

# Green Chemistry

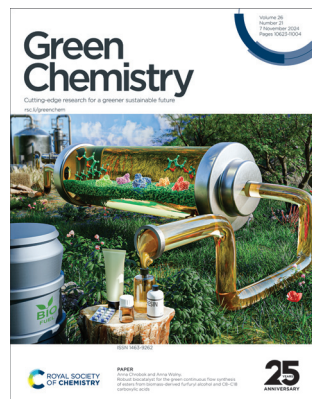
Cutting-edge research for a greener sustainable future

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### Cover

See Anna Wolny and Anna Chrobok  
pp. 10829–10841.

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### Inside cover

See Zen Maeno *et al.*,  
pp. 10842–10850.

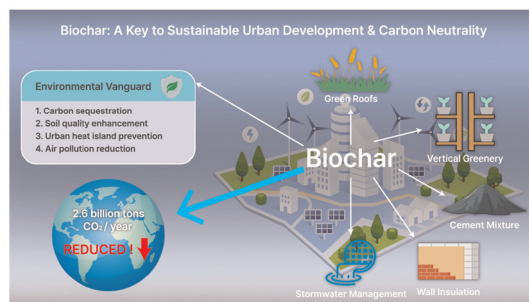
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## CRITICAL REVIEWS

10634

### Carbon negative biochar systems contribute to sustainable urban green infrastructure: a critical review

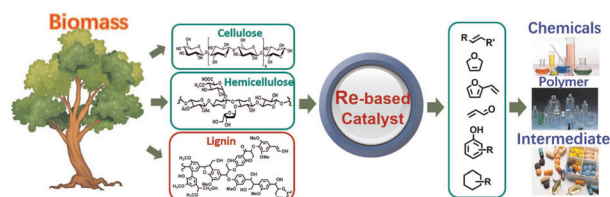
Sachini Supunsala Senadheera, Piumi Amasha Withana, Juin Yau Lim, Siming You, Scott X. Chang, Fang Wang, Jay Hyuk Rhee and Yong Sik Ok\*



10661

### Rhenium-based catalysts for biomass conversion

Julian Skagfjörd Reinhold, Jifeng Pang,\* Bo Zhang,\* Fritz E. Kühn\* and Tao Zhang



# Environmental Science: Atmospheres

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Fundamental questions  
Elemental answers





## CRITICAL REVIEWS

10687

## Recent progress in energy conversion and storage of agricultural waste-derived (carbon/nano) materials: a review

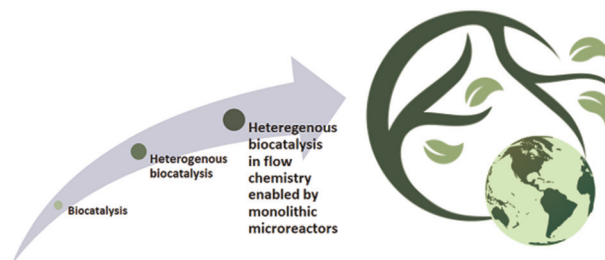
Zahra Nezafat, Yahao Dong,\*  
 Mahmoud Nasrollahzadeh,\* Nasrin Shafiei,  
 Hanieh Gharoubi and Shahrzad Javanshir



10718

## Monoliths enabling biocatalysis in flow chemistry

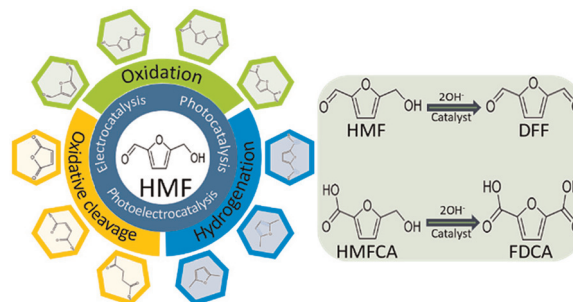
Aleksandra Lambarska, Katarzyna Szymańska\* and  
 Ulf Hanefeld\*



10739

## Research progress on photocatalytic, electrocatalytic and photoelectrocatalytic selective oxidation of 5-hydroxymethylfurfural

