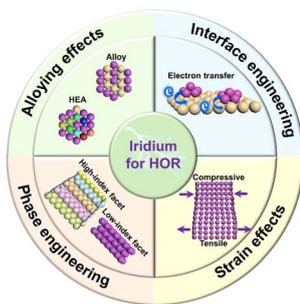
Tailoring functionalities: pore engineering strategies in porous organic cages for diverse applications

Mingming Hua, Yang Ding, Chunxiao Lv,* Ning Han and Kaibin Chu*



REVIEWS

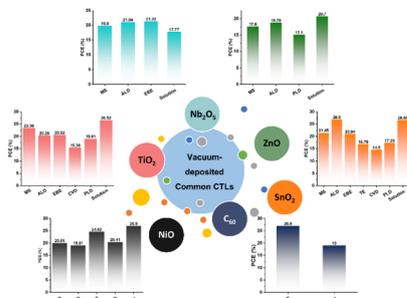
1659



Iridium-based electrocatalysts for the hydrogen oxidation reaction toward alkaline exchange membrane fuel cells

Yaping Chen,* Yuyue Yang, Ziheng Liang, Zhanpeng Tao, Qiao Ni* and Wenping Sun

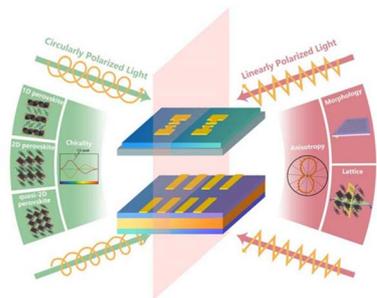
1669



Vacuum preparation of charge transport layers for perovskite solar cells and modules

Tian Luo, Lu Liu, Minyong Du, Kai Wang* and Shengzhong Liu*

1711

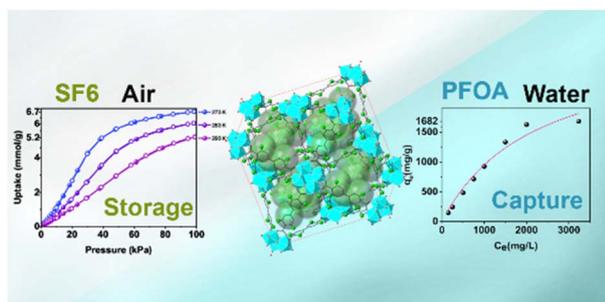


Progress in and outlook on polarization-sensitive perovskite photodetectors

Hongxu Chen, Guohua Wang, Yufei Wang, Xin Zhao, Xinglu Xu, Luxin Zhang, Wei Wei* and Liang Shen*

COMMUNICATIONS

1731



A fluorinated zirconium-based metal–organic framework as a platform for the capture and removal of perfluorinated pollutants from air and water

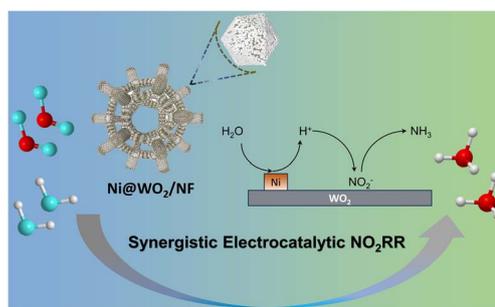
Daniel Hedbom, Philipp Gaiser, Tyran Günther, Ocean Cheung, Maria Strømme, Michelle Åhlén* and Martin Sjödin*



1738

The synergistic effect of Ni and WO₂ effectively boosts the electrochemical reduction of nitrite to ammonia

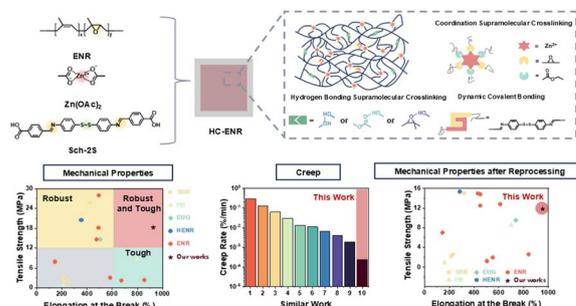
Hang Qiu, Qiuyue Chen, Jing Zhang, Xuguang An,^{*} Qian Liu, Lisi Xie, Weitang Yao and Qingquan Kong^{*}



1746

Robust, tough, ultra-low-creep and reprocessable rubber enabled by weak supramolecular-interaction-dominated yet strong covalent-bond-assisted reverse design paradigm

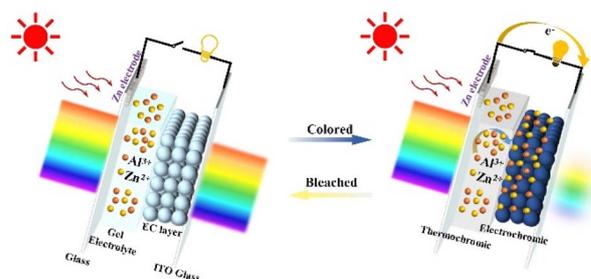
Wei-Chen Zhou, Xue-Qin Gao,^{*} Jia-Hao Li, Chen Ye, Yu-Zhong Wang and Cong Deng^{*}



1755

A bifunctional self-powered electrochromic and thermochromic smart window with enhanced privacy protection ability

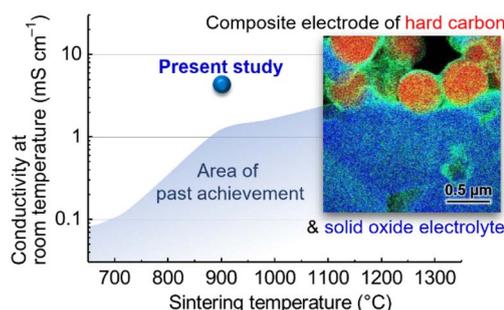
Wanxiong Yong, Weining Liu, Xiaoying Xin and Guodong Fu^{*}



