### **RSC Sustainability**

### rsc.li/rscsus

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 2753-8125 CODEN RSSUAN 1(4) 651-1056 (2023)



#### Cover

See Eric Husson, Catherine Sarazin et al., pp. 853-865. Image reproduced by permission of Catherine Sarazin from RSC. Sustainability., 2023, 1, 853.



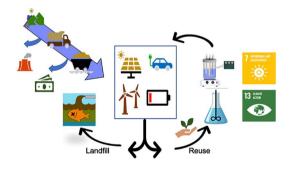
#### Inside cover

See Nuno Cerca, Alexander M. Kirillov et al., pp. 866-875. Image reproduced by permission of Alexander M. Kirillov from RSC. Sustainability., 2023, 1, 866.

#### **EDITORIAL**

UN Sustainable Development Goals 7 and 13. How sustainable are the metals in our journey to clean energy storage?

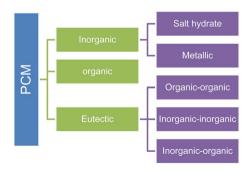
Cristina Pozo-Gonzalo



#### **CRITICAL REVIEWS**

Advancements in organic and inorganic shell materials for the preparation of microencapsulated phase change materials for thermal energy storage applications

Tushar Kanti Maiti, Prakhar Dixit, Amit Suhag, Sakchi Bhushan, Aparna Yadav, Namita Talapatra and Sujay Chattopadhyay\*



#### **Editorial Staff**

**Executive Editor** 

Emma Eley

Deputy Editor

Jon Ferrier

**Editorial Production Manager** 

Sarah Whitbread

**Assistant Editors** 

Jamie Purcell, Aphra Murray, Alexander John, Emily Ellison, Jack Pitchers

Editorial Assistan Alex Holiday

**Publishing Assistant** 

Lee Colwill

Publisher

Neil Hammond

For queries about submitted papers, please contact Sarah Whitbread, Editorial Production Manager in the first instance. E-mail: rscsus@rsc.org

For pre-submission queries please contact Emma Eley, Executive Editor. E-mail: rscsus-rsc@rsc.org

RSC Sustainability (electronic: ISSN 2753-8125) is published 6 times a year by the Royal Society of Chemistry, Thomas Graham House, Science Park, Milton Road, Cambridge, UK CB4 0WF.

RSC Sustainability is a Gold Open Access journal and all articles are free to read. Please email orders@rsc.org to register your interest or contact Royal Society of Chemistry Order Department, Royal Society of Chemistry, Thomas Graham House, Science Park, Milton Road, Cambridge, CB4 OWF, UK Tel +44 (0)1223 432398; E-mail: orders@rsc.org

Whilst this material has been produced with all due care, the Royal Society of Chemistry cannot be held responsible or liable for its accuracy and completeness, nor for any consequences arising from any errors or the use of the information contained in this publication. The publication of advertisements does not constitute any endorsement by the Royal Society of Chemistry or Authors of any products advertised. The views and opinions advanced by contributors do not necessarily reflect those of the Royal Society of Chemistry which shall not be liable for any resulting loss or damage arising as a result of reliance upon this material. The Royal Society of Chemistry is a charity, registered in England and Wales, Number 207890, and a company incorporated in England by Royal Charter (Registered No. RC000524), registered office:
Burlington House, Piccadilly, London W1J 0BA, UK, Telephone: 444 (0) 207 4378 6556.

#### Advertisement sales:

Tel +44 (0) 1223 432246; Fax +44 (0) 1223 426017; E-mail advertising@rsc.org

For marketing opportunities relating to this journal, contact marketing@rsc.org

## **RSC Sustainability**

#### rsc.li/RSCSus

RSC Sustainability publishes experimental and theoretical work across the breadth of materials science.

