

# Journal of Materials Chemistry A

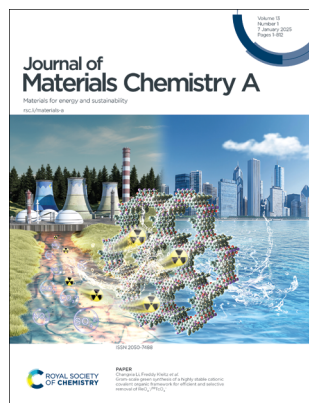
Materials for energy and sustainability

[rsc.li/materials-a](http://rsc.li/materials-a)

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

## IN THIS ISSUE

ISSN 2050-7488 CODEN JMCAET 13(1) 1–812 (2025)



### Cover

See Changxia Li, Freddy Kleitz *et al.*, pp. 214–219. Image reproduced by permission of Freddy Kleitz and Changxia Li from *J. Mater. Chem. A*, 2025, **13**, 214.



### Inside cover

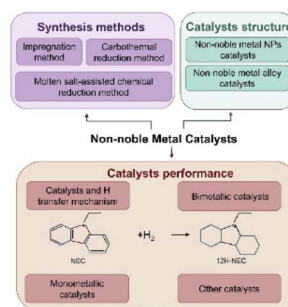
See Jose J. Plata *et al.*, pp. 220–229. Image reproduced by permission of Victor Postigua, Hernández, José Javier Plata Ramos from *J. Mater. Chem. A*, 2025, **13**, 220.

## REVIEWS

20

### Recent advances in non-noble metal catalysts toward *N*-ethylcarbazole hydrogen storage

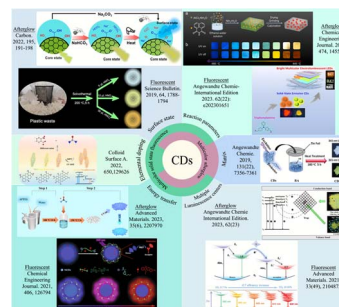
Hansai Wu, Junming Zhang, Zicong Wang, Xianglong Kong, Gaofu Li, Ying Zhao,\* Piaoping Yang\* and Zhiliang Liu\*



36

### Multicolor solid-state fluorescence and multicolor afterglow carbon dots: preparation, luminescence regulation, and applications

Qiang Fu,\* Jianye Zhang, Kailin Zhang, Shouhong Sun and Zhanhua Dong



# RSC Sustainability

GOLD  
OPEN  
ACCESS

Dedicated to sustainable  
chemistry and new solutions

For an open, green and inclusive future

[rsc.li/RSCSus](https://rsc.li/RSCSus)

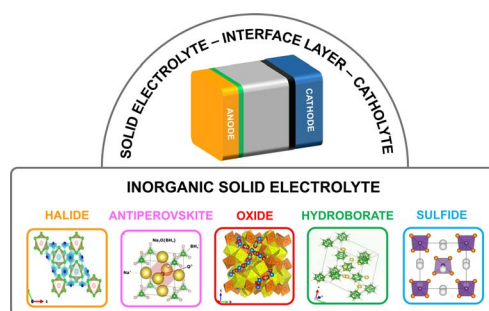
Fundamental questions  
Elemental answers

## REVIEWS

73

## Inorganic solid electrolytes for all-solid-state lithium/sodium-ion batteries: recent developments and applications

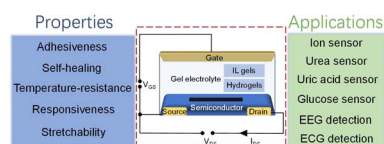
Muhammad Muzakir, Karnan Manickavasakam, Eric Jianfeng Cheng,\* Fangling Yang, Ziyun Wang, Hao Li, Xinyu Zhang and Jiaqian Qin\*



136

## Solid-state organic electrochemical transistors (OECTs) based on gel electrolytes for biosensors and bioelectronics

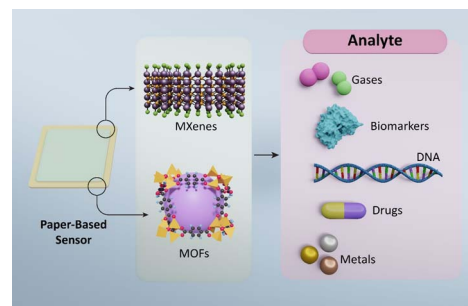
Dongdong Lu\* and Hu Chen\*



158

## Advancing paper-based sensors with MXenes and MOFs: exploring cutting-edge innovations

Sepehr Larjani, Atefeh Zarepour, Arezoo Khosravi, Siavash Iravani,\* Mahnaz Eskandari\* and Ali Zarrabi\*

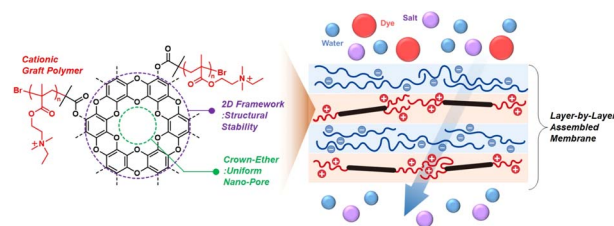


## COMMUNICATIONS

184

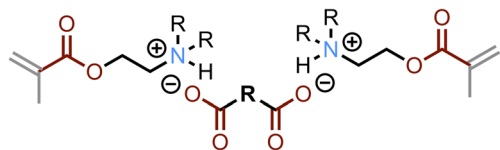
## Ordered crown-ether 2D framework based loose nanofiltration membranes for improved separation and stability

Jae Jun Kim, Huiran Seo, Jinseok Kim, Mun Hyeon Kim, Jinwook Park, Hyunkee Hong, Hee Joong Kim\* and Jong-Chan Lee\*



190

## Liquid Resins from Solid Carboxylic Acids

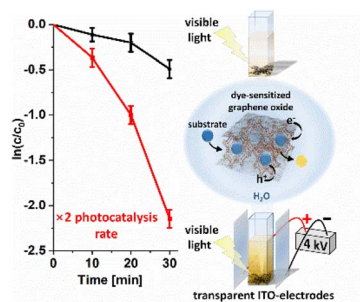


- ✓ low viscosity
- ✓ fast methacrylate polymerization
- ✓ wide selection of acids
- ✓ dual-cure with epoxy