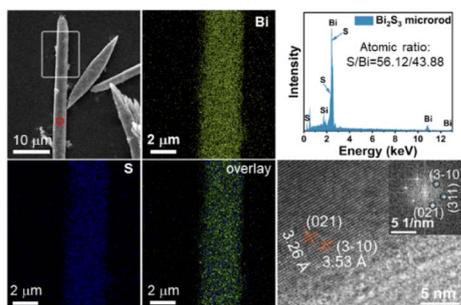
1766

High-conductivity, low-temperature sintering-compatible NASICON solid electrolyte for enhanced compositing with hard carbon electrode in all-solid-state batteries

Bowei Xun, Jian Wang, Yukio Sato, George Hasegawa, Hirofumi Akamatsu and Katsuro Hayashi^{*}



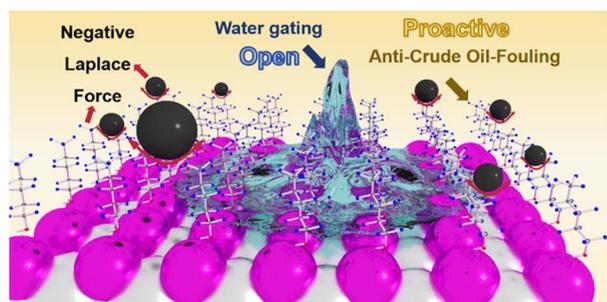
1772



Single-crystalline bismuth sulfide microrods for efficient visible light photodetection

Ao Zeng, Rawaid Ali, Shili Fu, Lei Liu, Asif Rasool, Chaoping Liu, Jiaxiu Man,* Xiaolu Zheng and Hong-En Wang*

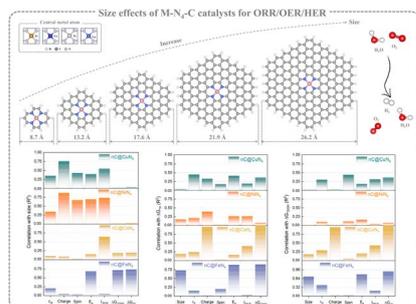
1779



Selective superwettability coated surface with proactive anti-crude-oil-fouling property

Zhecun Wang,* Zhanyuan Cui, Yubing Shao and Jinghan Zhang

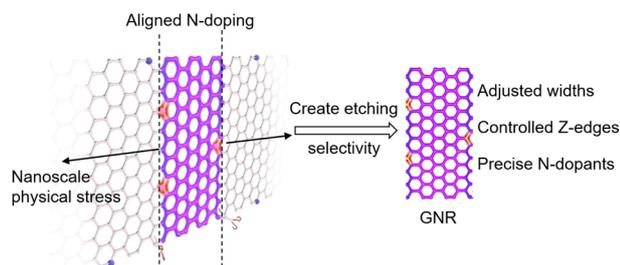
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Effect of molecular size on the electrocatalytic activity of M-N₄-C catalysts for ORR, OER, and HER

Liang Xie, Wei Zhou,* Zhibin Qu, Xiaoxiao Meng, Yuming Huang, Xuwei Zhang, Chaowei Yang, Junfeng Li, Jingyu Li, Fei Sun, Jihui Gao and Guangbo Zhao

1796



Synergistic strain and N-doping for creating physical orientation selectivity in chemical etching of graphene nanoribbons

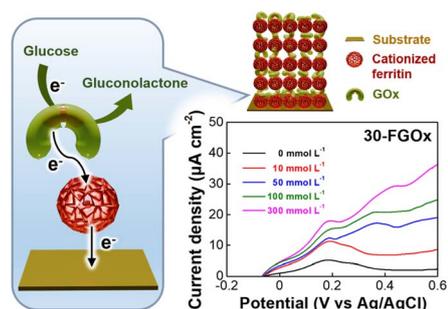
Xiangyu Meng, Yuansen Zhu, Ying Li, Chengqian Huang, Shiming Zhou,* Kuibo Yin, Liang Ma,* Jinlan Wang, Yueming Sun and Yunqian Dai*



1808

Enhancement of electron transfer efficiency in biofuel cell anodes using biocompatible redox-active ferritin and enzyme assemblies

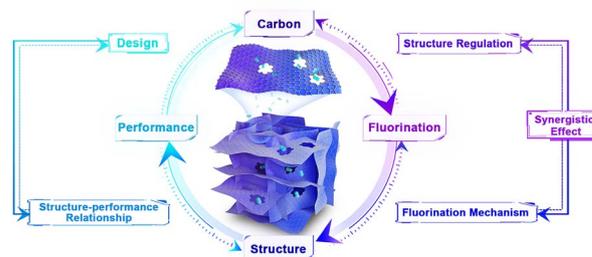
Gee Chan Jin, Hye Min Yu, Eui Guk Jung, Seung-Kyum Choi, Yongmin Ko* and Cheong Hoon Kwon*



1820

Elucidating the effects of the carbon source on fluorination kinetics and the CF_x structure to tailor the energy density of Li/CF_x

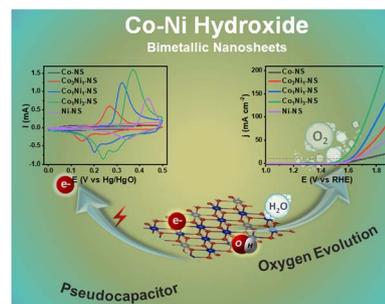
Shixue Zhang, Yu Li, Hang Xu, Cong Peng, Lingchen Kong, Zhihao Gui and Wei Feng*



1830

Unveiling the performance of ultrathin bimetallic Co_xNi_{1-x}(OH)₂ nanosheets for pseudocapacitors and oxygen evolution reaction

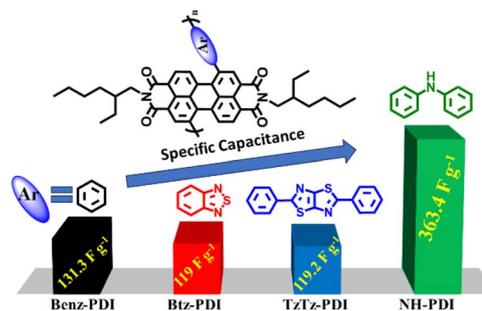
Pallavi Bhaktapralhad Jagdale, Sayali Ashok Patil, Arupjyoti Pathak, Mukaddar Sk, Ranjit Thapa, Amanda Sfeir, Sebastien Royer, Akshaya Kumar Samal and Manav Saxena*



