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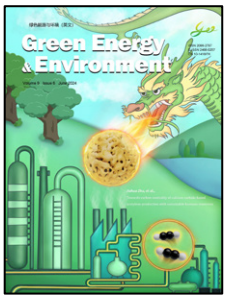

## Front Cover

**Towards carbon neutrality of calcium carbide-based acetylene production with sustainable biomass resources**

*Peng Jiang, Guanhan Zhao, Hao Zhang, Tuo Ji, Liwen Mu, Xiaohua Lu, Jiahua Zhu**

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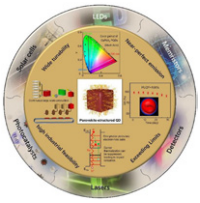
**Construction of Pd-doped $RuO_2$ nanosheets for efficient and stable acidic water oxidation**
Yibo Liu, Xing Hu, Chenxi Liu, Shan Zhu, Kezhu Jiang*, Feng Liu*, Shijian Zheng* ..... 937

### Review articles

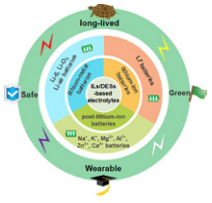
**Advantageous properties of halide perovskite quantum dots towards energy-efficient sustainable applications**
Qian Zhao, Shuo Wang, Young-Hoon Kim, Shekhar Mondal, Qingqing Miao, Simiao Li, Danya Liu, Miao Wang, Yaxin Zhai, Jianbo Gao, Abhijit Hazarika*, Guo-Ran Li*..... 949

This review summarize the advantageous properties of lead halide perovskite quantum dots and survey the prospects for diverse applications which include light-emitting devices, solar cells, photocatalysts, lasers, detectors and memristors, emphasizing the distinct superiority as well as the challenges.



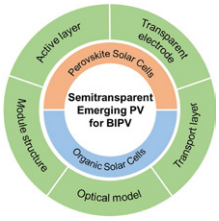
**Reviewing electrochemical stability of ionic liquids-/deep eutectic solvents-based electrolytes in lithium-ion, lithium-metal and post-lithium-ion batteries for green and safe energy**
Yu Chen*, Shuzi Liu, Zixin Bi, Zheng Li, Fengyi Zhou, Ruifen Shi, Tiancheng Mu*..... 966

Electrochemical stability of ionic liquids-/deep eutectic solvents-based electrolytes in lithium-ion, lithium-metal and post-lithium-ion batteries is reviewed.




**Progress of semitransparent emerging photovoltaics for building integrated applications**
Zhisheng Zhou[1], Zhangyu Yuan[1], Zhipeng Yin, Qifan Xue, Ning Li*, Fei Huang*..... 992

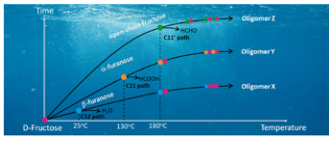
This review article summarized recent advances in material selection, optical engineering, and device architecture design for high-performance semitransparent emerging PV devices, and discuss the application of optical modeling, as well as the challenges of commercializing these semitransparent solar cells for building-integrated applications.




## Research papers

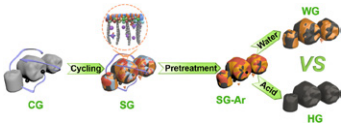
**Mapping out the reaction network of humin formation at the initial stage of fructose dehydration in water**
Xing Fu, Yexin Hu, Ping Hu, Hui Li, Shuguang Xu, Liangfang Zhu*, Changwei Hu*…… 1016

A detailed reaction network at the initial stage of fructose to 5-hydroxymethylfurfural (HMF) dehydration in water is figured out, wherein three bimolecular reaction pathways to build up oligomeric byproducts (i.e., soluble humins) are demonstrated. It explains well the general carbon loss of 10~50% in HMF production.



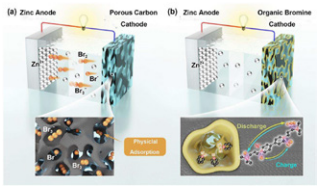

**An efficient recycling strategy to eliminate the residual "impurities" while heal the damaged structure of spent graphite anodes**
Dan Yang, Ying Yang*, Haoran Du, Yongsheng Ji, Mingyuan Ma, Yujun Pan, Xiaoqun Qi, Quan Sun, Kaiyuan Shi*, Long Qie*…… 1027

The regenerated graphite is revitalized by calcination treatment and acid leaching on the basis of the careful investigation of the composition of the spent graphite, delivering superb rate performance and a high specific capacity of 370 mAh $g^{-1}$ after 100 cycles at 0.1 C.




**Reversible solid-liquid conversion enabled by self-capture effect for stable non-flow zinc–bromine batteries**
Xixi Zhang[1], Xiaoke Wang[1], Guangmeng Qu, Tairan Wang, Xiliang Zhao, Jun Fan, Cuiping Han, Xijin Xu*, Chunyi Zhi, Hongfei Li*…… 1035

An ultra-stable non-flow zinc-bromine battery with a novel self-capture $NVBr_4$ based cathode was developed.With the "self-capture" effect of the quaternary ammonium group, it can effectively capture the soluble bromine substances and realize reversible solid complexation, which transforms the conventional "liquid-liquid" conversion of soluble bromide components into "liquid-solid" model and effectively suppresses the shuttle effect. As a result, a notable specific capacity (325 mAh $g^{-1}_{NVBr_4}$ ) and super-long cycling life up to 20000 cycles were realized.



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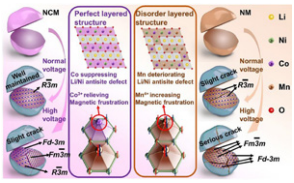
**Understanding the failure mechanism towards developing high-voltage single-crystal Ni-rich Co-free cathodes**

Jixue Shen, Bao Zhang, Changwang Hao, Xiao Li, Zhiming Xiao, Xinyou He, Xing Ou*…… 1045

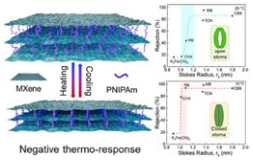
The single-crystal traditional ternary $LiNi_{0.8}Co_{0.1}Mn_{0.1}O_2$ and Co-free $LiNi_{0.8}Mn_{0.2}O_2$ (NM) are systematically compared. Furthermore, the failure mechanism of Co-free Ni-rich cathode under the high-voltage testing condition is unraveled, which demonstrates that NM cathode is more suitable for high-safety and low-cost route in lithium-ion batteries.




**Biomimetic MXene membranes with negatively thermo-responsive switchable 2D nanochannels for graded molecular sieving**

Yi Wang[1], Yangyang Wang[1], Chang Liu, Dongjian Shi, Weifu Dong, Baoliang Peng, Liangliang Dong*, Mingqing Chen*…… 1058

This article present a biomimetic negatively thermo-responsive MXene membrane by covalently grafting poly (N-isopropylacrylamide) (PNIPAm) onto MXene nanosheets.




**Towards carbon neutrality of calcium carbide-based acetylene production with sustainable biomass resources**

Peng Jiang, Guanhan Zhao, Hao Zhang, Tuo Ji, Liwen Mu, Xiaohua Lu, Jiahua Zhu*…… 1068

Biomass conversion is coupled with calcium carbide synthesis for sustainable co-production of acetylene, syngas and power that shows a good example of using sustainable resources for $CO_2$ reduction in traditional industrial processes.