

# Green Chemistry

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## IN THIS ISSUE

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### Cover

See Daan S. van Es, Pieter C. A. Bruijninx *et al.*, pp. 7739–7751.

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Cover artwork designed by Thomas Hartman Illustrates Science.



### Inside cover

See Luigi Vaccaro *et al.*, pp. 7752–7758.

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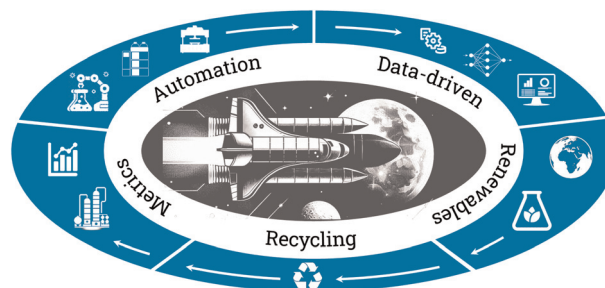
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## CONFERENCE REPORT

7443

### Where is chemistry's moon? Highlights from the 1<sup>st</sup> conference for the Center of the Transformation of Chemistry (CTC) at Ringberg Castle 2023

Matthew B. Plutschack\* and Peter H. Seeberger

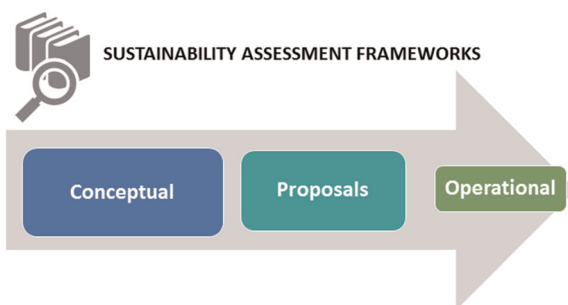


## CRITICAL REVIEWS

7456

### Safe and sustainable chemicals and materials: a review of sustainability assessment frameworks

Carla Caldeira, Elisabetta Abbate, Christian Moretti, Lucia Mancini and Serenella Sala\*



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## CRITICAL REVIEWS

7478

**Deep eutectic solvents as green solvents for materials preparation**

Dongkun Yu, Depeng Jiang, Zhimin Xue\* and Tiancheng Mu\*



7508

**Towards greener batteries: sustainable components and materials for next-generation batteries**

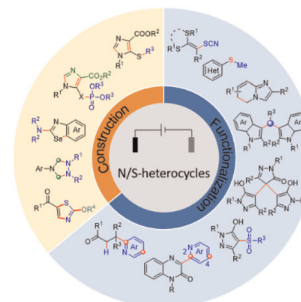
Palanivel Molaiyan, Shubhankar Bhattacharyya, Glaydson Simoes dos Reis,\* Rafal Sliz, Andrea Paoletta and Ulla Lassi



7532

**Electrosynthesis of N/S-heterocycles**

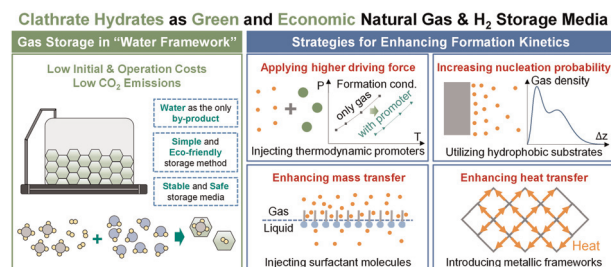
Jiangwei Wen,\* Yonghong Yin, Kelu Yan, Bingwen Li, Ming-Zhong Zhang\* and Jianjing Yang\*



7552

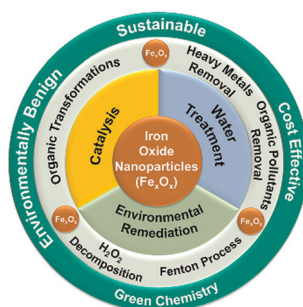
**Perspectives on facilitating natural gas and hydrogen storage in clathrate hydrates under a static system**