#### **Editorial Board**

#### Editor-in-Chief

Tom Welton, Imperial College London, UK

#### sociate Editors

Francesca Kerton, Memorial University of Newfoundland, Canada Haichao Liu, Peking University, China South Africa Cristina Pozo-Gonzalo, Deakin University, Australia Martin Prechtl, University of Lisbon, Portugal

Zhenyu Sun, Beijing University of Chemical

Vincent Nyamori, University of KwaZulu-Natal, Technology, China

#### Editorial Board Members

David Cole-Hamilton, University of St Andrews, UK

Mike Sutton, The Lubrizol Corporation, USA

#### **Advisory Board**

Jothi Kothandaraman, Pacific Northwest National Laboratory, USA
Chen Liao, Argonne National Laboratory, USA
Shengzhong Liu, Dalian National Laboratory for Clean Energy, China
Greta Patzke, University of Zurich, Switzerland
Peter Styring, The University of Sheffield, UK
Gyorgy Szekely, King Abdullah University of Science and Technology, Saudia Arabia
Luigi Vaccaro, University of Perugia, Italy
Sónia Ventura, University of Aveiro, Portugal
Charlotte Williams, University of Oxford, UK
Iris Yu, National University of Singapore, Singapore

#### Information for Authors

Full details on how to submit material for publication in RSC Sustainability are given in the Instructions for Authors (available from http://www.rsc.org/authors). Submissions should be made via the journal's homepage: rsc.li/RSCSus

Authors may reproduce/republish portions of their published contribution without seeking permission from the Royal Society of Chemistry, provided that any such republication is accompanied by an acknowledgement in the form: (Original Citation)–Reproduced by permission of the Royal Society of Chemistry.

This journal is © The Royal Society of Chemistry 2023. Apart from fair dealing for the purposes of research or private study for non-commercial purposes, or criticism or review, as permitted under the Copyright, Designs and Patents Act 1988 and the Copyright and Related Rights Regulation 2003, this publication may only be reproduced, stored or transmitted, in any form or by any means, with the prior permission in writing of the Publishers or in the case of reprographic reproduction in accordance with the terms of licences issued by the Copyright Licensing Agency in the UK. US copyright law is applicable to users in the USA.

Registered charity number: 207890

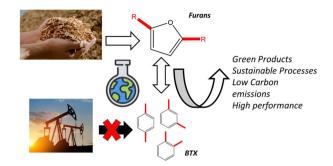


#### **CRITICAL REVIEWS**

698

### Bioderived furanic compounds as replacements for BTX in chemical intermediate applications

Amir Al Ghatta\* and Jason P. Hallett\*



746

#### Bio-based agricultural products: a sustainable alternative to agrochemicals for promoting a circular economy

A. K. Priya, Avinash Alagumalai, Devarajan Balaji and Hua Song\*



763

A review of past promises, present realities and a vibrant future for wound dressing from naturally occurring to sustainable materials

Supriya H., Sandeep Tripathi and Suryasarathi Bose\*

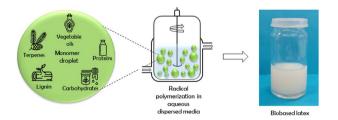


#### **TUTORIAL REVIEW**

788

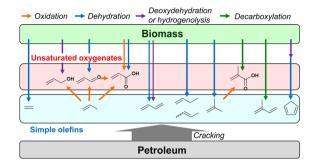
### Recent advances in radical polymerization of biobased monomers in aqueous dispersed media

Elena Rigo, Vincent Ladmiral, Sylvain Caillol and Patrick Lacroix-Desmazes\*



#### **PERSPECTIVES**

#### 814



### A perspective on catalytic production of olefinic compounds from biomass

Yoshinao Nakagawa,\* Mizuho Yabushita and Keiichi Tomishige\*

838



Safe-and-sustainable-by-design chemicals and advanced materials: a paradigm shift towards prevention-based risk governance is needed

Danail Hristozov,\* Alex Zabeo, Lya G. Soeteman-Hernández, Lisa Pizzol and Stella Stoycheva

#### COMMUNICATION

847



Cu-catalysed Chan-Evans-Lam reaction meets deep eutectic solvents: efficient and selective C-N bond formation under aerobic conditions at room temperature

