

# Green Chemistry

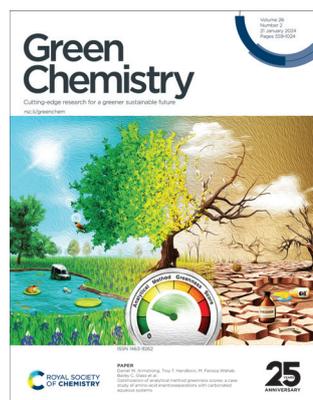
Cutting-edge research for a greener sustainable future

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

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 1463-9262 CODEN GRCHFJ 26(2) 559-1024 (2024)



### Cover

See Daniel W. Armstrong, Troy T. Handlovic, M. Farooq Wahab, Bailey C. Glass *et al.*, pp. 760–770.

Image reproduced by permission of Daniel W. Armstrong from *Green Chem.*, 2024, **26**, 760.



### Inside cover

See Guanben Du, Chengke Zhao, Li Shuai *et al.*, pp. 753–759.

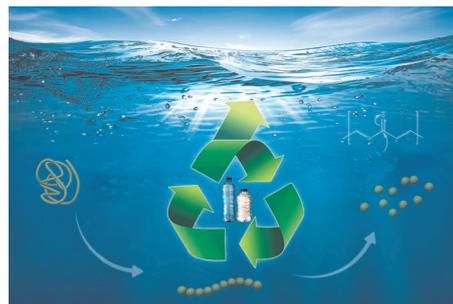
Image reproduced by permission of Li Shuai from *Green Chem.*, 2024, **26**, 753.

## CRITICAL REVIEWS

571

### Catalytic depolymerization of polyester plastics toward closed-loop recycling and upcycling

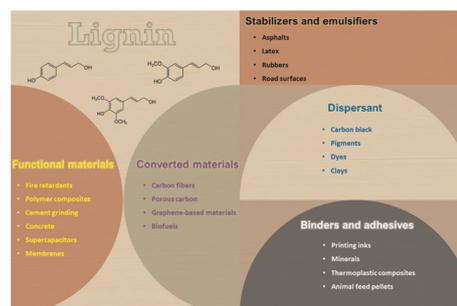
Yujing Weng, Cheng-Bin Hong, Yulong Zhang\* and Haichao Liu\*



593

### Lignin beyond the *status quo*: recent and emerging composite applications

Mahyar Fazeli,\* Sritama Mukherjee, Hossein Baniasadi, Roozbeh Abidnejad, Muhammad Mujtaba, Juha Lipponen, Jukka Seppälä and Orlando J. Rojas\*



# Royal Society of Chemistry approved training courses

Explore your options.  
Develop your skills.  
Discover learning  
that suits you.

**Courses in the classroom,  
the lab, or online**

Find something for every  
stage of your professional  
development. Search our  
database by:

- subject area
- location
- event type
- skill level

Members **get at least 10% off**

Visit [rsc.li/cpd-training](https://rsc.li/cpd-training)