Yang An, Tao Lei, Weiye Jiang and Huan Pang\*

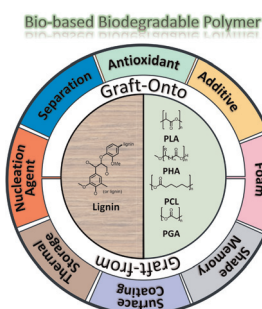


## TUTORIAL REVIEW

10774

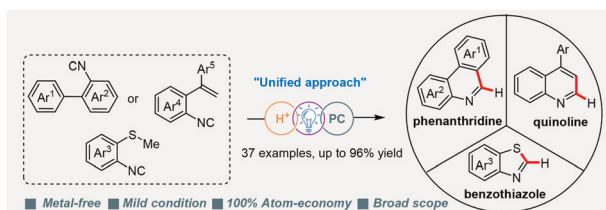
## Biodegradable polymers: from synthesis methods to applications of lignin-graft-polyester

Sundol Kim and Hoyong Chung\*



## COMMUNICATIONS

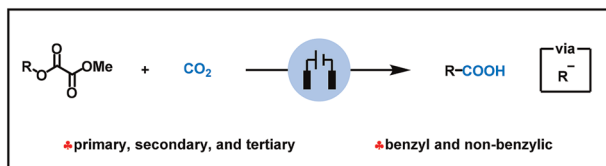
10804



### Metal-free photoinduced-radical hydrocyclization of 2-isocyanides: a unified synthetic approach to facilely assemble diverse *N*-heteroarenes

Ziyi Wang, Haonan Wei, Jinrong Du and Zhijun Zuo\*

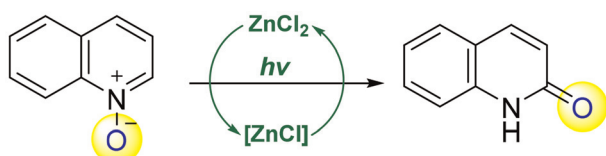
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### Electroreductive deoxygenative carboxylation of alkyl oxalates with $\text{CO}_2$

Yong Yuan,\* Hangfei Jiang, Ya-Nan Zhang, Yuyan Tao, Xincong Liu and Congde Huo

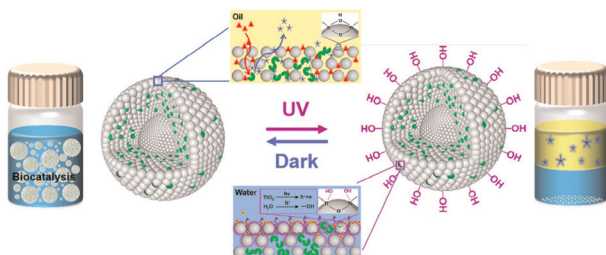
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### Light-induced isomerization of quinoline-*N*-oxide derivatives through Zn-catalysis: a photochemical approach for synthesizing 2-quinolinone derivatives

Xiaoqiang Yu,\* Sana Yang, Ning Yan, Yukang Fu, Yang Li,\* Wanhui Wang and Ming Bao

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### Lipase-entrapped colloidosomes with light-responsive wettability for efficient and recyclable Pickering interfacial biocatalysis

Dingyi Yang, Qi Zeng, Kaiwen Tan, Haoyue Hou, Xingyuan Fang, Chenlong Guo, Hao Yuan and Tao Meng\*

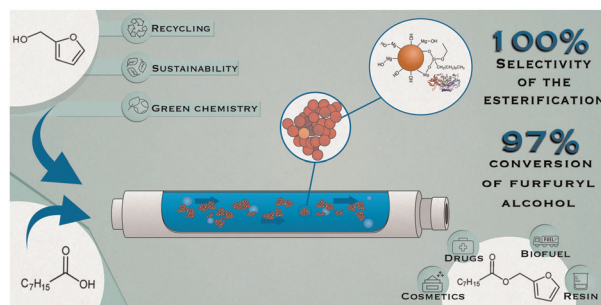


## PAPERS

10829

### Robust biocatalyst for the green continuous flow synthesis of esters from biomass-derived furfuryl alcohol and C8–C18 carboxylic acids

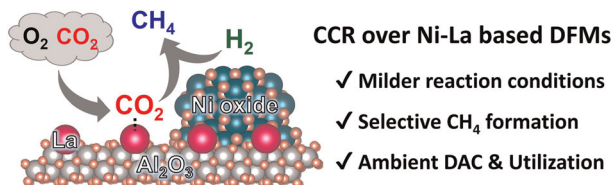
Anna Wolny, Dagmara Więctawik, Jakub Zdarta, Sebastian Jurczyk, Teofil Jesionowski and Anna Chrobok\*