## Solventless, rapid-polymerizable liquid resins from solid carboxylic acids through low-viscosity acid/base complexes

Grant M. Musgrave, Eden Y. Yau, Sijia Huang, Caleb J. Reese and Chen Wang\*

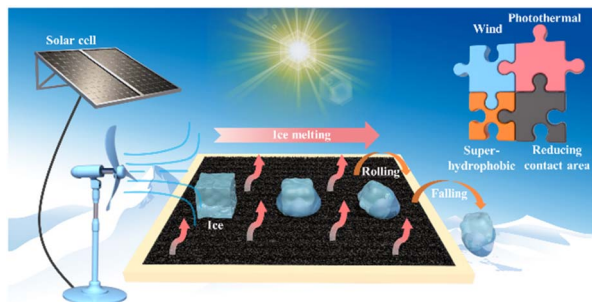
200



## Electric field-induced amplification of graphene oxide's visible light photocatalytic activity

Alsu G. Nugmanova, Maxim R. Sokolov, Alexey E. Alexandrov, Maria A. Kniazeva, Ivan Yu. Eremchev, Andrey V. Naumov, Danil W. Boukhvalov, Burkhard König and Maria A. Kalinina\*

205

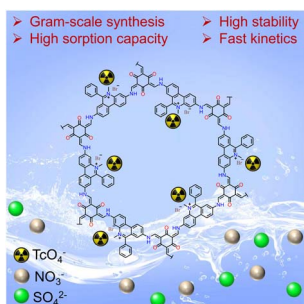


## Efficient anti-icing/deicing via photothermal-wind synergistic effects on femtosecond laser-induced superhydrophobic graphene

Xinghao Song, Kai Yin,\* Xun Li, Lingxiao Wang, Pengyu Yang, Jiaqing Pei, Yin Huang, Christopher J. Arnusch and Guoqiang Li\*

## PAPERS

214

Gram-scale green synthesis of a highly stable cationic covalent organic framework for efficient and selective removal of  $\text{ReO}_4^- / ^{99}\text{TcO}_4^-$ 

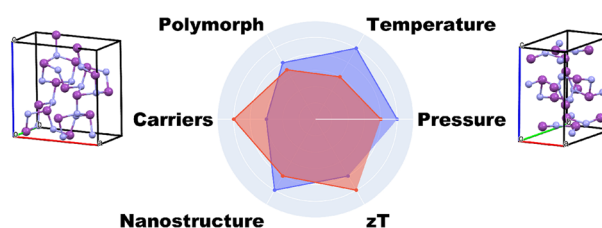
Changxia Li,\* Justyna Florek, Patrick Guggenberger and Freddy Kleitz\*



220

## Enhancing the thermoelectric figure of merit of BiN via polymorphism, pressure, and nanostructuring

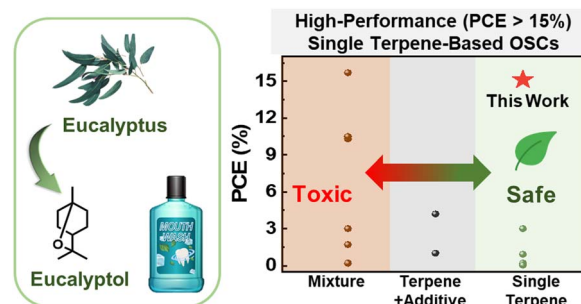
Elena R. Remesal, Victor Posligua, Miguel Mahillo-Paniagua, Konstantin Glazyrin, Javier Fdez. Sanz, Antonio M. Márquez and Jose J. Plata\*



230

## High-performance, ambient-processable organic solar cells achieved by single terpene-based entirely eco-friendly process

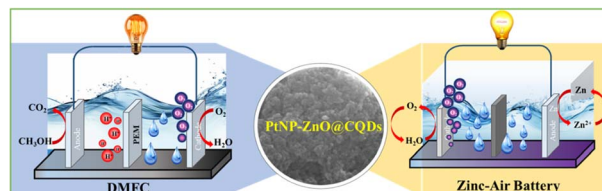
Hyerin Jeon, Jin-Woo Lee, Kihyun Bae, Tan Ngoc-Lan Phan, Chulhee Lim, Jaeyoung Choi, Cheng Wang, Seungjin Lee\* and Bumjoon J. Kim\*



243

## Pt-nanoparticles on ZnO/carbon quantum dots: a trifunctional nanocomposite with superior electrocatalytic activity boosting direct methanol fuel cells and zinc-air batteries

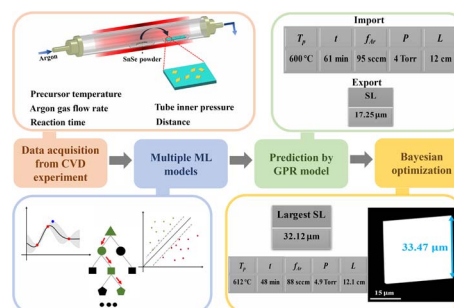
Anup Kumar Pradhan, Sayan Halder and Chanchal Chakraborty\*



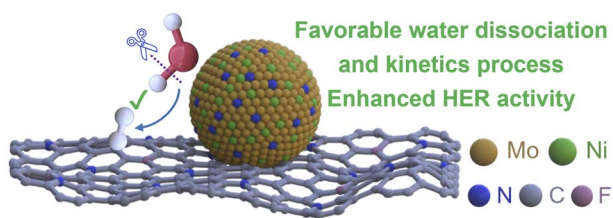
257

## Controlled growth of high-quality SnSe nanoplates assisted by machine learning

Huijia Luo, Wenwu Pan, Junliang Liu, Han Wang, Songqing Zhang, Yongling Ren, Cailei Yuan and Wen Lei\*



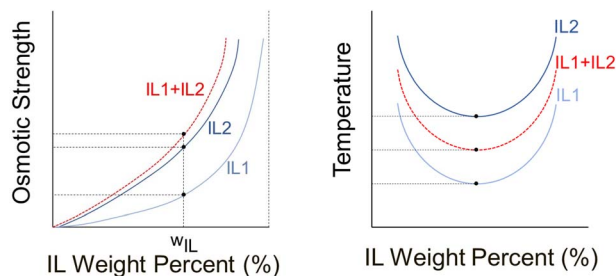
267



### Modulating the electronic interactions via heterostructure engineering for energy-saving hydrogen production at high current densities

Dongxing Tan,<sup>\*</sup> Xianfang Yin, Jing Wang, Zixuan Zhang, Xiao Zhu, Hengrui Kang and Yuanyuan Feng<sup>\*</sup>