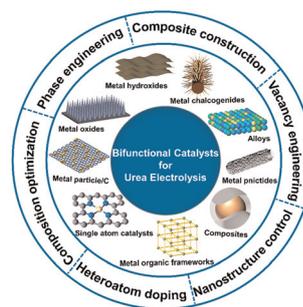
**SAVE  
10%**

## CRITICAL REVIEWS

631

### Designing bifunctional catalysts for urea electrolysis: progress and perspectives

Zhijie Chen, Wei Wei, Ho Kyong Shon and Bing-Jie Ni\*

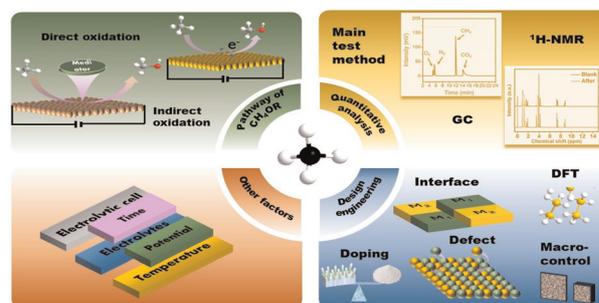


## TUTORIAL REVIEWS

655

### Recent advances in ambient electrochemical methane conversion to oxygenates using metal oxide electrocatalysts

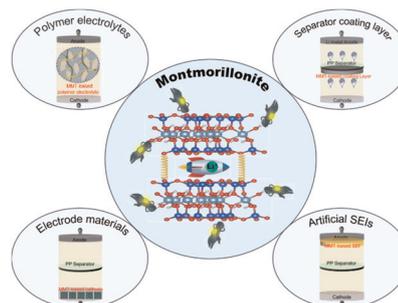
Fengli Liu, Yong Yan,\* Ge Chen\* and Dong Wang\*



678

### Montmorillonite-based materials for electrochemical energy storage

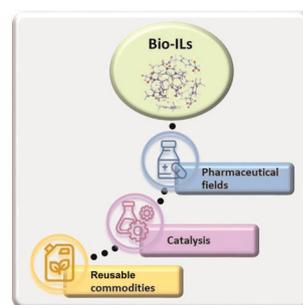
Lian Wu, Xin He, Yifang Zhao, Kelei Huang, Zhangfa Tong, Bing Liao\* and Hao Pang\*



705

### Progress in the applications of biocompatible ionic liquids: renewable commodity production, catalytic and pharmaceutical approaches – a review

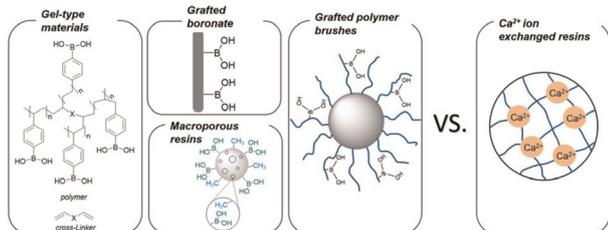
Josiel Martins Costa,\* Tânia Forster-Carneiro\* and Jason P. Hallett\*



## TUTORIAL REVIEWS

720

## Adsorptive separation of saccharides and polyols



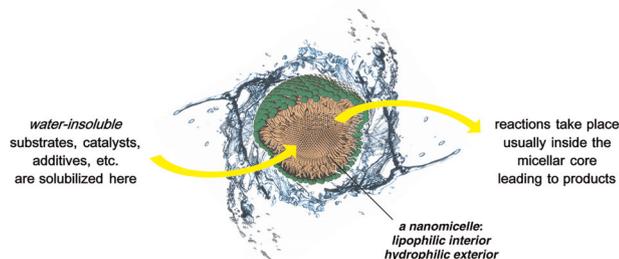
## Adsorptive separation of saccharides and polyols over materials functionalized with boronate groups

Irina Delidovich\* and Valérie Toussaint

## PERSPECTIVE

739

water: Nature's reaction medium

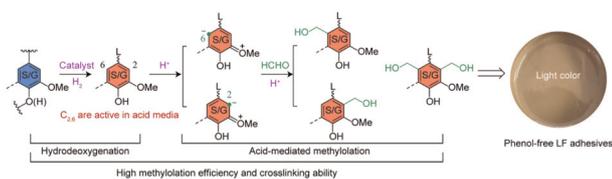


## On the role of surfactants: rethinking "aqueous" chemistry

Bruce H. Lipshutz

## COMMUNICATION

753

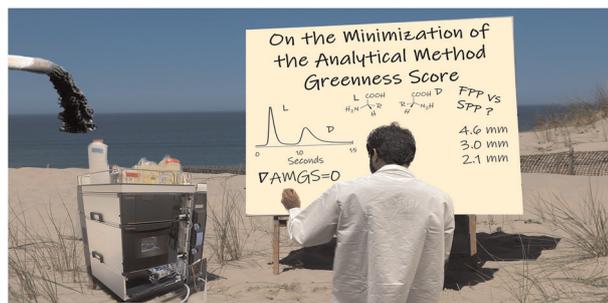


## Hydrodeoxygenation of condensed lignins followed by acid-mediated methylation enables preparation of lignin-based wood adhesives