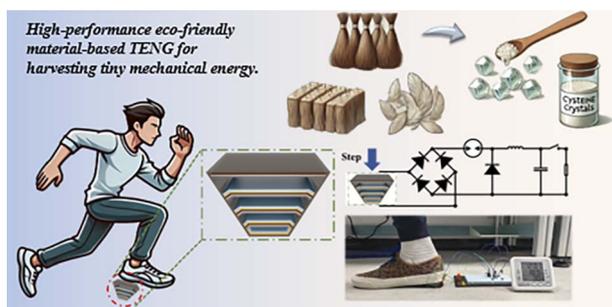
1842

Bay-substituted perylene diimide-based donor-acceptor type copolymers: design, synthesis, optical and energy storage behaviours

Lalmohan Das, Puspendu Das, Sk Mustak Ahamed, Ayan Datta, Arun K. Pal, Ayan Datta and Sudip Malik*



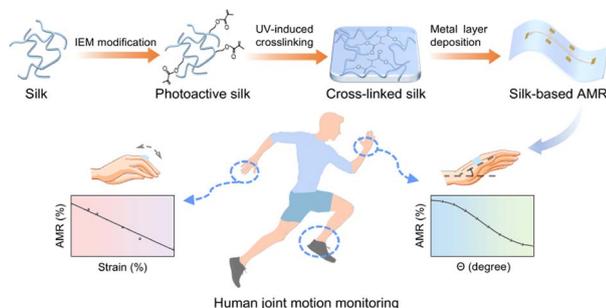
1853



PEO/cysteine composite nanofiber-based triboelectric nanogenerators for harvesting tiny mechanical energy

Yijun Hao, Jiayi Yang, Xiaopeng Zhu, Keke Hong, Jiayu Su, Yong Qin, Wei Su, Hongke Zhang, Chuguo Zhang* and Xiuhan Li*

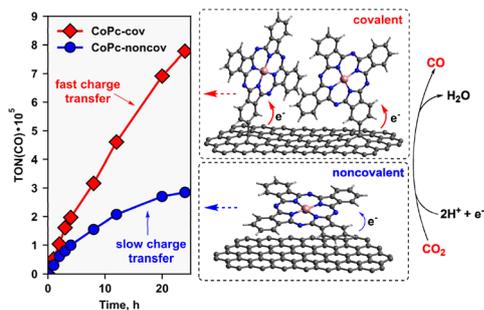
1863



A flexible silk film based on synergy of hydrogen bonds and a cross-linking network for magnetic sensitive skin

Cuilin Zhang, Qi Zhang, Xinran Li, Wang Zhan, Yongliang Han, Zeying Zhang, Wei Su, Li Xue, Wei Zhang, Ke Zhou, Shaoming Pan, Niancai Peng, Zhilu Ye,* Bin Peng* and Xiaohui Zhang*

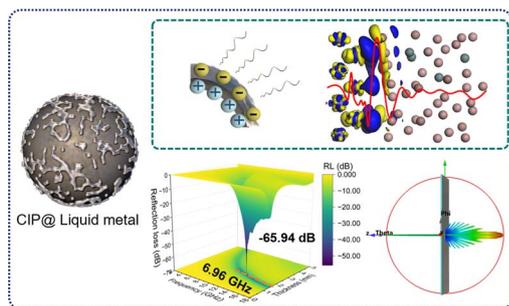
1874



Improved charge delivery within a covalently ligated cobalt phthalocyanine electrocatalyst for CO₂ reduction

Alena S. Kochubei, Aleksei N. Marianov, Oliver J. Conquest, Teng Lu, Yun Liu, Catherine Stampfl and Yijiao Jiang*

1887



Largely enhanced electromagnetic wave absorption via surface coating of carbonyl iron particles with liquid metal

Kang Xie, Qin Zhang,* Feng Chen* and Qiang Fu



1897

Ultrathin conjugated microporous thermoset nanosheets for efficient Li-ion storage

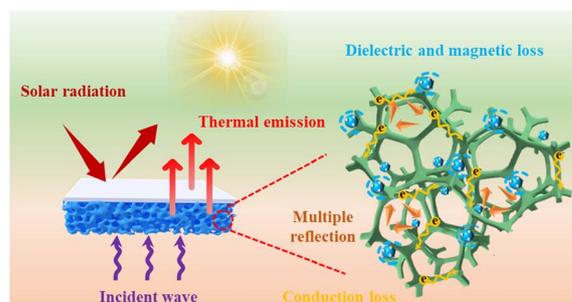
Yantuo Li, Yuzhe Sun, Jinshu Zhang, Yang Yang, Jianxue Wu, Mingyi Ning and Wei Liu*



1904

Construction of a photonic radiative cooling layer based on a 3D conductive network foam for efficient electromagnetic interference shielding and environmental thermal comfort

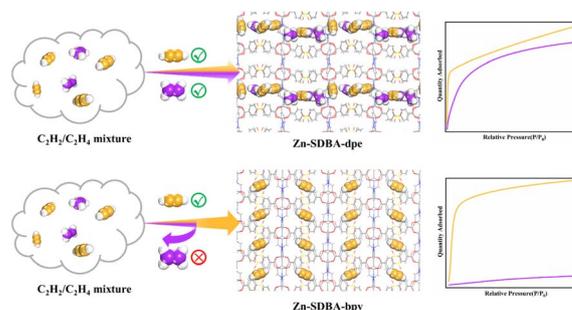
Mingtai Liu, Hongjian Huang,* Jie Mei, Siqi Yang,* Hao Tu and Jian Wang*



1915

Engineering the pore size of interpenetrated metal-organic frameworks for molecular sieving separation of C₂H₂/C₂H₄