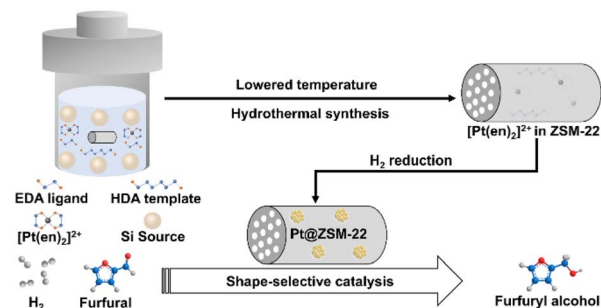
275



### Performance enhancement of aqueous ionic liquids with lower critical solution temperature (LCST) behavior through ternary mixtures

Ahmed Mahfouz, Andrew Z. Haddad, Jordan D. Kocher and Akanksha K. Menon<sup>\*</sup>

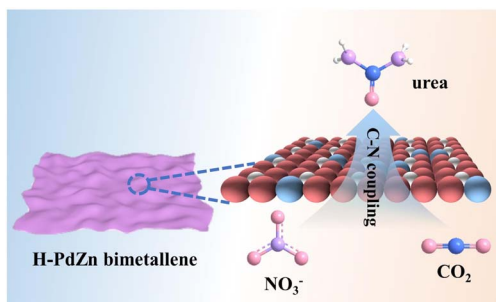
289



### Ligand-protected and lowered-temperature hydrothermal synthesis of platinum encapsulated in TON zeolite for shape-selective hydrogenation of furfural to furfuryl alcohol

Xuelin Wang, Congxin Wang,<sup>\*</sup> Wentao Bi, Wei Qu and Zhijian Tian<sup>\*</sup>

305



### Hydrogen-intercalation PdZn bimetallic for urea electro-synthesis from nitrate and carbon dioxide

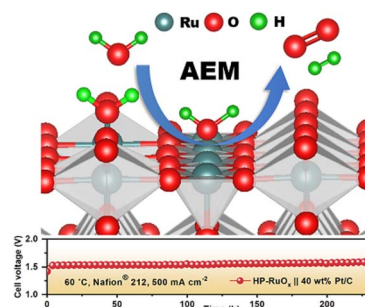
Ziqiang Wang, Yanan Wang, Shan Xu, Kai Deng, Hongjie Yu, You Xu, Hongjing Wang<sup>\*</sup> and Liang Wang<sup>\*</sup>



312

### Oxygen-defective ruthenium oxide as an efficient and durable electrocatalyst for acidic oxygen evolution reaction

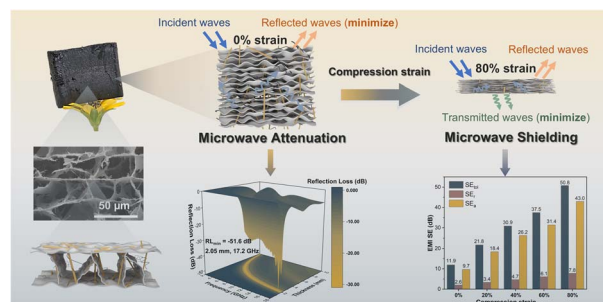
Jingwei Wang, Lejuan Cai, Zhipeng Yu,\* Hao Tan, Xinyi Xiang, Kaiyang Xu, Yang Chao, Sitaramanjaneya Mouli Thalluri, Fei Lin, Haoliang Huang, Chenyue Zhang, Yang Zhao, Wenlong Wang\* and Lifeng Liu\*



325

### Mechanical-dielectric optimized graphene aerogels with strain-tunable microwave attenuation and shielding functions

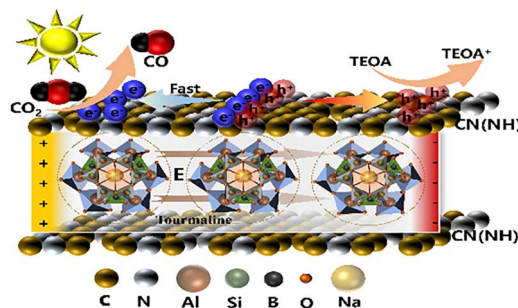
Yijing Zhao, Nasir Ahmad, Yong Yang\* and Wei Zhai\*



340

### Enhancing photoactivity of defective g-C<sub>3</sub>N<sub>4</sub> via self-polarization effect of tourmaline for CO<sub>2</sub> reduction

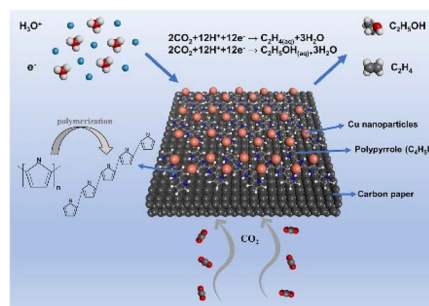
Jiangpeng Wang, Chao Huang, Deng Liu, Huihui Peng, Qiong Luo, Dimin Yang, Xuelian Yu\* and Yingmo Hu\*



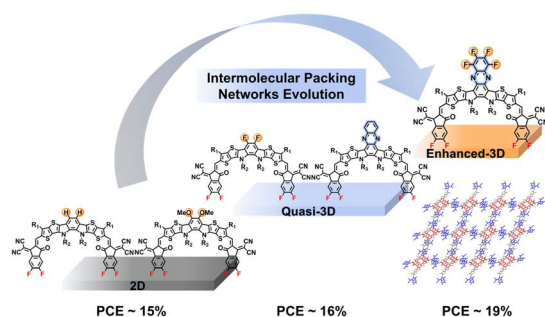
348

### A local proton-transport promoter for industrial CO<sub>2</sub> electroreduction to multicarbon products

Haiyi Guo, Qi Huang, Di Li, Shiyu Dai, Kang Yang, Sheng Chen, Wei Ma,\* Qiang Li\* and Jingjing Duan\*



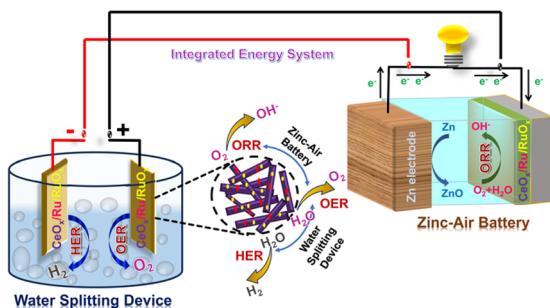
356



### Root-cause analyses for 3D intermolecular packing network formation in central unit extended small molecular acceptors