Guangxu Yang, Zhenggang Gong, Bei Zhou, Xiaolin Luo, Jing Liu, Guanben Du,\* Chengke Zhao\* and Li Shuai\*

## PAPERS

760



## Optimization of analytical method greenness scores: a case study of amino acid enantioseparations with carbonated aqueous systems

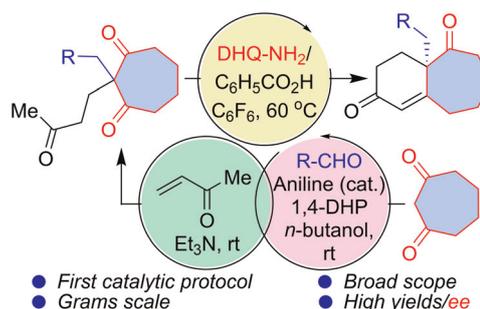
Troy T. Handlovic, M. Farooq Wahab, Bailey C. Glass and Daniel W. Armstrong\*



771

### Conformation-controlled catalytic asymmetric synthesis of Swaminathan ketones

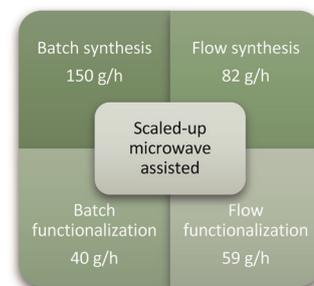
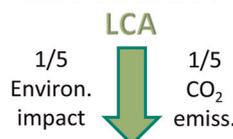
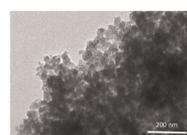
Anugam V. Krishna, Shyam D. Sanwal, Sibani Rath, P. R. Lakshmi and Dhevalapally B. Ramachary\*



785

### Scaled-up microwave-assisted batch and flow synthesis and life cycle assessment of a silica mesoporous material: UVM-7

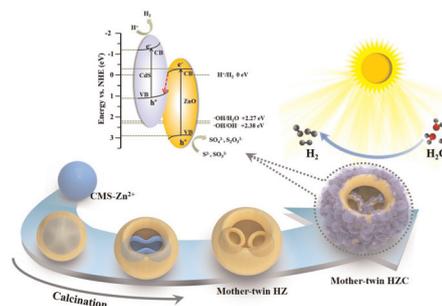
Miriam Benítez, Cristina Rodríguez-Carrillo, Sheila Sánchez-Artero, Jamal El Haskouri, Pedro Amorós and Jose Vicente Ros-Lis\*



794

### Bioinspired notched volvox-like nested Z-scheme heterostructure improves solar-energy utilization for high visible-light-driven hydrogen production

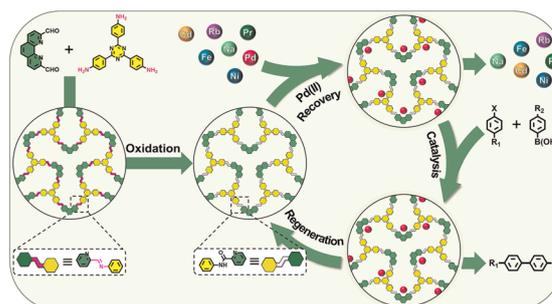
Yi Chang, Bowen Pang, Weiyi Cheng, Penghui Song, Ruijuan Qi, Xiaobing Wang, Zhengyu Bai,\* Yuming Guo, Nana Ma\* and Xiaoming Ma\*



804

### Palladium recovery from acidic solution with phenanthroline-based covalent organic polymers as adsorbents for efficient heterogeneous catalysis