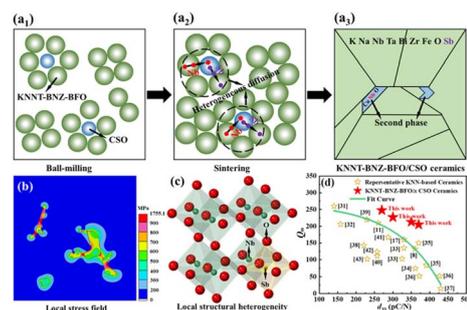
Pengxiang Wang, Shuangqing Shang, Hanting Xiong, Xing Liu, Junhui Liu, Hua Shuai, Lingmin Wang, Zhenglong Zhu, Zhiwei Zhao, Yong Peng, Jingwen Chen, Shixia Chen, Zhenyu Zhou* and Jun Wang



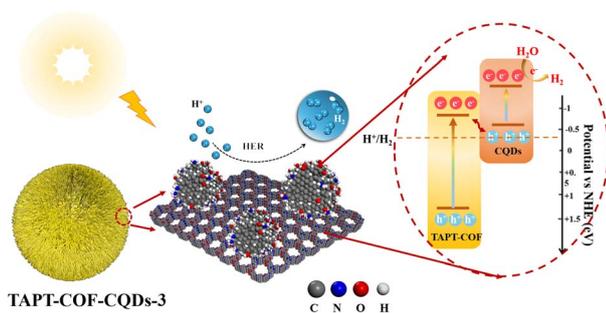
1923

Heterogeneous diffusion and remnant hardening with excellent electromechanical compatibility in alkaline niobate composites

Hongjiang Li, Ning Chen, Jie Xing, Wenbin Liu, Wei Shi, Hao Chen, Zhi Tan,* Manjing Tang, Mingyue Mo and Jianguo Zhu*



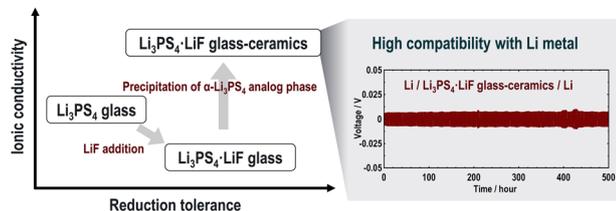
1932



Covalent organic framework spherical nanofibers bearing carbon quantum dots for boosting photocatalytic hydrogen production

Jiyuan Zang, Yuting Zhao, Lei Yu, David J. Young,^{*} Zhi-Gang Ren and Hong-Xi Li^{*}

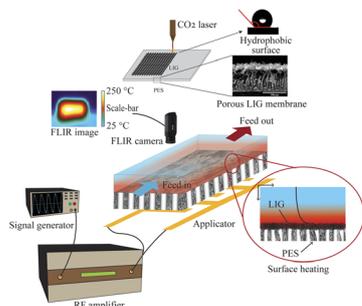
1942



LiF-doped sulfide solid electrolytes with a stabilized α - Li_3PS_4 analog phase for all-solid-state Li metal batteries

Taichi Asakura, Ryo Izawa, Takuya Kimura, Chie Hotehama, Hiroe Kowada, Minako Deguchi, Kota Motohashi, Atsushi Sakuda, Masahiro Tatsumisago and Akitoshi Hayashi^{*}

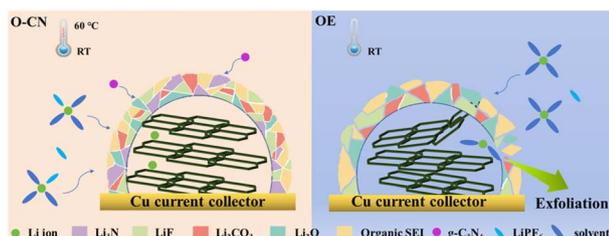
1950



Radiofrequency-triggered surface-heated laser-induced graphene membranes for enhanced membrane distillation

Hasib Mahbub, Fouzia Hasan Nowrin, Mohammad A. Saed and Mahdi Malmali^{*}

1964



Graphitic carbon nitride ($\text{g-C}_3\text{N}_4$) as an electrolyte additive boosts fast-charging and stable cycling of graphite anodes for Li-ion batteries

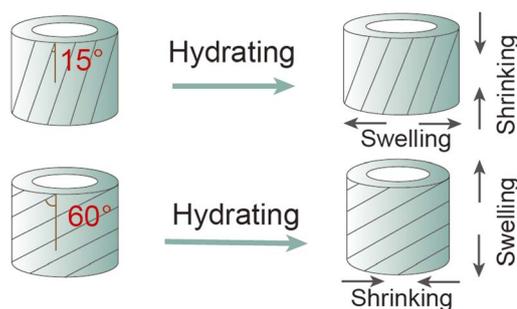
Jinze Song, Haoyu Qi, Wangsheng Yuan, Jiajin Li, Shanbao Zou, Wenlei Wang, Jiaxue Hu, Yunling Wu,^{*} Lijun Fu^{*} and Yuping Wu



1973

Hygromechanical deformation of wood cell walls regulated by the microfibril angle

RongZhuang Song, ZeZhou He, JiaHao Li, YuanZhen Hou, HengAn Wu and YinBo Zhu*



1983

Shola: a 3D porous hydrophobic–oleophilic lignocellulosic material for efficient oil/water separation

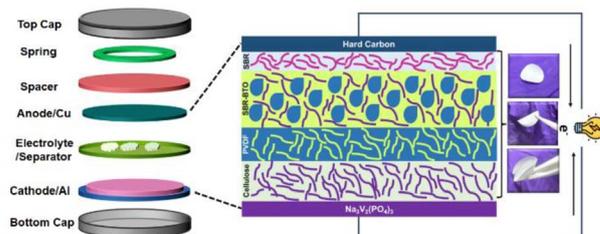
Keya Mondal, Kushagra Advani, Snigdha Ghosh, Kahiravan Shanmugathan, Goutam Kuls, Swaminathan Sivaram* and Sayam Sen Gupta*



1996

Flexible trilayer cellulosic paper separators engineered with the BaTiO₃ ferroelectric fillers for high energy density sodium-ion batteries