Luciana Cicco, Paola Vitale, Filippo Maria Perna, Vito Capriati\* and Joaquín García-Álvarez\*

#### **PAPERS**

853



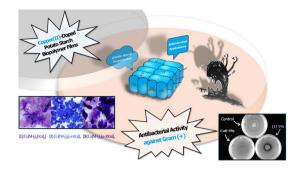
## Revisiting organosolv strategies for sustainable extraction of valuable lignin: the CoffeeCat process

Marie E. Vuillemin, María Catalina Quesada-Salas, Caroline Hadad, Jordane Jasniewski, Eric Husson\* and Catherine Sarazin\*

#### 866

#### Degradable copper(II)-doped starch-based biopolymeric films with antibacterial activity

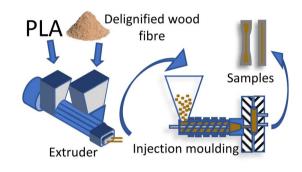
Kiryl I. Trusau, Paula Jorge, Ana Catarina Sousa, Tiago A. Fernandes, Vânia André, Marina V. Kirillova, Andrew I. Usevich, Nuno Cerca\* and Alexander M. Kirillov\*



#### 876

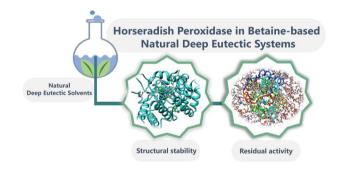
The effect of size and delignification on the mechanical properties of polylactic acid (PLA) biocomposites reinforced with wood fibres via extrusion

Renato Lemos Cosse, Vincent S. D. Voet, Rudy Folkersma and Katja Loos



### Improving the activity of horseradish peroxidase in betaine-based natural deep eutectic systems

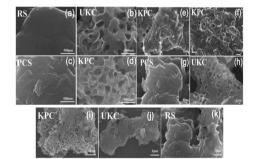
Liane Meneses, Nicolás F. Gajardo-Parra, Esteban Cea-Klapp, José Matías Garrido, Christoph Held, Ana Rita Duarte and Alexandre Paiva\*



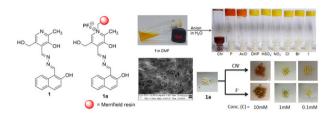
#### 898

#### Adsorption of sulfate ions from water by CaCl<sub>2</sub>modified biochar derived from kelp

Bingbing Tian, Yalong Song, Rubin Wang, Yi Wang, Tianyang Wang, Jinhui Chu, Zhu Qiao, Min Li,\* Jianjiang Lu\* and Yanbin Tong



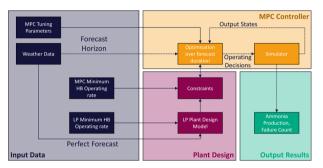
#### 914



## A new pyridoxal-derived gelator for selective recognition of CN<sup>-</sup> and F<sup>-</sup> under different conditions

Subhasis Ghosh, Nabajyoti Baildya and Kumaresh Ghosh\*

#### 923



# Impact of process flexibility and imperfect forecasting on the operation and design of Haber–Bosch green ammonia

Nicholas Salmon and René Bañares-Alcántara\*

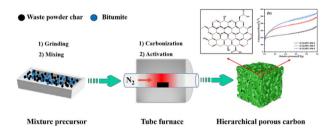
#### 938



# Understanding the important variables to optimize glycolysis of polyethylene terephthalate with lanthanide-containing ionic liquids

Nancy G. Bush, Caitlin H. Dinh, Casandrah L. Catterton and Megan E. Fieser\*

#### 948

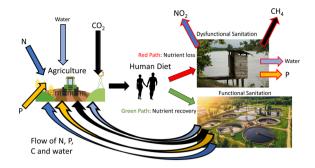


### Facile synthesis of functionalized porous carbon from bitumite mixed with waste powder char for excellent wastewater purification

Yufeng Yin,\* Yiting Zhao and Jing Wang

Will the circle be unbroken? The climate mitigation and sustainable development given by a circular economy of carbon, nitrogen, phosphorus and water