Wonhyeong Lee, Kwangbum Kim, Jeongwoo Lee, Yun-Ho Ahn and Jae W. Lee\*



## TUTORIAL REVIEWS

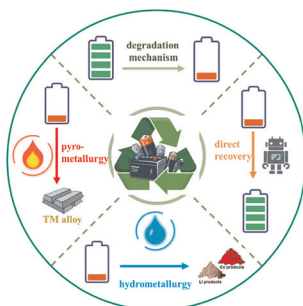
7579



### A review on sustainable iron oxide nanoparticles: syntheses and applications in organic catalysis and environmental remediation

Dinesh S. Chaudhari, Rohit P. Upadhyay, Gajanan Y. Shinde, Manoj B. Gawande,\* Jan Filip, Rajender S. Varma\* and Radek Zbořil\*

7656

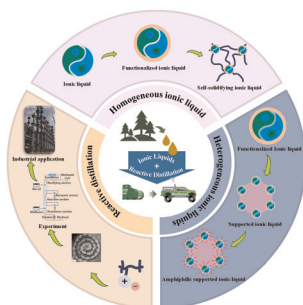


### Recycling spent lithium-ion battery cathode: an overview

Xun Zhang and Maiyong Zhu\*

## PERSPECTIVE

7718

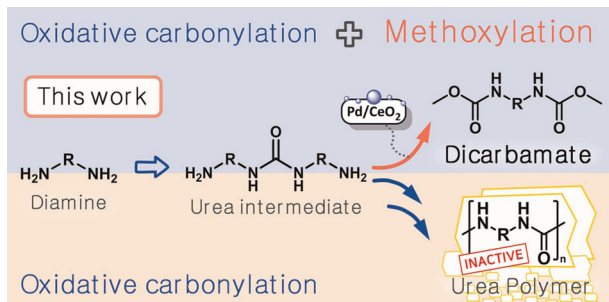


### Challenges and perspectives on using acidic ionic liquids for biodiesel production *via* reactive distillation

Zhaoyang Qi, Rongkai Cui, Hao Lin, Changshen Ye, Jie Chen\* and Ting Qiu\*

## COMMUNICATION

7732



### A dual-functional catalyst for selective dicarbamate synthesis *via* oxidative carbonylation: enhanced methoxylation for suppressing urea polymer formation

Seulgi Han, Young-Woo You, Kwanyong Jeong, Mintae Im, Jung-Ae Lim, Soo Min Kim, Jin Hee Lee\* and Ji Hoon Park\*

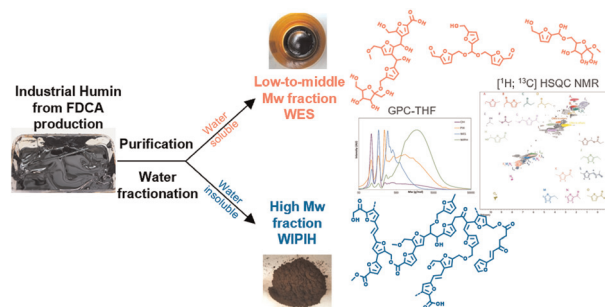


## PAPERS

7739

## Molecular structure and composition elucidation of an industrial humin and its fractions

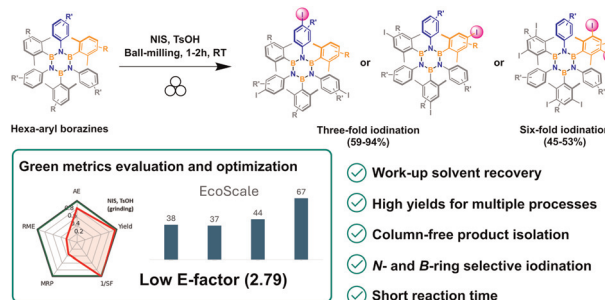
Sandra Constant, Christopher S. Lancefield, Willem Vogelzang, Rajeesh Kumar Pazhavelikkakath Purushothaman, Augustinus E. Frissen, Klaartje Houben, Peter de Peinder, Marc Baldus, Bert M. Weckhuysen, Daan S. van Es\* and Pieter C. A. Bruijninx\*