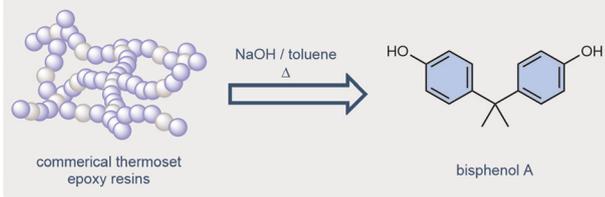
Hui Liu, Pengcheng Wu, Ke Wang, Qing Li, Chengkan Yu, Xiaowei Li, Yimin Cai,\* Wen Feng\* and Lihua Yuan\*



## PAPERS

815

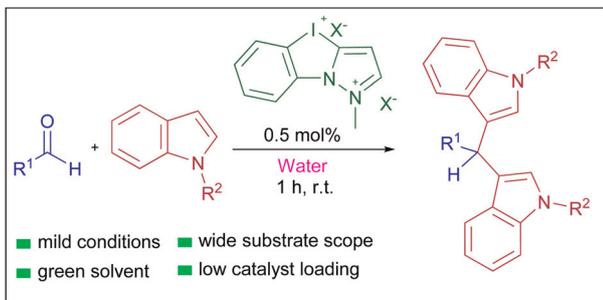
## Chemical deconstruction of epoxy polymers for monomer recovery



## Solvent–base mismatch enables the deconstruction of epoxy polymers and bisphenol A recovery

Hongwei Sun, Alexander Ahrens,\* Gabriel Martins Ferreira Batista, Bjarke S. Donslund, Anne K. Ravn, Emil Vincent Schwibinger, Ainara Nova and Troels Skrydstrup\*

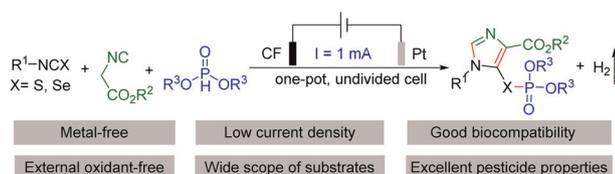
825



## Organocatalytic Friedel–Crafts arylation of aldehydes with indoles utilizing N-heterocyclic iod(az)olium salts as halogen-bonding catalysts

Eirini M. Galathri, Thomas J. Kuczmera, Boris J. Nachtsheim\* and Christoforos G. Kokotos\*

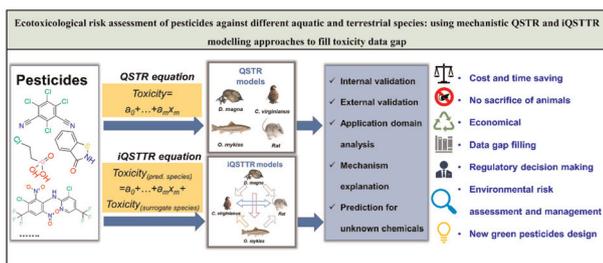
832



## Electrooxidation-induced synthesis of 3-thio/selenophosphorylated imidazole: a potent pesticide with good biocompatibility

Yonghong Yin, Jianjing Yang, Kelu Yan, Ting Zeng, Hongyan Lin, Jing Ling, Shibo Wang\* and Jiangwei Wen\*

839



## Ecotoxicological risk assessment of pesticides against different aquatic and terrestrial species: using mechanistic QSTR and iQSTTR modelling approaches to fill the toxicity data gap

Yishan Li, Tengjiao Fan, Ting Ren, Na Zhang, Lijiao Zhao, Rugang Zhong and Guohui Sun\*