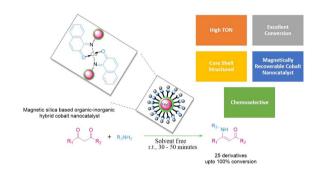
Patrick McKenna,\* Fiona Zakaria, Jeremy Guest, Barbara Evans and Steven Banwart



#### 975

A versatile core-shell hetero-nanostructure catalysed chemo-selective synthesis of β-enamino carbonyl compounds

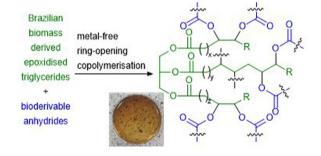
Sriparna Dutta, Prashant Kumar, Shivani Sharma, Sneha Yadav, Priyanka, Ranjana Dixit, Anju Srivastava and Rakesh Kumar Sharma\*



#### 987

Highly crosslinked polyesters prepared by ringopening copolymerization of epoxidized baru nut and macaw palm oils with cyclic anhydrides

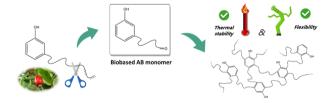
Aaron L. Vermiglio, Rafael T. Alarcon, Éder T. G. Cavalheiro, Gilbert Bannach, Thomas J. Farmer\* and Michael North\*



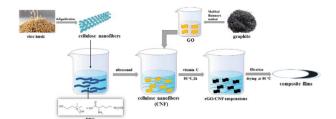
### 994

Eco-friendly synthesis of cardanol-based AB monomer for formaldehyde-free phenolic thermosets

Benoit Briou,\* Lucas Jégo, Thomas De Dios Miguel, Nicolas Duguet\* and Sylvain Caillol\*



#### 1006



### Deep eutectic solvent assisted preparation of cellulose nanofibers and graphene composite films for supercapacitors

Zhongzheng Ma, Yi Duan, Yongqi Deng, Hongdong Quan, Xiuguo Yang, Hongyan Li, Luqian Ye, Bingxia Xu and Lifeng Yan\*

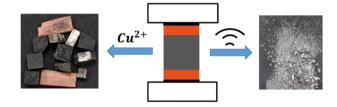




# An integrated green process for the extraction of triterpenic acids from *Eucalyptus globulus* leaves after hydrodistillation

Cátia S. D. Oliveira, Patrícia Moreira, Maria T. Cruz, Cláudia M. F. Pereira, Alexandre Gaspar, Carlos Pascoal Neto, Paula C. R. O. Pinto, Pedro Costa Branco, Artur M. S. Silva, Sónia A. O. Santos\* and Armando J. D. Silvestre

#### 1025

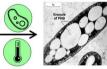


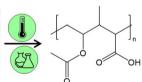
## Targeted recovery of metals from thermoelectric generators (TEGs) using chloride brines and ultrasound

Guillaume Zante,\* Evangelia Daskalopoulou, Christopher E. Elgar, Rodolfo Marin Rivera, Jennifer M. Hartley, Kevin Simpson, Richard Tuley, Jeff Kettle and Andrew P. Abbott

#### 1035







# Poly(vinyl acetate-co-crotonic acid) from bio-based crotonic acid: synthesis, characterization and carbon footprint evaluation

Alexandra Jorea, Adriano Parodi, Tiziana Benelli, Luca Ciacci, Maurizio Fagnoni, Paola Galletti, Laura Mazzocchetti, Davide Ravelli, Cristian Torri, Ivano Vassura and Chiara Samori\*

#### 1043

### Metabolic engineering for 4-aminophenylalanine production from lignocellulosic biomass by recombinant Escherichia coli

Hideo Kawaguchi, Shunsuke Masuo, Keiko Wakai, Naoki Takaya, Tomohisa Hasunma, Tatsuo Kaneko, Satoshi Okada, Takashi Sazuka, Chiaki Ogino\* and Akihiko Kondo