7752

## A waste-minimized approach for the synthesis of iodinated organic borazines

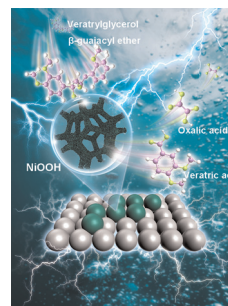
Dario Marchionni, Daniele Gernini, Alireza Nazari Khodadadi, Ejdi Cela, Fan Huang and Luigi Vaccaro\*



7759

## Electrochemical oxidation of lignin model compounds over metal oxyhydroxides on nickel foam

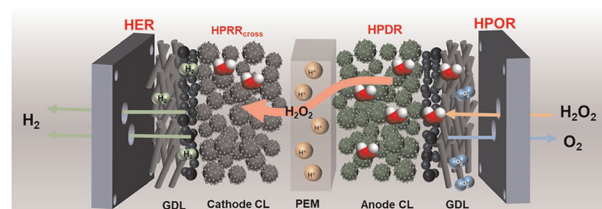
Zhang Danlu, Zeng Xu,\* Wang Sinong, Xu Yan, Dai Qiqi, Yue Fengxia, Wang Peng, Liu Chuanfu and Lan Wu\*



7769

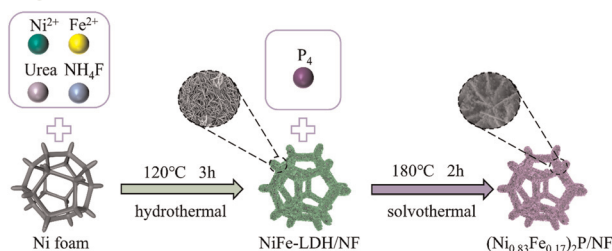
Maximization of hydrogen peroxide utilization in a proton exchange membrane H<sub>2</sub>O<sub>2</sub> electrolyzer for efficient power-to-hydrogen conversion

Jie Yang, Ruimin Ding,\* Chang Liu, Lifang Chen, Qi Wang, Shanshan Liu, Qinchao Xu and Xi Yin\*



## PAPERS

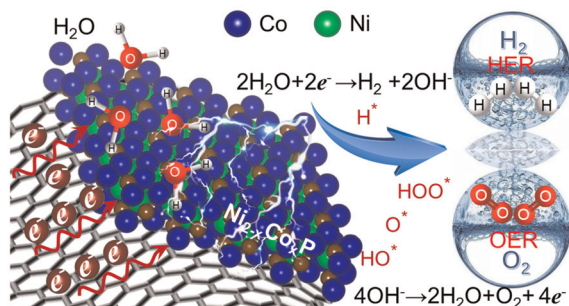
7779



### Iron-doped nickel phosphide hollow nanospheres synthesized by solvothermal phosphidization of layered double hydroxides for electrocatalytic oxygen evolution

zeyi Wang, Shuling Liu,\* Jinyu Du, Yichuang Xing, Yanling Hu, Yujie Ma, Xinyi Lu and Chao Wang\*

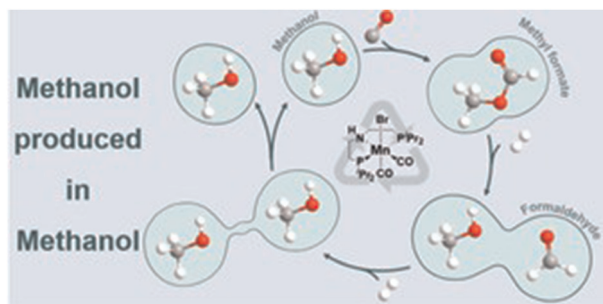
7789



### Bimetallic Ni<sub>2-x</sub>Co<sub>x</sub>P carbon nanofibers network: solid–solution alloy nano-architecture as efficient electrocatalyst for water splitting