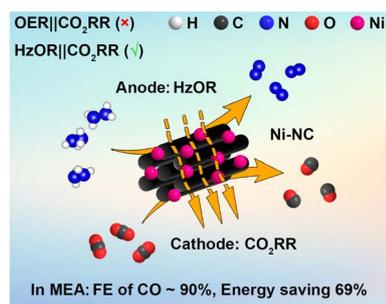
Simranjot K. Sapra, Mononita Das, M. Wasim Raja, Jeng-Kuei Chang and Rajendra S. Dhaka*



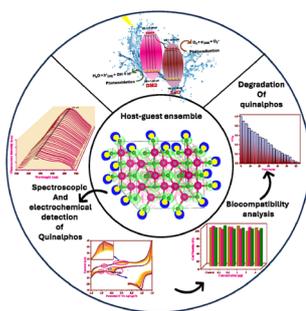
2010

Highly graphitized nitrogen-doped ordered mesoporous carbon supported Ni nanocrystals for efficient hydrazine-assisted CO₂ splitting

Kang Lian, Junyang Ding, Jin Zhang,* Quan Zhang,* Yifan Liu, Guangzhi Hu, Jia He and Xijun Liu*



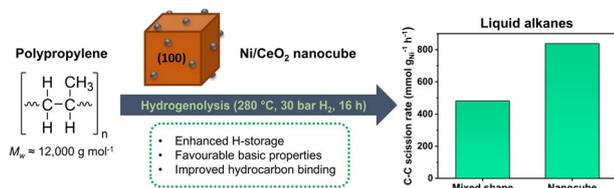
2019



Dipeptide-functionalized type II heterojunctions: a bioinspired dual functionality for quinalphos detection and photodegradation

Divya, Sanchit Kalra, Sanjeev Saini, Navneet Kaur* and Narinder Singh*

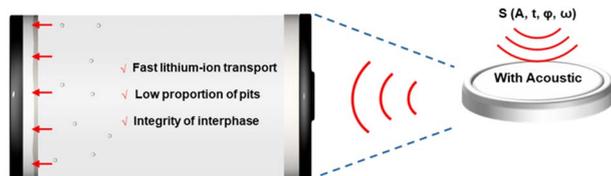
2032



Elucidating the effect of nanocube support morphology on the hydrogenolysis of polypropylene over Ni/CeO₂ catalysts

Donald R. Inns, Megan Carr, Mounib Bahri, Ajay Tomer, Troy D. Manning, Nigel Browning, Simon A. Kondrat, John B. Claridge, Alexandros P. Katsoulidis and Matthew J. Rosseinsky*

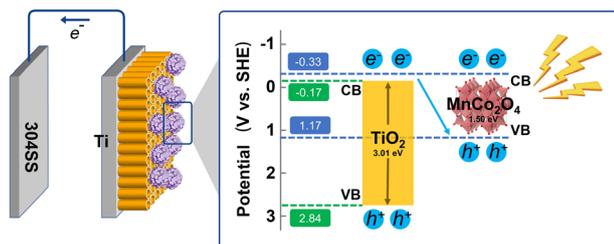
2047



Enhancing performance of lithium metal batteries through acoustic field application

Qipeng Zhang, Luyu Bo, Hao Li, Jiali Li, Teng Li, Zhenhua Tian* and Rui Qiao*

2056



Construction of a Z-scheme heterojunction with camellia-like MnCo₂O₄/TiO₂ for photogenerated cathodic protection

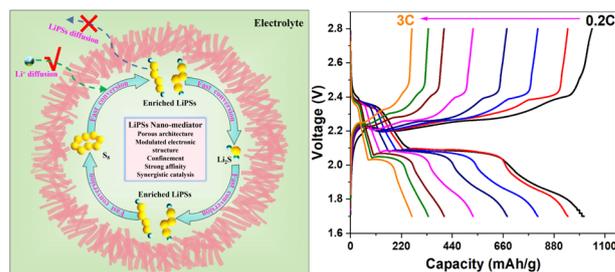
Yanan Sun, Xiutong Wang,* Congtao Sun, Shengxun Yao, Mingxing Wang, Jiayan Pu, Youbo Nan, Jingshun He, Xi Chen, Yanliang Huang and Fanglin Du



2067

One-step synthesis of hollow spherical Co/Ni hydroxides as multifunctional polysulfide mediators to steer sulfur redox kinetics for high performance lithium–sulfur batteries

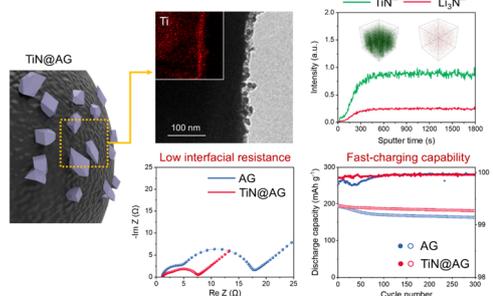
Zhen Li,^{*} Man Yang, Qing Li, Xianghan Cheng, Fengting Geng, Yuye Wang, Xiaoli Wang, Dashuai Zhang, Yongzheng Zhang, Xiuling Zhang, Zhongmin Liu, Xuliang Pang and Longlong Geng^{*}



2084

Conductive TiN network-assisted fast-charging of lithium-ion batteries

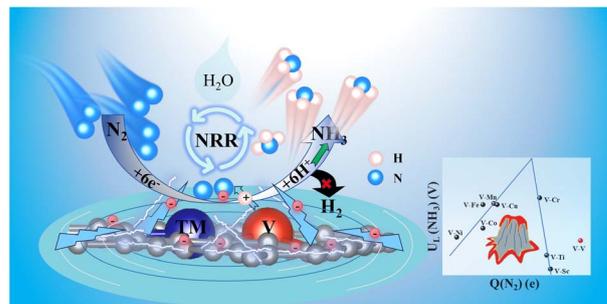
Won Ung Jeong, Hong Rim Shin, Ilyoung Choi, Jae Seok Jeong, Joo Hyeong Suh, Dong Ki Kim, Younguk Kim,^{*} Jong-Won Lee^{*} and Min-Sik Park^{*}