10842

### Direct capture of low-concentration CO<sub>2</sub> and selective hydrogenation to CH<sub>4</sub> over Al<sub>2</sub>O<sub>3</sub>-supported Ni–La dual functional materials

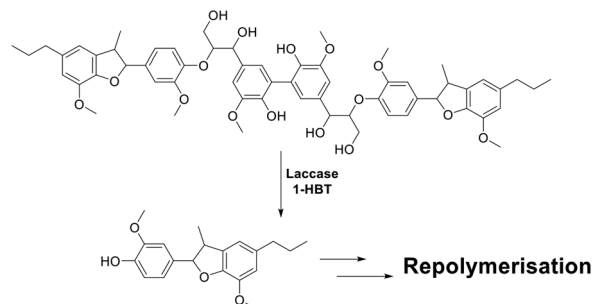
Tomotaka Tatsumichi, Rei Okuno, Hideki Hashimoto, Norikazu Namiki and Zen Maeno\*



10851

### Biocatalytic conversion of lignin model oligomer using a laccase-mediator system

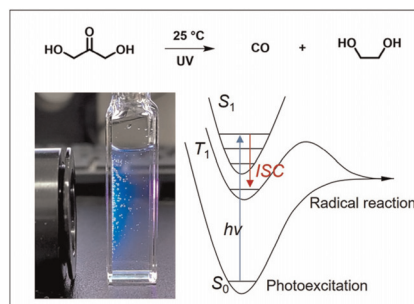
Christopher W. J. Murnaghan,\* William G. Forsythe, Jack H. Lafferty and Gary N. Sheldrake



10859

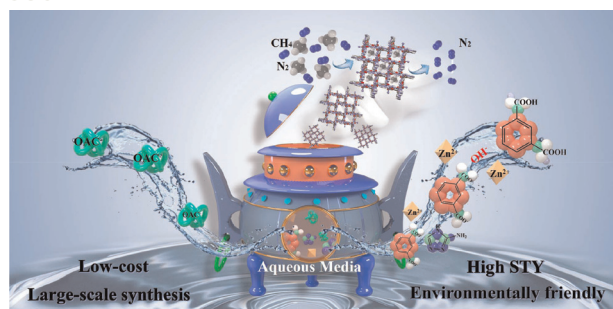
### Light-driven ultrafast dual C–C cleavage and coupling of dihydroxyacetone into high-purity carbon monoxide and ethylene glycol

Fanhao Kong, Hongru Zhou, Zhiwei Chen, Zhaolin Dou and Min Wang\*



## PAPERS

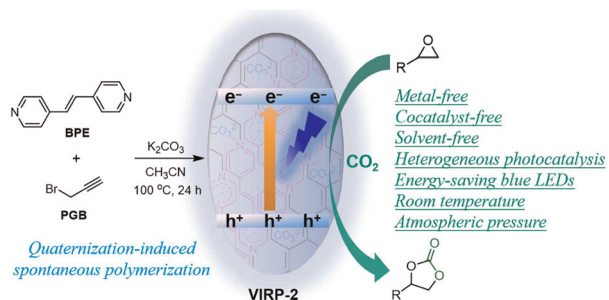
10867



### Green and scalable synthesis of a dual-ligand Zn-MOF with unprecedented space–time yield in aqueous media and efficient CH<sub>4</sub>/N<sub>2</sub> separation

Zhang-Ye Han, Xuefeng Bai, Yan-Long Zhao, Wen-Liang Li, Quanyou Sun, Zheng-He Xie, Li-Feng Ding, Rui Li\* and Jian-Rong Li\*

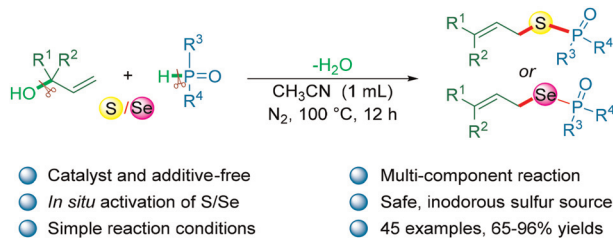
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### One-pot synthesis of conjugated vinylene-extended viologen ionic radical polyacetylenes for visible light-promoted photocatalytic CO<sub>2</sub> cycloaddition

Yanan Chang, Shuo Wang, Juan Chen, Zixuan Xu, Qing Shi, Yunjie Mao, Yanli Gai, Zhouyang Long and Guojian Chen\*