Meijie Ding, Zhiqiang Wei,\* Wenhua Zhao, Qiang Lu, Chenggong Lu, Meipan Zhou, Dexue Liu\* and Hua Yang

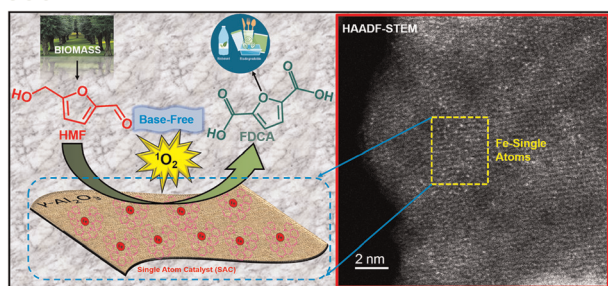
7799



### Liquid-phase hydrogenation of carbon monoxide to methanol using a recyclable manganese-based catalytic system

Sebastian Stahl, Niklas Wessel, Andreas J. Vorholt\* and Walter Leitner\*

7806



### Base-free aerobic oxidation of 5-hydroxymethylfurfural to 2,5-furandicarboxylic acid over a Fe single-atom catalyst

Sohaib Hameed, Wengang Liu,\* Zhounan Yu, Jifeng Pang, Wenhao Luo\* and Ai Qin Wang\*

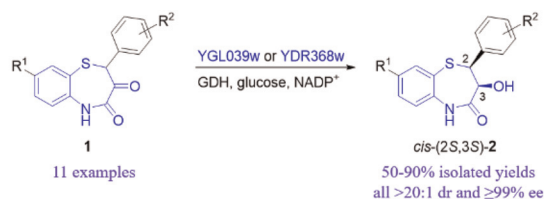


## PAPERS

7818

### Ketoreductase-catalyzed dynamic reductive kinetic resolution of sterically hindered 2-aryl-1,5-benzothiazepin-3,4(2*H*,5*H*)-diones: asymmetric synthesis of a key diltiazem precursor and its analogues

Zijun Guo, Zexin Wu, Xiaofan Wu, Li Zhang, Zedu Huang\* and Fener Chen\*

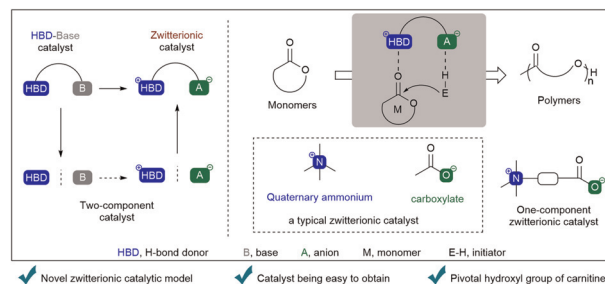


Dynamic reductive kinetic resolution ✓ Excellent stereoselectivity ✓  
Gram scale synthesis of diltiazem precursor ✓ Enzyme immobilization and reuse ✓

7825

### Zwitterionic organocatalysis for ring-opening polymerization of cyclic esters

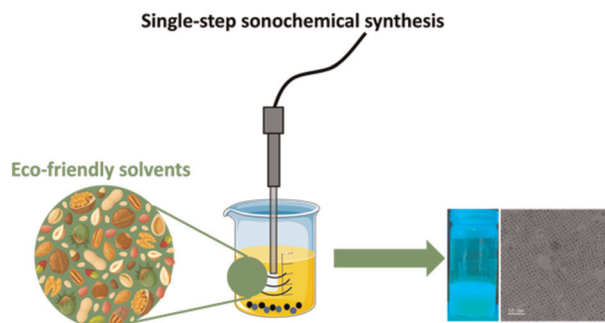
Yue Xu, Peng Guo, Zhenjiang Li,\* Ziqi Liu, Tianyu Zhu, Yujia Wang, Hao Zhang, Wei He, Mingfu Lyu and Kai Guo\*