2093

Breaking scaling relations and boosting ammonia synthesis in nitrogen reduction with V-containing heteronuclear double metal atoms

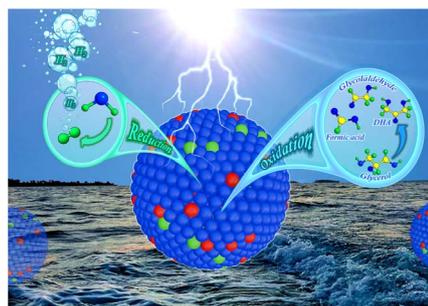
Bingling He, Mingyang Ren, Liying Zhang, Peng Lv,^{*} Mengyin Liu, Song Ye and Yu Jia^{*}



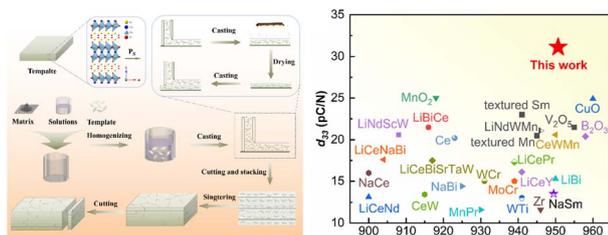
2105

Multifunctional NiO/Ti³⁺–TiO₂ for concurrent water reduction and glycerol oxidation to value added products by sunlight driven photocatalysis

Sivaraj Rajendran, Simi Saju, Sunesh S. Mani, Anantha Krishnan Asoka, Arindam Saha, Pushkaran S. Arun, Biplab Ghosh, Thomas Mathew^{*} and Chinnakonda S. Gopinath^{*}



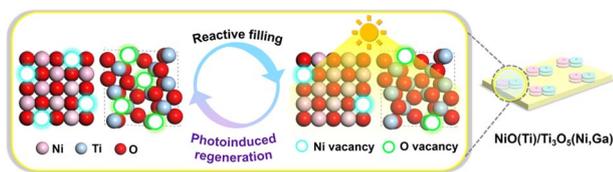
2121



Piezoelectricity in excess of 30 pC N⁻¹ with a high Curie temperature of 950 °C in strongly textured CaBi₂Nb₂O₉ ceramics

Xiaogang Luo, Mengsi Wang, Xi Yuan, Yan Zhang, Xuefan Zhou,* Hang Luo* and Dou Zhang

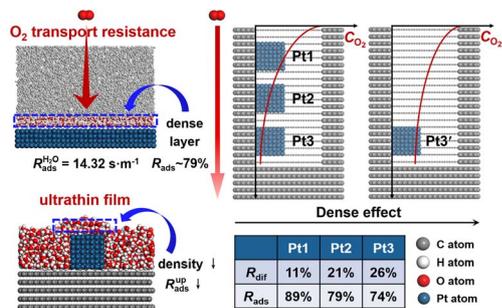
2131



A Z-scheme inorganic intergrowth bulk heterojunction to achieve photostimulated oxygen vacancy regeneration for photocatalytic CO₂ reduction

Yuexian Li, Wei Zou, Xiaoyan Wang, Jun Lu,* Weiwei Liu* and Shuo Wei*

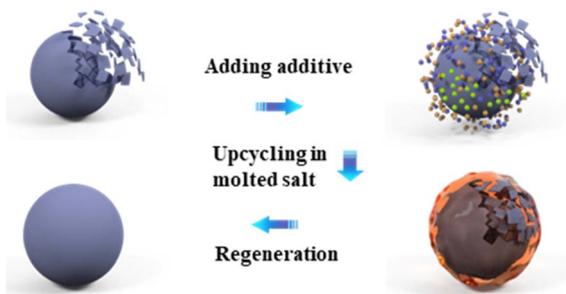
2143



Mechanisms of oxygen transport resistance of mesoporous carbon-supported catalysts in fuel cells

Kai-Bo An, Wen-Zhen Fang,* Zi-Hao Xuan, Guo-Rui Zhao, Han Ling and Wen-Quan Tao

2155



Value-added upcycling of spent low-nickel into a high-nickel layered oxide cathode *via* a eutectic salt system

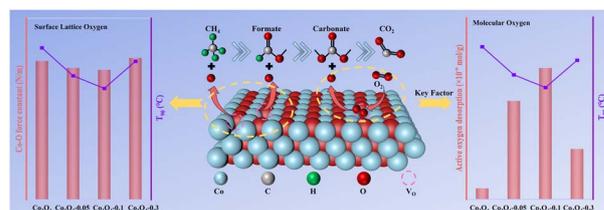
Mengyuan Li, Di Shao, Zhihao Mao, Zengjie Fan, Lei Xu, Hui Dou, Zuling Peng,* Bing Ding* and Xiaogang Zhang*



2162

In situ pyrolysis of ZIF-67 with cobalt nitrate etching for the catalytic oxidation of methane: promoting surface lattice oxygen and molecular oxygen activation

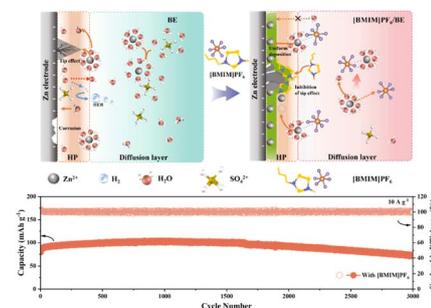
Yuyang Liu, Xiaofeng Wang,* Birong Miao, Qianji Chu, Yanghui Mao, Rui Zhang and Qingbo Li



2174

A multifunctional ionic liquid additive providing a solvation structure and electrostatic shielding layer for highly stable aqueous zinc ion batteries