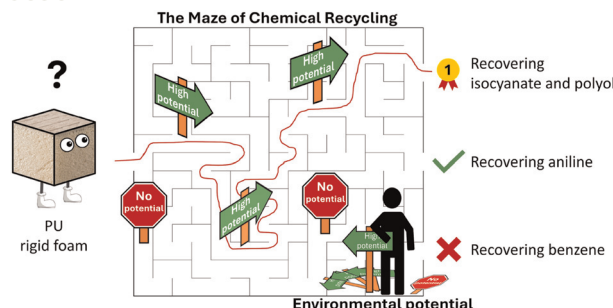
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### Halide-free and metal-free allylic thiolation/selenation of P(O)H compounds with sulfur/selenium and allylic alcohols

Longzhi Zhu,\* Weiwei Luo, Furong Guo, Lin Chen, Ying Tang, Biquan Xiong,\* Yu Liu, Ke-Wen Tang and Renhua Qiu\*

10893



### What to do with polyurethane waste? The environmental potential of chemically recycling polyurethane rigid foam

Martin Pillich, Johannes Schilling, Luca Bosetti and André Bardow\*

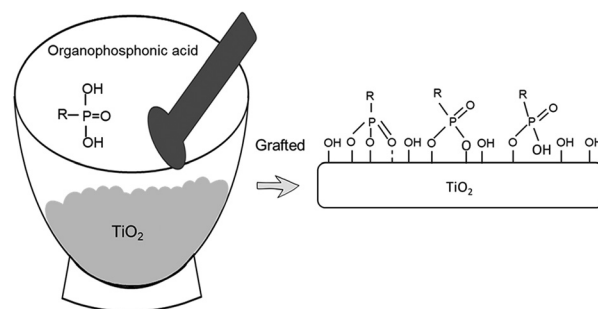


## PAPERS

10907

### Straightforward solid-phase modification of TiO<sub>2</sub> with propylphosphonic acid *via* manual grinding and shaker mixing: enhancing modification degree by thermal control while improving atom economy

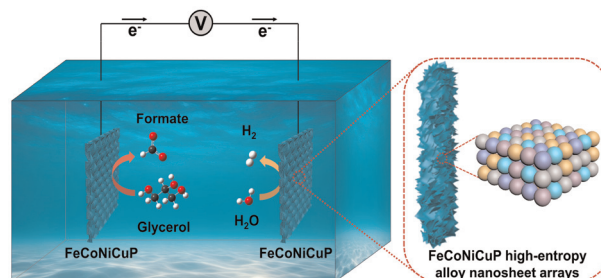
Kaimin Zhang, Jinxin Wang,\* Nick Gys, Elien Derveaux, Nahal Ghanemnia, Wouter Marchal, Peter Adriaensens and Vera Meynen\*



10921

### Self-supported FeCoNiCuP high-entropy alloy nanosheet arrays for efficient glycerol oxidation and hydrogen evolution in seawater electrolytes

Leyang Song, Chaoqun Ma, Peidong Shi, Xiaojuan Zhu, Kaiyu Qu, Lijie Zhu,\* Qipeng Lu\* and An-Liang Wang\*

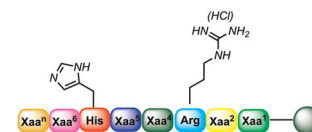


10929

### Solid phase peptide synthesis using side-chain unprotected arginine and histidine with Oxyma Pure/TBEC in green solvents

Tommaso Fantoni, Andrea Orlandin, Ilaria Di Stefano, Marco Macis, Alessandra Tolomelli, Antonio Ricci,\* Walter Cabri\* and Lucia Ferrazzano

#### TBEC/Oxyma Pure protocol for minimal protection SPPS

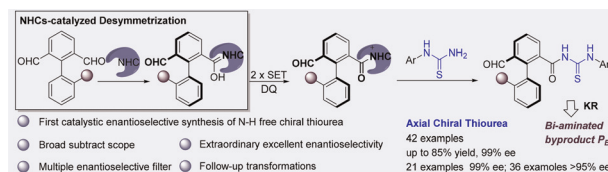


- ✓ High Atom Economy and low PMI
- ✓ Green binary solvents
- ✓ Side-chain free arginine, histidine, tryptophane and tyrosine
- ✓ Application for API synthesis