Jiaxin Guo, Xiangjian Cao, Zheng Xu, Tengfei He, Xingqi Bi, Zhaoyang Yao,<sup>\*</sup> Yaxiao Guo, Guankui Long, Chenxi Li, Xiangjian Wan<sup>\*</sup> and Yongsheng Chen<sup>\*</sup>

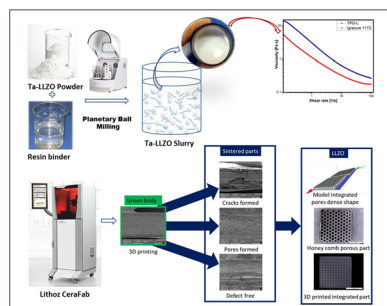
368



### Synergistic influence of multivalent Ru<sup>δ+</sup> on a CeO<sub>x</sub> nanocatalyst for self-powered efficient electrochemical water splitting

Papri Mondal and Sujoy Baitalik<sup>\*</sup>

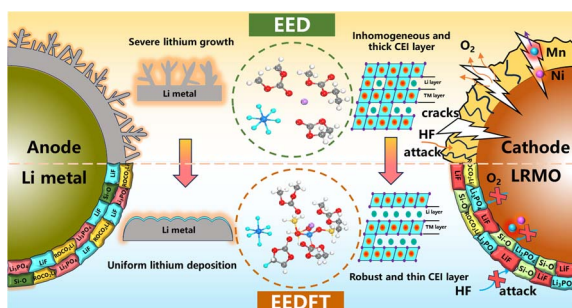
387



### Vat photopolymerization of tantalum-doped Li<sub>7</sub>La<sub>3</sub>Zr<sub>2</sub>O<sub>12</sub> electrolytes: a new Frontier in solid-state battery design

Diwakar Karupiah, Dmitrii Komissarenko, Tamanna Thakur, Nur Sena Yüzbası, Frank Clemens, Elias Reisacher, Pinar Kaya, James Pikul and Gurdial Blugan<sup>\*</sup>

399



### Synchronous dual additives to boost multiphase interface stability of high-voltage Li-rich Mn-based batteries

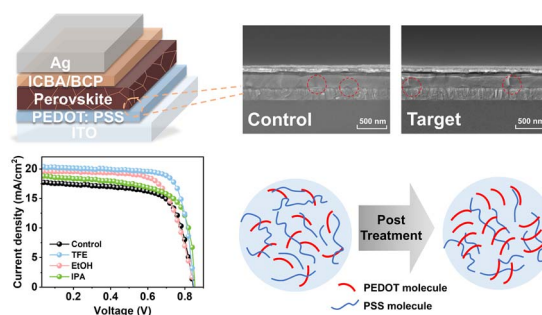
Qiangfeng Zhang, Shijie Xu, Haipeng Zhu, Zhao Chen, Libao Chen, Chunxiao Zhang<sup>\*</sup> and Weifeng Wei



409

## Enhanced charge carrier extraction and transport with interface modification for efficient tin-based perovskite solar cells

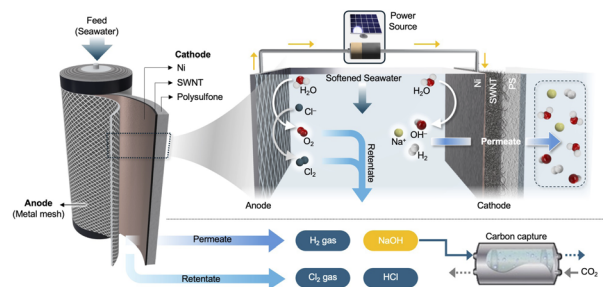
Zhenzhu Zhao, Mulin Sun, Fang Xiang, Xuefei Wu, Zachary Fink, Zongming Huang, Junyao Gao, Honghe Ding, Pengju Tan, Chengjian Yuan, Yuqian Yang, Nikita A. Emelianov, Lyubov A. Frolova, Zhengguo Xiao, Pavel A. Troshin, Thomas P. Russell, Junfa Zhu, Yu Li\* and Qin Hu\*



418

## Efficient caustic and hydrogen production using a pressurized flow-through cathode

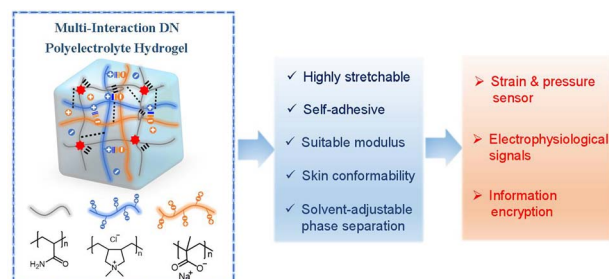
Fan Yang, Minhao Xiao, Sangsuk Lee, Javier Alan Quezada Renteria, Xinyi Wang, Minju Cha, Anya Dickinson-Cove, Sungsoon Kim, Guy Z. Ramon, Gaurav N. Sant, Eric M. V. Hoek and David Jassby\*



427

## A multi-interaction conductive double-network polyelectrolyte hydrogel with high stretchability, self-adhesion, and tunable transparency for bioelectronic sensing and information encryption

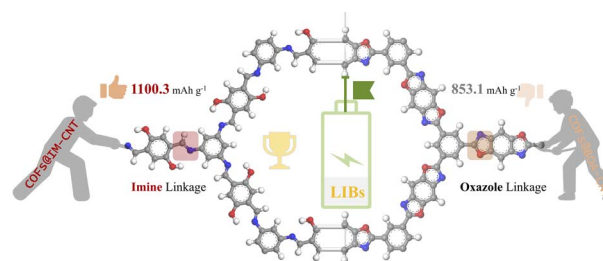
Dongdong Lu,\* Zilong Zhu, Mingning Zhu, Peng Zhang and Xiaodong Xiang\*



441

## Linkage engineering regulated $\pi$ -conjugated covalent organic framework (COF)-based anodes for high-performance LIBs

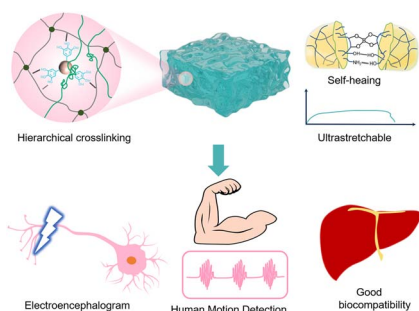
Changyu Weng, Hongmei Yuan, Jie Wang, Longlong Ma and Jianguo Liu\*



Through linkage engineering to regulate COFs as anodes.