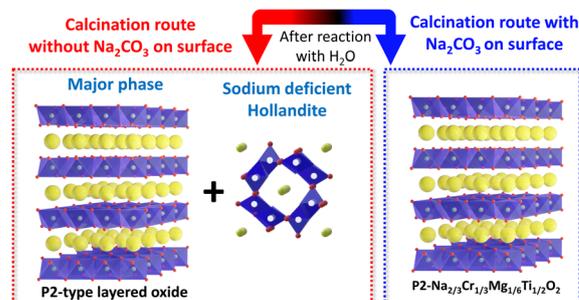
Chen Shen, Yuxin Zhang, Xiang Li, Peng Guo, Xiang Zeng, Kangqi Ni, Rufeng Cao, Zhenguo Wang, Zhiliang Wang* and Lin Qin*



2187

Mechanistic study on moisture exposure of Ti-based layered oxides for sodium storage applications

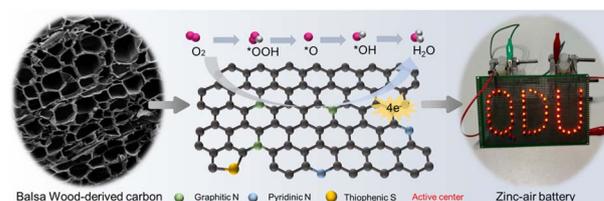
Benoît D. L. Campéon, Tetsuya Ishikawa, Kuriyama Tomohiro and Naoaki Yabuuchi*



2198

Electronic structure regulation of carbon atoms from wood for enhancing Zn–air battery performances

Shengyue Zhang, Zhonghao Chen, Zhong Xiong, Zhicong Wang, Zhihui Zhao, Zhixin Xue, Kang Li, Kai Wang and Bin Hui*



2208

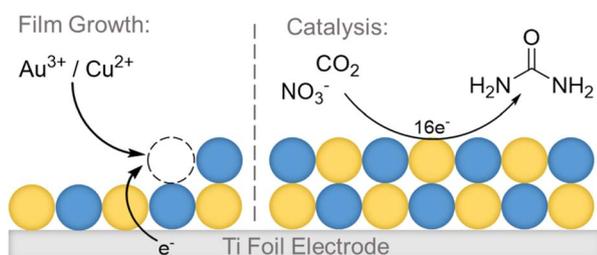


Low-cost and transparent cooling films with solar-selective nanoparticles for reducing the energy consumption of buildings

Cheng Wang, Hailu Wei, Zihua Zhou, Yuechao Chao, Junwei Liu,* Xueqing Yang, Yahui Du, Wufan Wang, Lu Yu, Shuqi Zhang and Jinyue Yan*

2217

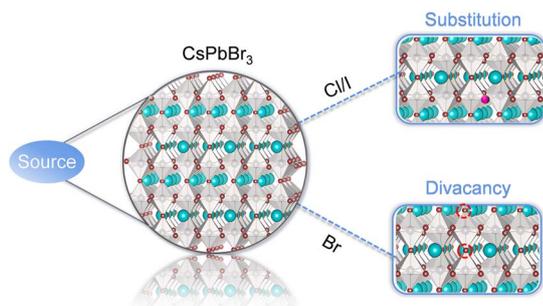
Electrochemically Grown AuCu Films for C-N Coupling



Conformal electrochemical deposition of intermetallic AuCu thin films for convergent C-N coupling

Carter S. Gerke, Gregory D. Y. Foley, Logan M. Wilder, Yuwei Yang, James L. Young, Nicholas M. Bedford, Elisa M. Miller and V. Sara Thoi*

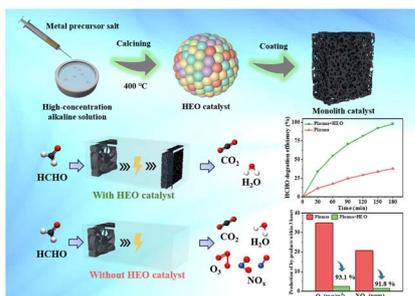
2227



Electronic structure of CsPbBr₃ with isovalent doping and divacancies: the smallest metal Pb cluster

Xiangyue Cui, Bowen Wang, Dandan Zhang, Hongfei Chen, Hejin Yan, Zheng Shu and Yongqing Cai*

2237



High-entropy oxide synthesis in concentrated alkaline solutions for plasma-catalytic formaldehyde oxidation

Xiaodong Liu, Zijie Qin, Rongrong Jia, Liyi Shi and Lei Huang*



2251

Near-infrared driven N_2 fixation on ZnO–MXene (Ti_3C_2) heterostructures through pyroelectric catalysis

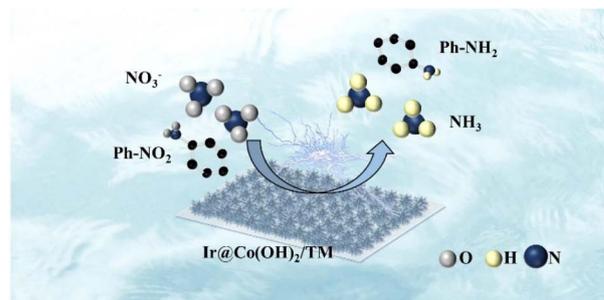
Chunzheng Wu, Jingyuan Lin, Zhuojiong Xie, Xuan Kai, Xiao Yu, Zhenyu Yan, Jinwei Fang, Shanliang Chen, Jianzhong Guo,* Wei Wang* and Fengping Peng*



2263

Iridium-incorporated cobalt hydroxide electrodeposited on titanium meshes enabling electroreduction of nitrate and nitrobenzene to ammonia and aniline

Jingwen Yan, Song Wu, DongLin Zhao, Dandan Li, Guangyin Fan,* Yan Long and Xiaojun Yu*

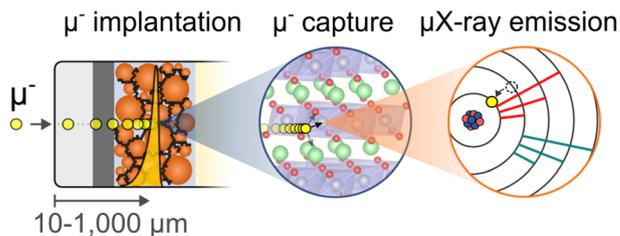


2275

Overcoming the probing-depth dilemma in spectroscopic analyses of batteries with muon-induced X-ray emission (MIXE)