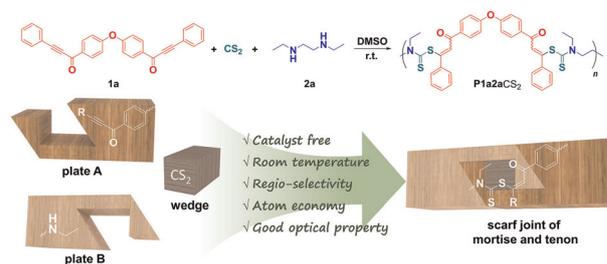


## PAPERS

857

### Green synthesis of sulfur-containing polymers by carbon disulfide-based spontaneous multicomponent polymerization

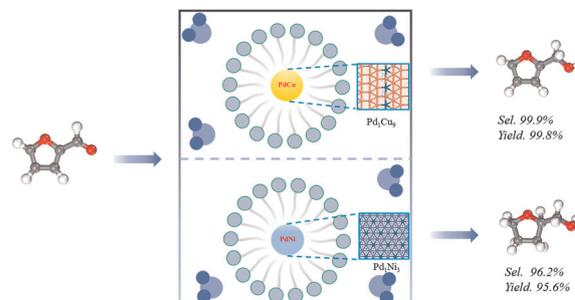
Xu Chen, Anjun Qin\* and Ben Zhong Tang\*



866

### Composition control of Pd-based bimetallic alloys to boost selective hydrogenation of furfural in aqueous micelles

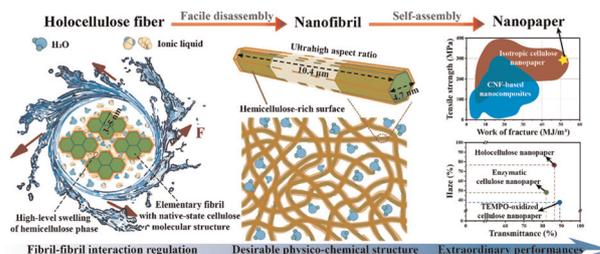
Yiru Chen, Xi He, Ming Zhang, Lixin Chen, Xuemin Liu, Bing Liu,\* Hengquan Yang\* and Xin Ge\*



879

### Weakening fibril–fibril interactions via an on-demand regulation of hemicellulose phase towards the facile disassembly of lignocellulose heterostructure into approaching native-state elementary fibrils

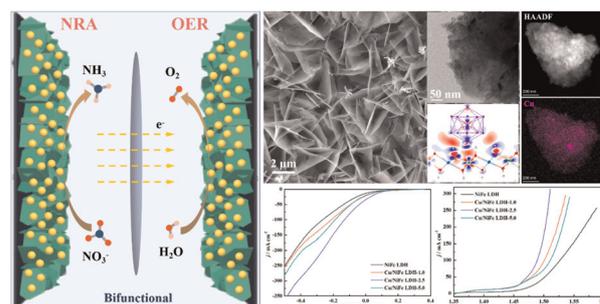
Yan Jiang, Xinyi Wang, Zhiqian Meng, Mengyang Zhang, Shuangfei Wang and Xiuyu Liu\*



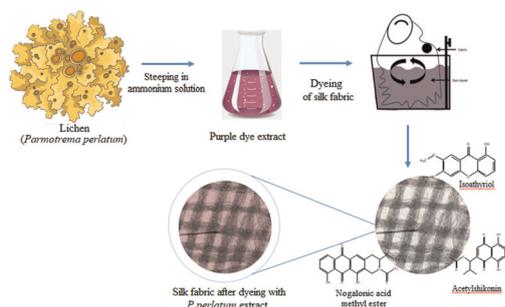
895

### A Cu loaded NiFe layered double hydroxide bifunctional electrocatalyst with a coupled interface structure for both the nitrate reduction reaction and oxygen evolution reaction

Feng Du, Jixin Yao, Hui Luo, Yanru Chen, Yujie Qin, Yuxin Du, Yijian Wang, Wei Hou, Miaoxi Shuai and Chunxian Guo\*



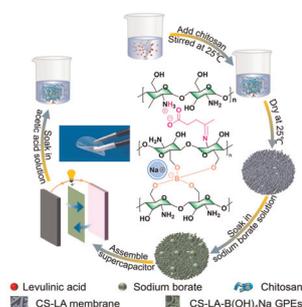
904



### Sustainable dyeing of silk using an acetylshikonin-based natural colourant from the lichen *Parmotrema perlatum*

Rupsa Roychowdhury, Saptarshi Maiti,\*  
Ravindra V. Adivarekar and Rekha S. Singhal\*