7837

### Sonochemical-assisted synthesis of CsPbBr<sub>3</sub> perovskite quantum dots using vegetable oils

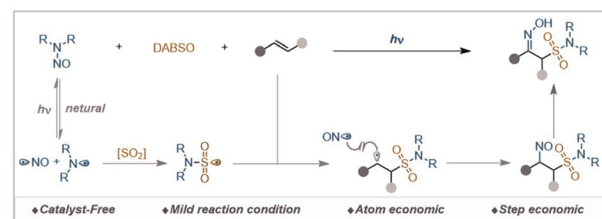
Pedro Conceição, Andrés Perdomo, Diogo F. Carvalho, Jennifer P. Teixeira, Pedro M. P. Salomé and Tito Trindade\*



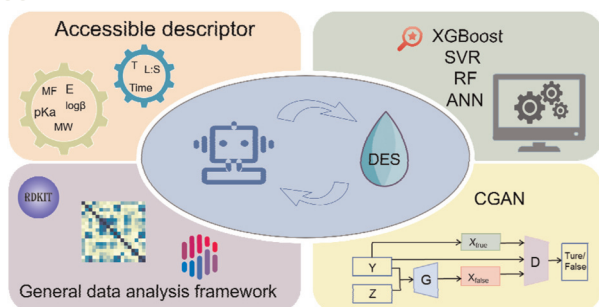
7849

### Photo-mediated radical relay oximinosulfonamidation of alkenes with *N*-nitrosamines triggered by DABSO

Ji-Wei Sang, Hong Chen, Yu Zhang,\* Jinxin Wang\* and Wei-Dong Zhang\*



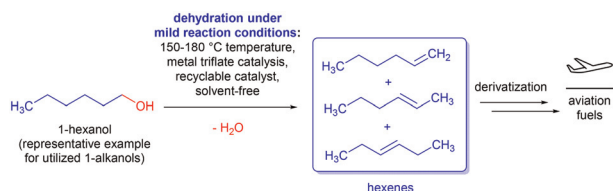
7857



### Machine learning models accelerate deep eutectic solvent discovery for the recycling of lithium-ion battery cathodes

Fengyi Zhou, Dingyi Shi, Wenbo Mu, Shao Wang, Zeyu Wang, Chenyang Wei, Ruiqi Li\* and Tiancheng Mu\*

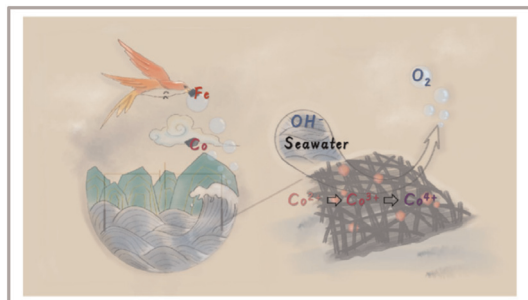
7869



### Catalyst screening for dehydration of primary alcohols from renewable feedstocks under formation of alkenes at energy-saving mild reaction conditions