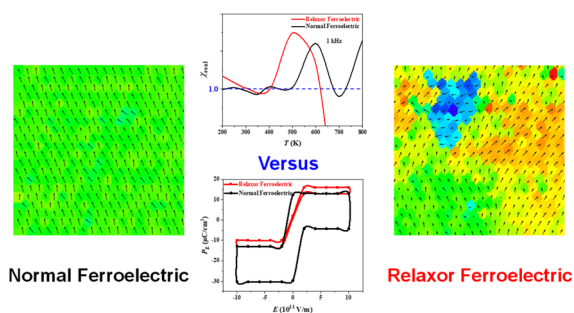
450



### Hierarchical hybrid crosslinking multifunctional gelatin-based hydrogel: ideal platforms for flexible wearable devices, brain–computer interfaces and biomedical applications

Chang Xu, Shiqiang Guan, Hao Zhang, Weiwang Fan, Xijing Zhuang\* and Xufeng Dong\*

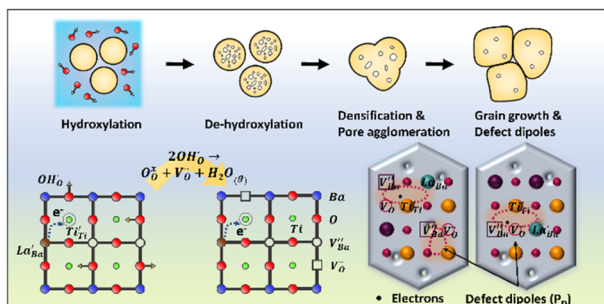
460



### Monte Carlo simulations of the temperature-dependent microstructure evolution of relaxor ferroelectric polymers

Tong Guan, Quan-Ao He and Shuang Chen\*

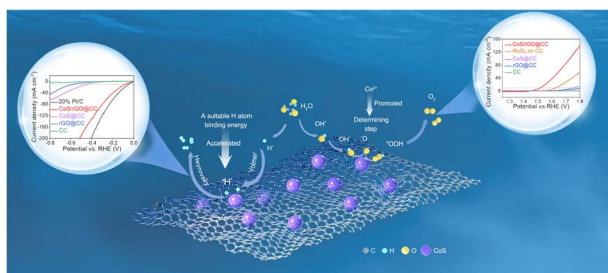
475



### Enhanced colossal permittivity in mono-doped BaTiO<sub>3</sub> via particle hydroxylation-induced defect dipoles

Seung Yong Lee, Jung Hwan Song, Jiseop Oh and Do Kyung Kim\*

486



### Facile engineering of CoS/rGO heterostructures on carbon cloth for efficient all-pH hydrogen evolution reaction and alkaline water electrolysis

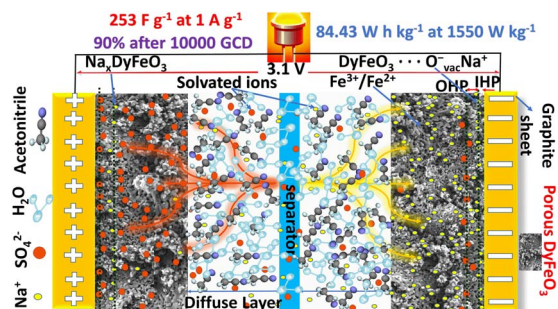
Yuxian Chen, Jiayi Rong, Qiaolin Fan, Meng Sun, Qiuyi Deng, Zhonghua Ni, Xiao Li\* and Tao Hu\*



499

## High-voltage symmetric supercapacitors developed by engineering DyFeO<sub>3</sub> electrodes and aqueous electrolytes

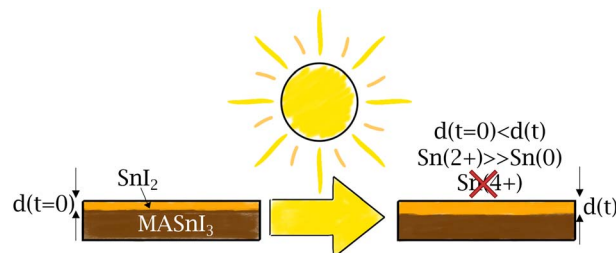
Mohasin Tarek, Ferdous Yasmeen and M. A. Basith\*



517

## Light-induced degradation of methylammonium tin iodide absorber layers

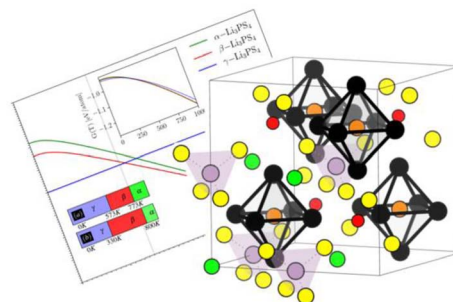
Joana Ferreira Machado, Jeremy Hieulle, Aline Vanderhaegen and Alex Redinger\*



526

## The devil in the details: lessons from Li<sub>6</sub>PS<sub>5</sub>X for robust high-throughput workflows

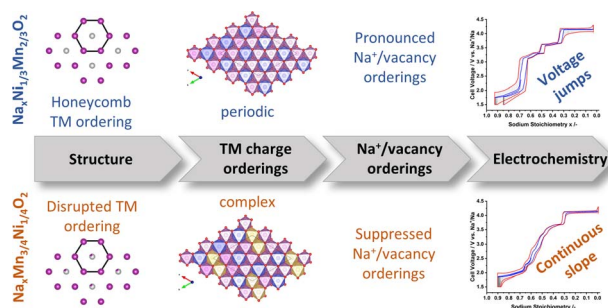
Asif Iqbal Bhatti, Sandeep Kumar, Catharina Jaeken, Michael Sluydts, Danny E. P. Vanpoucke and Stefaan Cottenier\*



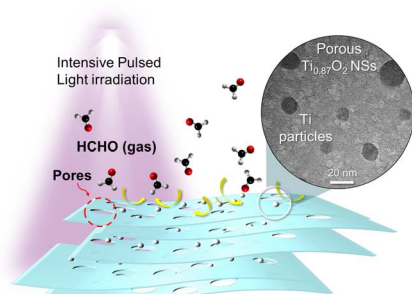
540

## From structure to electrochemistry: the influence of transition metal ordering on Na<sup>+</sup>/vacancy orderings in P2-type Na<sub>x</sub>MO<sub>2</sub> cathode materials for sodium-ion batteries