10940

### Synthesis of axially chiral thiourea by NHC-catalyzed desymmetrization

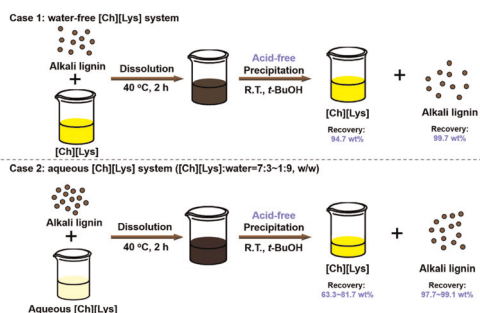
Yingtiao Wu, Xin Guan, Kehan Jiao, Huaqiu Zhao, Mingrui Li, Jiaqiong Sun, Guangfan Zheng\* and Qian Zhang





## PAPERS

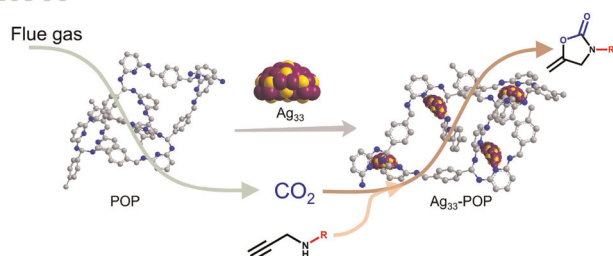
10950



### Evaluation on the recovery of lignin from basic [Ch][Lys] systems using low-cost alcohols as anti-solvents under acid-free conditions

Yichen Liu, Wanting Zhao, Qizhen Luo, Jipeng Yan\* and Jian Sun\*

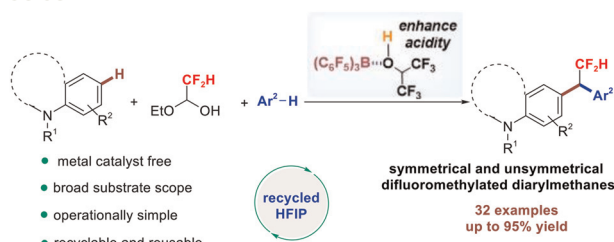
10960



### A sequential flow process of CO<sub>2</sub> capture and conversion using cost-effective porous organic polymers

Zhongqi Wu, Zhong Li, Lei Hu, Samson Afewerki, Maria Strømme, Qian-Feng Zhang and Chao Xu\*

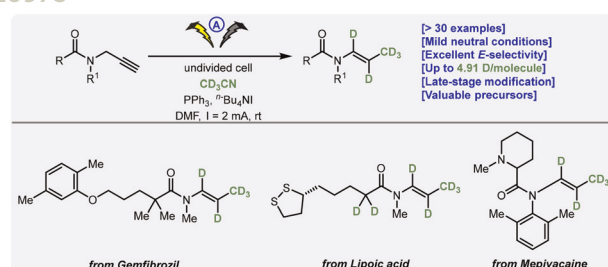
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### Green and controllable synthesis of symmetrical and unsymmetrical difluoromethylated diarylmethanes via a direct bisarylation strategy enabled by an HFIP-B(C<sub>6</sub>F<sub>5</sub>)<sub>3</sub> adduct

Xindi Li, Yiping Zhu, Zhina Gong, Jinshan Li,\* Jialin Xie, Zhendong Zhao, Jianwei Li and Chunman Jia\*

10975



### Electroreductive deuteration of *N*-propynylamides to enamides

Qiansong Gao, Mingchun Wang, Lianyou Zheng, Lingling Shi, Cheng Wu, He Li and Jinbao Xiang\*



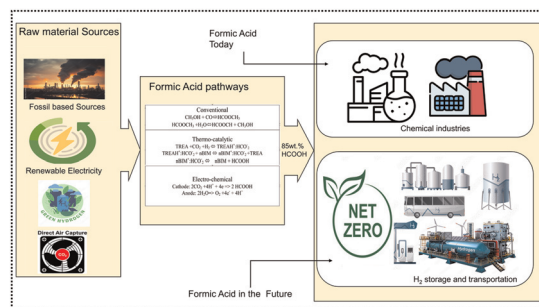


## PAPERS

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# Feasibility and sustainability of emerging CCU pathways for formic acid production

Tesfalem Aregawi Atsbha, Ha-Jun Yoon, Ali Cherif and Chul-Jin Lee\*



10996

# Electrochemistry-enabled Rh-catalyzed regioselective [4 + 1] and [4 + 2] cycloaddition of benzoic acid with alkynyl esters/amides

Wei-Jung Chiu and Chung-Ming Sun\*