Adil Allahverdiyev, Jianing Yang and Harald Gröger\*

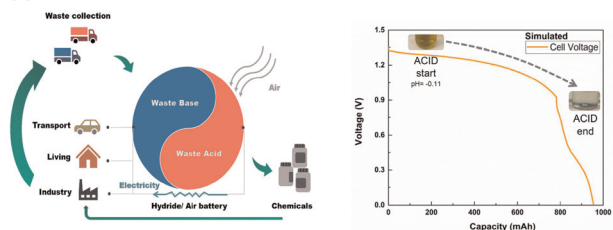
7879



### Eggshell membrane-derived metal sulfide catalysts for seawater splitting

Lingyu Cui, Lan Zhang\* and Yi Shen\*

7891



### An air/metal hydride battery for simultaneous neutralization treatment of acid–base wastewater and power generation

Kangqiang Ye, Yu'an Du, Yuxin Yang, Rong Chen, Chao Deng\* and Guo-Ming Weng\*

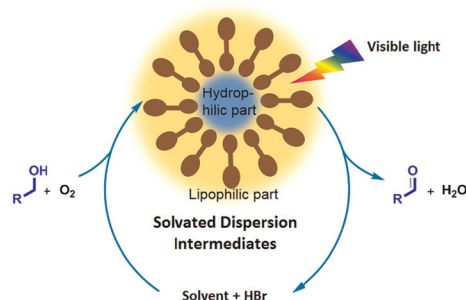


## PAPERS

7902

### Visible-light-induced aerobic oxidation of alcohols to aldehydes/ketones *via* solvated dispersion intermediates

Wenlong Lei, Runze Liu, Rengui Li, Yan Liu and Can Li\*



7911

### Sustainable upgrading of glycerol into glycidol and its derivatives under continuous-flow conditions

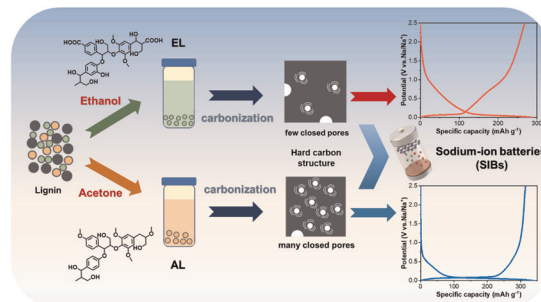
Alessandra Sivo, Ilaria Montanari, Mert Can Ince and Gianvito Vilé\*



7919

### Lignin molecular sieving engineering enables high-plateau-capacity hard carbon anodes for sodium-ion batteries

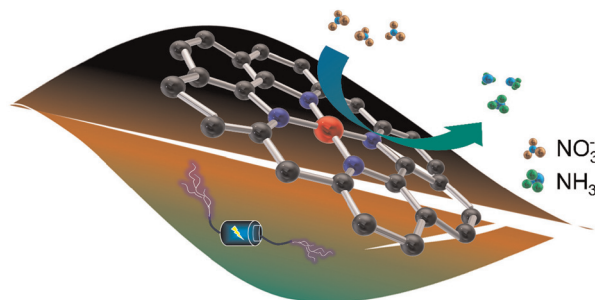
Binyi Chen, Lei Zhong, Manjia Lu, Wenbin Jian, Shirong Sun, Qingwei Meng,\* Tiejun Wang, Wenli Zhang\* and Xueqing Qiu



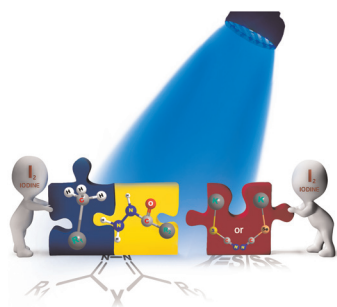
7931

### Green synthesis of a magnesium single-atom catalyst from *Spinacia oleracea* chlorophyll extracts for sustainable electrocatalytic nitrate reduction to ammonia

Kanhai Kumar, Pragyan Tripathi, Gokul Raj, Dova Kalyan, Demudu Babu Gorle, Nikhil George Mohan, Surendra Kumar Makineni, Kothandaraman Ramanujam, Abhishek Kumar Singh and Karuna Kar Nanda\*