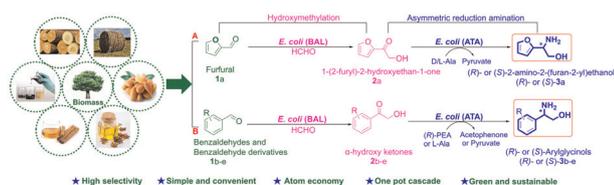
918



### Engineering chitosan into a recyclable and flame-resistant gel electrolyte *via* a dual cross-linking strategy for flexible supercapacitors

Mingwei Xu, Wang Yue, Lihua Zhang, Kui Chen,  
Shizhao Li, Yongzhen Xu, Qinqin Xu, Jun Huang\* and  
Haibo Xie\*

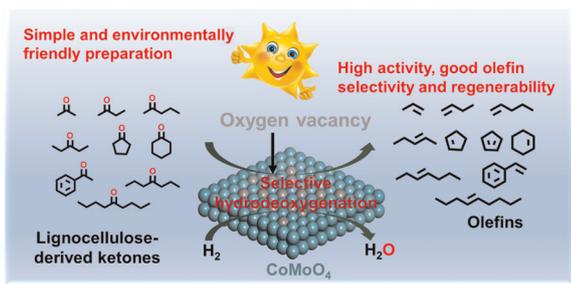
927



### One-pot two-stage biocatalytic upgrading of biomass-derived aldehydes to optically active $\beta$ -amino alcohols *via* sequential hydroxymethylation and asymmetric reduction amination

Yin-Hua Suo, Jing-Qi Zhang, Ning Qi,  
Shuang-Ping Huang, Hang Gao, Li-Li Gao,  
Chao-Feng Zhang, Yu-Cai He and Jian-Dong Zhang\*

936



### Manufacture of olefins by the selective hydrodeoxygenation of lignocellulosic ketones over a cobalt molybdate catalyst

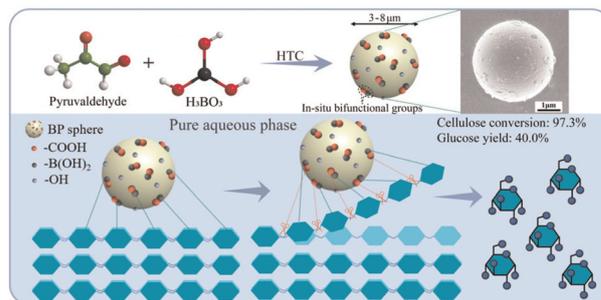
Fengan Han, Guangyi Li, Yanting Liu, Aiqin Wang,  
Feng Wang, Tao Zhang and Ning Li\*



948

### *In situ* bifunctional solid acids bearing B–OH and –COOH groups for efficient hydrolysis of cellulose to sugar in a pure aqueous phase

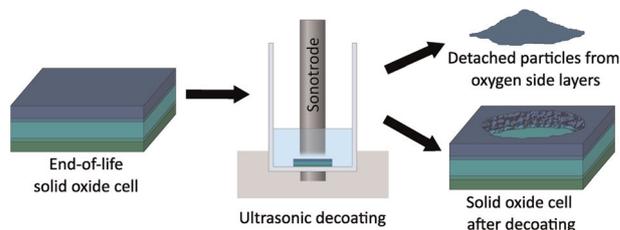
Yuhua Chen, Chengqi Feng,\* Chenkai Jin, Yuxin Zhu, Juncheng Huang, Haining Na\* and Jin Zhu