Lukas Fridolin Pfeiffer,\* Manuel Dillenz, Nora Burgard, Premysl Beran, Daniel Roscher, Maider Zarrabeitia, Paul Drews, Charles Hervoches, Daria Mikhailova, Ahmad Omar, Volodymyr Baran, Neelima Paul, Mohsen Sotoudeh, Michael Busch, Margret Wohlfahrt-Mehrens, Axel Groß, Stefano Passerini and Peter Axmann\*



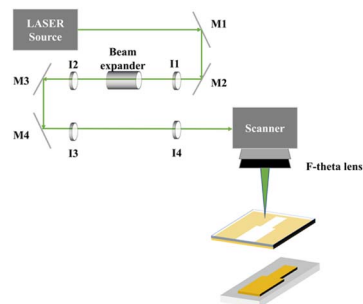
561



### Ultrafast formation of porosity and heterogeneous structures on 2D oxides via momentary photothermal effect

Ahrom Ryu, Bo-In Park, Hyun-Jae Lee, Jung-Won An, Jeong-Jun Kim, Sahn Nahm, Seong H. Kim, Byungju Lee,\* Ji-Won Choi\* and Ji-Soo Jang\*

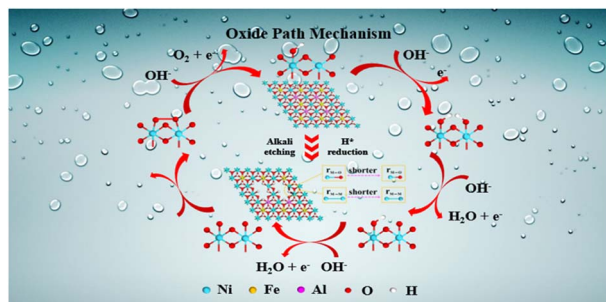
573



### Non-enzymatic low-level glucose detection electrode fabricated via single-step laser-induced forward transfer

Pong-Ping Liu, Shing-Fung Lau and Chien-Fang Ding\*

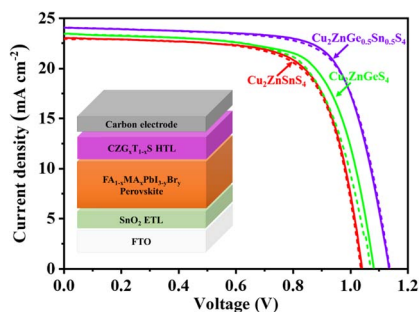
587



### Atomic cation and anion co-vacancy defects boosted the oxide path mechanism of the oxygen evolution reaction on NiFeAl-layered double hydroxide

Zhaoyan Li, Duo Wang, Hongguang Kang, Zhongning Shi, Xianwei Hu, Hongbin Sun and Junli Xu\*

595



### Composition engineering of a $\text{Cu}_2\text{ZnGe}_x\text{Sn}_{1-x}\text{S}_4$ nanoparticle hole transport layer for carbon electrode-based perovskite solar cells

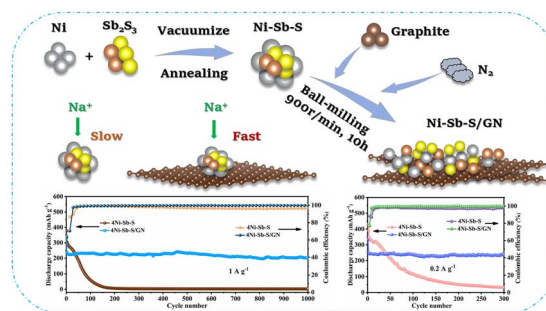
Nian Cheng,\* Weiwei Li, Zhenyu Xiao, Han Pan, Dingshan Zheng and Wen-Xing Yang\*



604

## Enhanced electrochemical performance of NiSbS/NiSb/NiS nanocomposites anchored on graphite nanosheets for sodium-ion battery applications

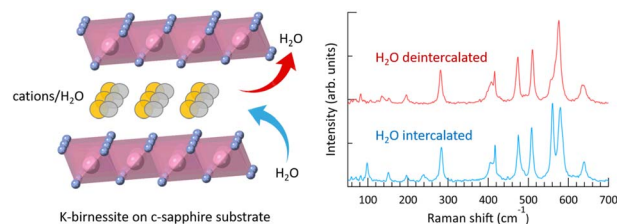
Shandong Huang, Dong Feng,\* Yuanzhi Zhu, Yihong Ding,\* Delong Xie, Yi Mei and Tianbiao Zeng\*



617

## Raman spectroscopy study of K-birnessite single crystals

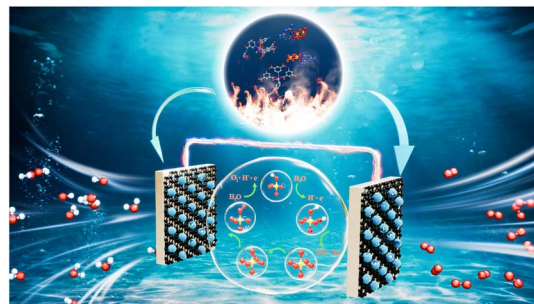
Dong Han Ha,\* Gichang Noh, Hakseong Kim, Dong Hwan Kim, Jeongho Kim, Suyong Jung, Chanyong Hwang, Ha Young Lee, Yong Ju Yun, Joon Young Kwak, Kibum Kang and Sam Nyung Yi\*



627

## Co-MOF-derived core-shell CoP@Co<sub>3</sub>O<sub>4</sub> nanoparticle loaded N-doped graphene: an efficient catalyst for the oxygen evolution reaction

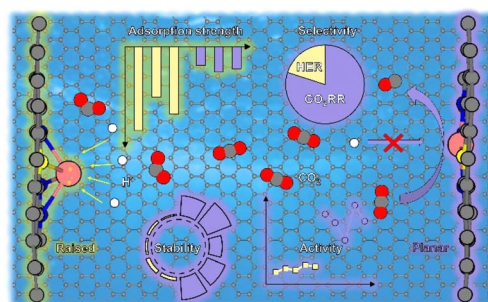
Xian-Chen Meng, Jian Luan,\* Yi Liu, Yu-Shu Sheng, Fu-Yu Guo, Peng Zheng, Wen-Long Duan\* and Wen-Ze Li\*