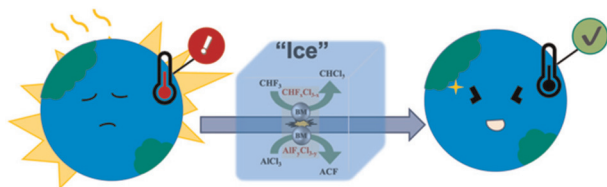
7944



### Light-assisted green and efficient construction of thiadiazole/selenadiazole derivatives

Changting Wen, Guojin Sun, Lang Liu, Jun Zhang, Mengyao She, Zheng Yang,\* Ping Liu,\* Shengyong Zhang and Jianli Li\*

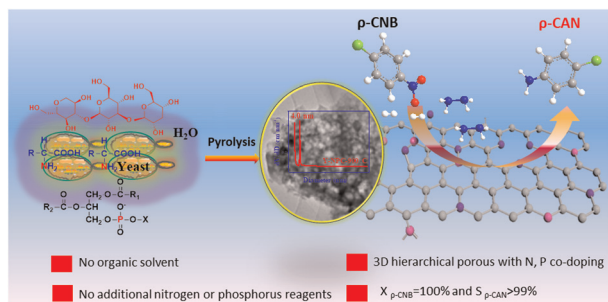
7951



### Conversion of fluoroform to $\text{CHCl}_3$ and $\text{AlCl}_3\text{F}_{3-x}$ via its mechanochemical reaction with $\text{AlCl}_3$

Yiwei Tang, Hui Shao, Yingzhou Lu,\* Hong Meng, Hongwei Fan and Chunxi Li\*

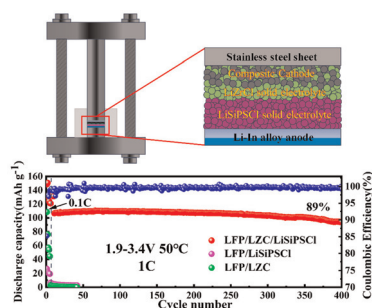
7958



### Yeast-derived N, P co-doped porous green carbon materials as metal-free catalysts for selective hydrogenation of chloronitrobenzene

Xiaohua Wang,\* Hongfan Zhao, Yebin Zhou, Chunyu Yin, Wei He, Feng Feng, Fengli Wang, Chunshan Lu\* and Xiaonian Li\*

7971



### Halide-sulfide bilayer electrolytes for $\text{LiFePO}_4$ -based all-solid-state batteries

Guoyao Zhang, Xixi Shi, Qili Su, Yiming Sun, Yong Lu, Kai Liu,\* Zhe Li,\* Haijing Liu\* and Lianqi Zhang\*

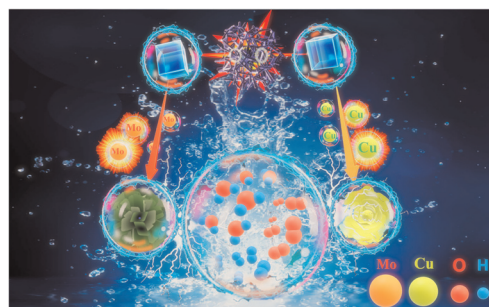


## PAPERS

7980

### Efficient oxygen evolution activity of CoFe-PBA heterojunctions using a bimetallic probe (Mo/Cu) at room temperature: construction of multilayered activated structures and cationic vacancies

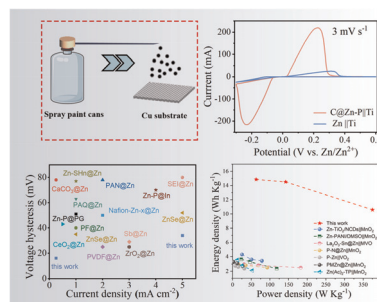
Lihai Wei, Zhihao Liu, Xiaodong Wu,\* Huabo Huang,\* Qianqian Jiang\* and Jianguo Tang\*