960

### Ultrasonic decoating as a new recycling path to separate oxygen side layers of solid oxide cells

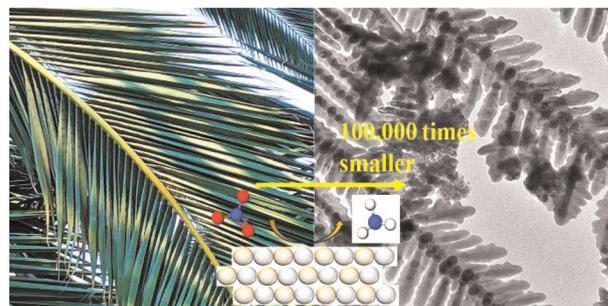
Carlo Kaiser,\* Thomas Buchwald and Urs A. Peuker



968

### Enhanced nitrate reduction via the Ag–Cu–P catalyst for sustainable ammonia generation under ambient conditions

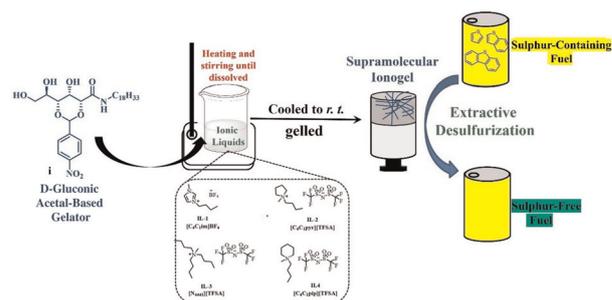
Xinwei Wen, Yue Zhao, Puyang Fan, Jiajie Wu, Kai Xiong, Chang Liu, Qing Qu\* and Lei Li\*



979

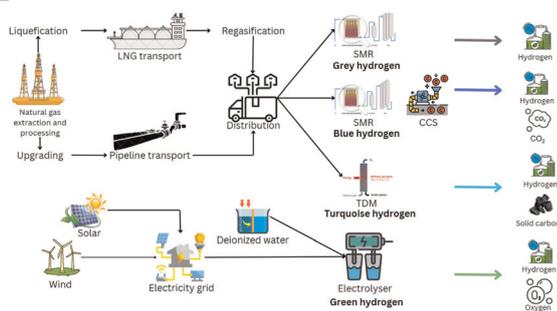
### Preparation, characterization and application of D-gluconic acetal-based self-healing supramolecular ionogels for desulphurization of fuels

Shipeng Chen,\* Jinping Wang, Li Feng, Zebin Song, Xiaoji Wang, Yubin Ke, Lin Hua, Yange Fan, Zheng Li, Yimin Hou,\* Baoyu Xue\* and Luke Liu\*



## PAPERS

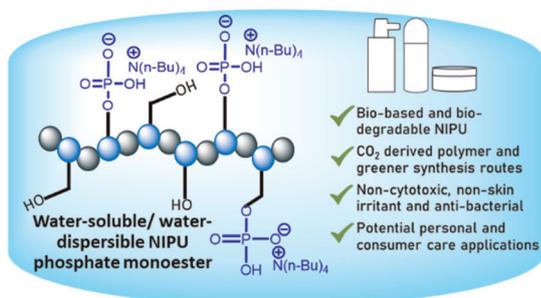
992



### Climate change performance of hydrogen production based on life cycle assessment

Gulam Husain Patel,\* Jouni Havukainen, Mika Horttanainen, Risto Soukka and Mari Tuomaala

1007



### Phosphate functionalized nonisocyanate polyurethanes with bio-origin, water solubility and biodegradability

Eric Kwok Wai Tam, Ning Xi Chong, Ping Sen Choong, Barindra Sana, Abdul Majeed Seayad, Satyasankar Jana\* and Jayasree Seayad\*

## CORRECTION

1020

### Correction: Organocatalytic Friedel–Crafts arylation of aldehydes with indoles utilizing N-heterocyclic iod(az)olium salts as halogen-bonding catalysts

Eirini M. Galathri, Thomas J. Kuczmera, Boris J. Nachtsheim\* and Christoforos G. Kokotos\*