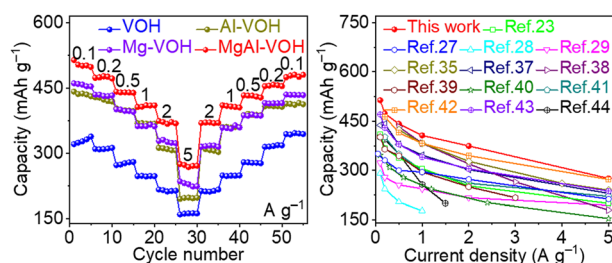
638

## Structural rule of heteroatom-modified single-atom catalysts for the CO<sub>2</sub> electroreduction reaction

Xinyuan Sui, Haiyang Yuan\* and Yu Hou\*



645



### Bimetallic-ion co-intercalation to stabilize vanadium–oxygen bonds towards high-performance aqueous zinc-ion storage

Yulin Jiang, Xia Wen, Yinuo Li, Yuhang Li, Yanan Peng, Wang Feng, Xiaohui Li, Junbo Yang, Luying Song, Ling Huang, Hang Sun and Jianping Shi\*

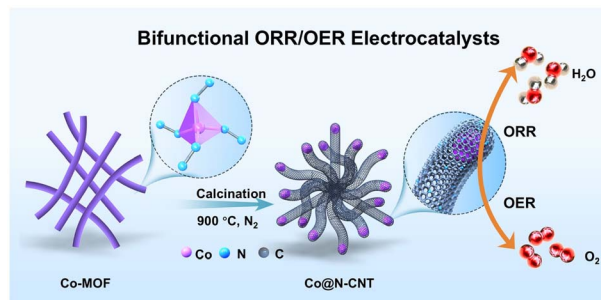
654



### Scalable and environmentally friendly MXene-tetrahedrites for next-generation flexible thermoelectrics

Priyanshu Banerjee, Jiyuan Huang, Jacob Lombardo, Swapnil B. Ambade, Rohan B. Ambade, Tae Hee Han, Srushti Kulkarni, Shreyasi Sengupta, Zeev Rosenzweig, Howard Fairbrother, Sichao Li, Sunmi Shin and Deepa Madan\*

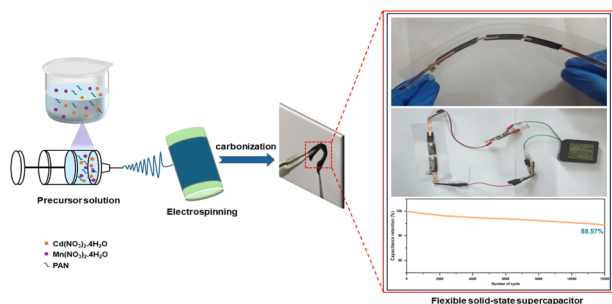
669



### Co nanoparticles encapsulated in N-doped carbon nanotube materials derived from new metal–organic frameworks for oxygen electrocatalysis

Jieling Zhang, Weiran Suo, Yu Han, Yiwen Cao, Yuhan Xu, Mengying Wang, Zuo Zhong Liang,\* Yuan Wang,\* Haoquan Zheng\* and Rui Cao\*

680



### Fabrication and electrochemical evaluation of flexible spinel CdMn<sub>2</sub>O<sub>4</sub> carbon nanofibers for advanced supercapacitor applications

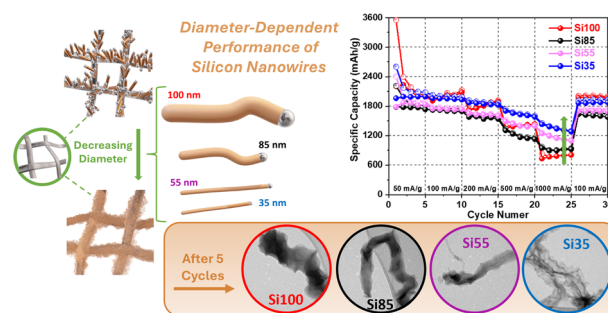
Akashkumar P. Patel, Deep S. Sharma, Sanjay N. Bariya, Yash G. Kapdi, Jaydip D. Solanki, Saurabh S. Soni, Vaibhav K. Patel\* and Sanjay H. Panjabi\*



696

## Diameter dependent performance of silicon nanowire anodes grown on 3D current collectors for lithium-ion batteries

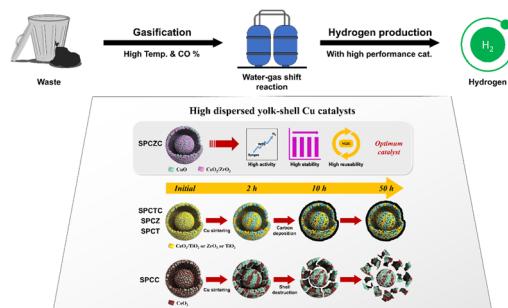
Mei Li, Niraj Nitish Patil, Shalini Singh, David McNulty\* and Kevin M. Ryan\*



704

## Highly dispersed copper-based nanocomposite synthesis via spray pyrolysis: towards waste-to-hydrogen production through the water-gas shift reaction

I-Jeong Jeon, Jae Seob Lee, Kun Woo Baek, Chang-Hyeon Kim, Ji-Hyeon Gong, Won-Jun Jang,\* Jung Sang Cho\* and Jae-Oh Shim\*

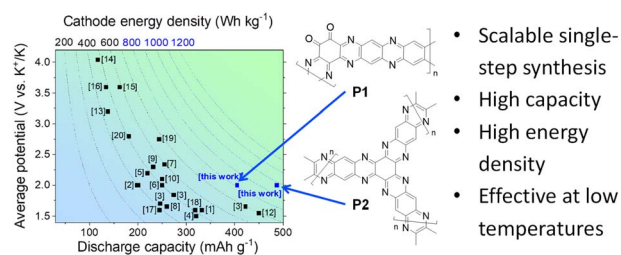


721

## Potassium batteries for low temperature applications using high energy density organic cathodes

Elena V. Shchurik, Alexander V. Mumyatov, Ivan S. Zhidkov, Tatiana A. Savinykh, Guzaliya R. Baymuratova, Alexander F. Shestakov, Olga A. Kraevaya\* and Pavel A. Troshin\*