7990

### Spraying amorphous carbon coated zinc to prepare powder-based anodes for long-life zinc-ion batteries

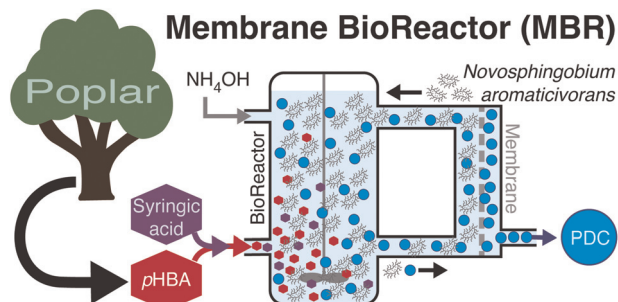
Jiahao Tang, Jiale Cao, Yunxuan Jiang, Siying Gou, Ruiqi Yao, Yingqi Li\* and Bo-Tian Liu\*



7997

### Achieving high productivity of 2-pyrone-4,6-dicarboxylic acid from aqueous aromatic streams with *Novosphingobium aromaticivorans*

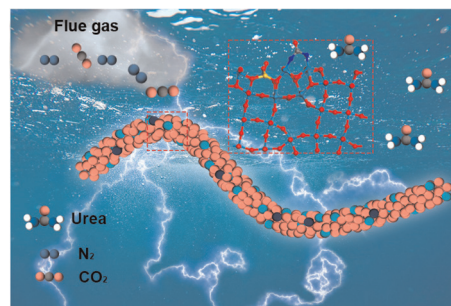
Bumkyu Kim, Jose M. Perez, Steven D. Karlen, Jason Coplien, Timothy J. Donohue and Daniel R. Noguera\*



8010

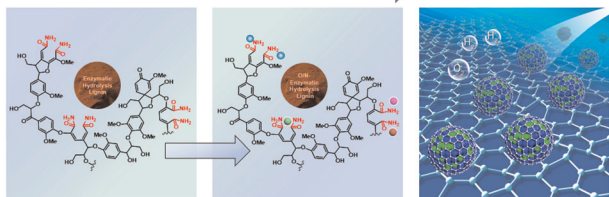
### Boosting urea synthesis in simulated flue gas electroreduction by adjusting W–W electronic properties

Xiaohui Yao, Changyan Zhu, Jie Zhou, Kunhao Zhang, Chunyi Sun,\* Man Dong, Guogang Shan,\* Zhuo Wu, Min Zhang,\* Xinlong Wang and Zhongmin Su



## PAPERS

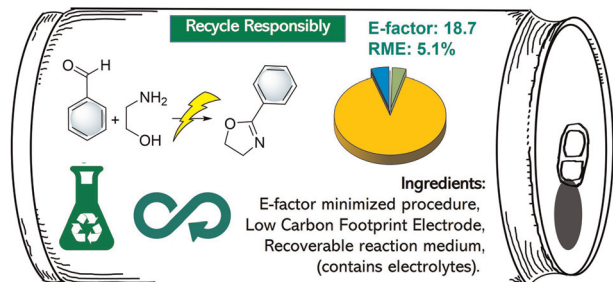
8020

Lignin-Metal Supramolecular Framework  $\rightarrow$  Carbon-based Catalyst

### Synthesis of highly dispersed carbon-encapsulated Ru–FeNi nanocatalysts by a lignin–metal supramolecular framework strategy for durable water-splitting electrocatalysis

Jianglin Liu, Xueqing Qiu,\* Shirong Sun,\* Bowen Liu, Yuhui Tian, Yanlin Qin and Xuliang Lin\*

8030



### Sustainability in a can: upcycling aluminium scrap in the waste-minimized electrochemical synthesis of 2-oxazoline

Simone Trastulli Colangeli, Francesco Ferlin\* and Luigi Vaccaro\*

## CORRECTION

8037

### Correction: CO<sub>2</sub>-derived non-isocyanate polyurethanes (NIPUs) and their potential applications

Rita Turnaturi, Chiara Zagni,\* Vincenzo Patamia, Vincenzina Barbera, Giuseppe Floresta and Antonio Rescifina\*