Edouard Quérel,* Sayani Biswas,* Michael W. Heiss, Lars Gerchow, Qing Wang, Ryo Asakura, Gian Müller, Debarchan Das, Zurab Guguchia, Fabian Hotz, Gianluca Janka, Andreas Knecht, Hubertus Luetkens, Charles Mielke, III, Carlos Vigo, Chennan Wang, Stergiani Marina Vogiatzi, Toni Shiroka, Thomas Prokscha, Katharina von Schoeler, Shunsuke Asari, I.-Huan Chiu, Akira Sato, Kazuhiko Ninomiya, Megumi Niikura, Corsin Battaglia, Alex Amato and Arndt Remhof

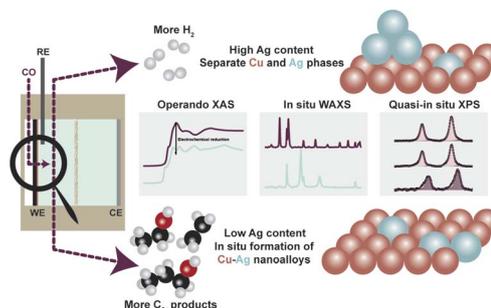
MIXE for battery characterization



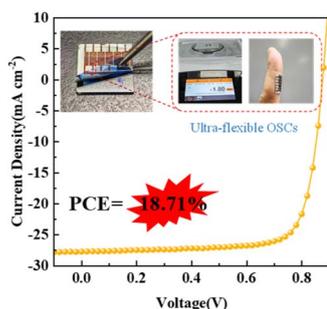
2285

Cu–Ag interactions in bimetallic Cu–Ag catalysts enhance C_{2+} product formation during electrochemical CO reduction

Floriane A. Rollier, Valery Muravev, Nikolay Kosinov, Tim Wissink, Dimitra Anastasiadou, Bianca Ligt, Laurent Barthe, Marta Costa Figueiredo and Emiel J. M. Hensen*



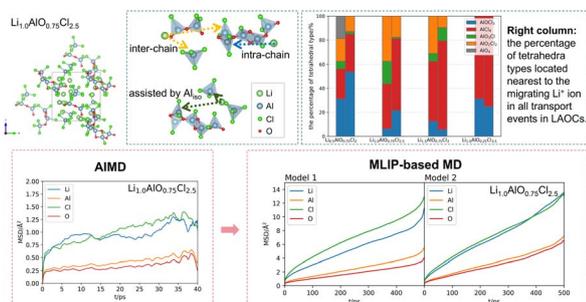
2301



Ultra-flexible organic solar cells based on eco-friendly cellulose substrate with efficiency approaching 19%

Zheng Xiao, Jian Liu, Xin Chen, Zhaochen Suo, Xiangjian Cao, Nuo Xu, Zhaoyang Yao, Chenxi Li, Xiangjian Wan* and Yongsheng Chen*

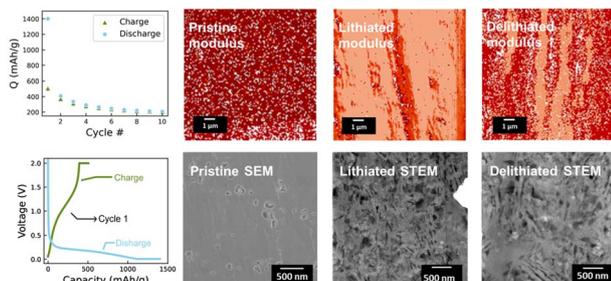
2309



Atomic insight into Li⁺ ion transport in amorphous electrolytes Li_xAlO_yCl_{3+x-2y} (0.5 ≤ x ≤ 1.5, 0.25 ≤ y ≤ 0.75)

Qifan Yang, Jing Xu, Xiao Fu, Jingchen Lian, Liqi Wang, Xuhe Gong, Ruijuan Xiao* and Hong Li*

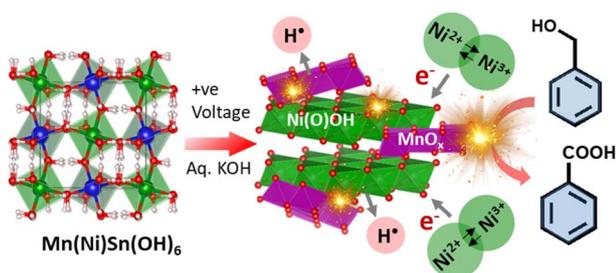
2316



Mechanical and electrical changes in electrochemically active polyimide binders for Li-ion batteries

Zoey Huey, Joseph Quinn, Marco-T. F. Rodrigues, Sathish Rajendran, Chongmin Wang, Steven DeCaluwe and Chun-Sheng Jiang*

2327



A MnNi-heterometallic perovskite hydroxide (pre)catalyst for electrochemical alcohol oxidation: insight into the active phase

Anisha Mondal, Subhash Chandra Shit and Indranil Mondal*



CORRECTIONS

2335

Correction: Atomic-scale structure and thermoelectric properties in medium-entropy PbSnTeSe alloy

Shuwei Zhang, Liqing Xu,* Xinxiu Cheng, Wei Liu, Zhanxiang Yin, Xiangdong Ding, Xiang Gao, Tao Hong* and Yu Xiao*

2336

Correction: Raman spectroscopy study of K-birnessite single crystals

Dong Han Ha,* Gichang Noh, Hakseong Kim, Dong Hwan Kim, Jeongho Kim, Suyong Jung, Chanyong Hwang, Ha Young Lee, Yong Ju Yun, Joon Young Kwak, Kibum Kang and Sam Nyung Yi*

2337

Correction: Growth of p/n-type BiFeO₃ thin films for construction of a bilayer p–n junction for photodegradation of organic pollutants

Hao-Yun Tu and Xiaoding Qi*

2338

Correction: H₂O assisted in improving the electrochemical performance of a deep eutectic electrolyte formed by choline chloride and magnesium chloride hexahydrate

Kaixiang Zou, Xiao Wang and Yuanfu Deng*