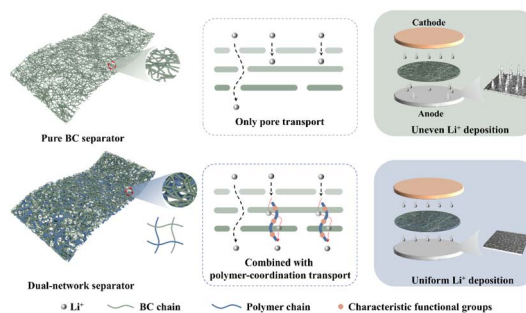
### Promising organic cathodes for potassium batteries



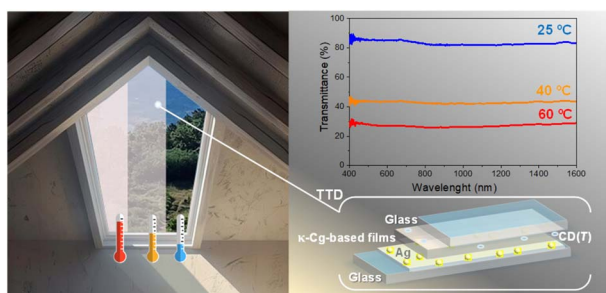
730

## Dual-network bacterial cellulose-based separators with high wet strength and a dual ion transport mechanism for uniform lithium deposition

Chen Cheng, Rendang Yang, Yang Wang,\* Xiaohui Guo and Jie Sheng



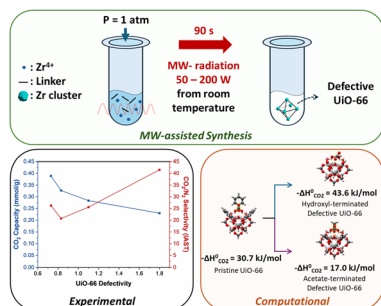
743



### Eco-friendly innovation: three-mode sun-actuated thermotropic devices integrating $\kappa$ -carrageenan-based film doped with *Arundo donax* leaf-derived carbon dots and 1-butyl-3-methyl-1*H*-imidazolium chloride

S. C. Nunes,<sup>\*</sup> T. A. G. Duarte, R. F. P. Pereira, L. Fu, R. A. S. Ferreira, P. Almeida and V. de Zea Bermudez<sup>\*</sup>

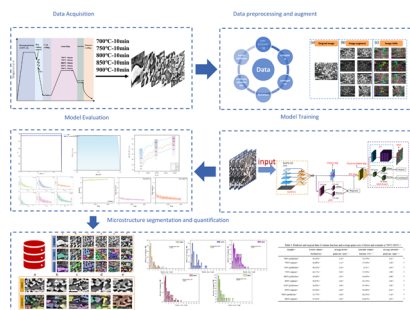
762



### Rapid one-pot microwave-assisted synthesis and defect engineering of UiO-66 for enhanced CO<sub>2</sub> capture

Dong A. Kang, Amro M. O. Mohamed, Christian Murphy, Andres Ramos, Ioannis G. Economou, Jinsoo Kim<sup>\*</sup> and Hae-Kwon Jeong<sup>\*</sup>

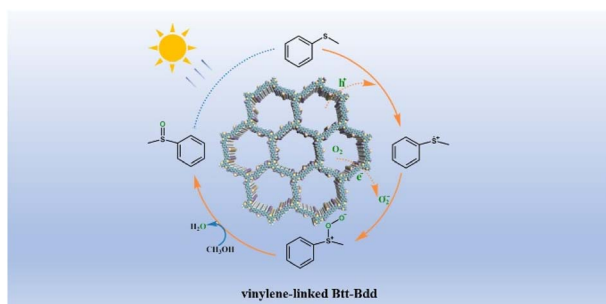
772



### An automatic segmentation and quantification method for austenite and ferrite phases in duplex stainless steel based on deep learning

Lun Che, Zhongping He,<sup>\*</sup> Kaiyuan Zheng, Xiaotian Xu and Feng Zhao

786



### Vinylene-linked donor-acceptor covalent organic polymers with low exciton binding energy for enhanced photocatalytic oxidation of sulfides

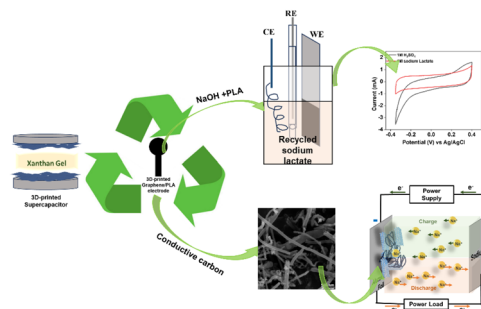
Wenhao Liu, Yujie Li, Fang Duan,<sup>\*</sup> Haiping Liu, Yanyan Ren, Shengrong Yan, Shuanglong Lu, Mingliang Du, Xin Chen and Jun Wang<sup>\*</sup>



795

## Recyclable HF-free $\text{Ti}_3\text{C}_2\text{T}_x$ 3D-printed supercapacitors: their second life in sodium-ion batteries

Bindu Kalleshappa and Martin Pumera\*



## EXPRESSIONS OF CONCERN

808

### Expression of concern: Reduced graphene oxide nanosheets decorated with Au, Pd and Au–Pd bimetallic nanoparticles as highly efficient catalysts for electrochemical hydrogen generation

Gitashree Darabdhara, Mohammed A. Amin,\* Gaber A. M. Mersal, Emad M. Ahmed, Manash R. Das,\* Mohamed B. Zakaria, Victor Malgras, Saad M. Alshehri, Yusuke Yamauchi, Sabine Szunerits and Rabah Boukherroub\*

809

### Expression of concern: Construction of desert rose flower-shaped NiFe LDH– $\text{Ni}_3\text{S}_2$ heterostructures *via* seawater corrosion engineering for efficient water-urea splitting and seawater utilization

Zhao-Hui Zhang, Zhi-Ran Yu, Yi Zhang, Alexandre Barras, Ahmed Addad, Pascal Roussel, Long-Cheng Tang, Mu. Naushad, Sabine Szunerits and Rabah Boukherroub\*

810

### Expression of concern: Preparation of reduced graphene oxide– $\text{Ni}(\text{OH})_2$ composites by electrophoretic deposition: application for non-enzymatic glucose sensing

Palaniappan Subramanian, Joanna Niedziolka-Jonsson, Adam Lesniewski, Qian Wang, Musen Li, Rabah Boukherroub and Sabine Szunerits\*

