

Sustainable Energy & Fuels

Interdisciplinary research for the development of sustainable energy technologies

rsc.li/sustainable-energy

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 2398-4902 CODEN SEFUA7 7(23) 5435–5600 (2023)



Cover

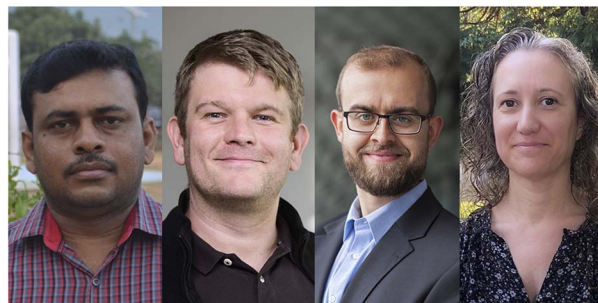
See Hongxian Liu, Zhenxing Fang, Yanning Zhang *et al.*, pp. 5483–5491. Image reproduced by permission of Hongxian Liu, Zhenxing Fang and Yanning Zhang from *Sustainable Energy Fuels*, 2023, 7, 5483.

EDITORIAL

5442

Shaping the future of hybrid ion capacitors

Vanchiappan Aravindan,* Martin Oschatz,* Konstantin Schutjajew* and Marta Sevilla*

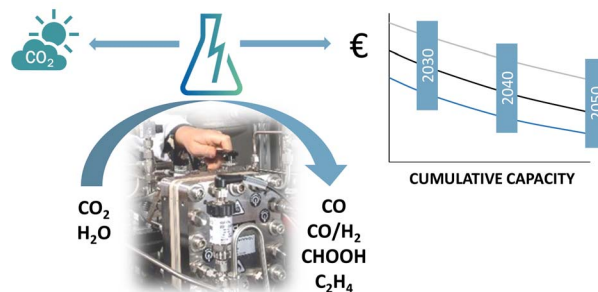


PERSPECTIVES

5445

Electrochemical CO₂ conversion technologies: state-of-the-art and future perspectives

Remko J. Detz,* Claire J. Ferchaud, Arie J. Kalkman, Jasmin Kemper, Carlos Sánchez-Martínez, Marija Saric and Manoj V. Shinde



Editorial Staff

Executive Editor

Neil Scriven

Deputy Editor

Sarah Holmes

Development Editor

Lily Newton

Editorial Production Manager

Claire Darby

Publisher

Sam Keltie

Publishing Editors

Emma Carlisle, Hannah Hamilton, Ephraim Otumudia, Irene Sanchez Molina Santos, Michael Spenceley, Callum Woof, Lauren Yarrow-Wright

Editorial Assistant

Kate Bando

Publishing Assistant

Linda Warncke

For queries about submitted articles, please contact Claire Darby, Editorial Production Manager, in the first instance. E-mail sustainableenergy@rsc.org

For pre-submission queries, please contact Neil Scriven, Executive Editor.

E-mail sustainableenergy-rsc@rsc.org

Sustainable Energy & Fuels (electronic: ISSN 2398-4902) is published 24 times per year by the Royal Society of Chemistry,

Thomas Graham House, Science Park, Milton Road, Cambridge, CB4 0WF, UK.

All orders, with cheques made payable to the Royal Society of Chemistry, should be sent to the Royal Society of Chemistry Order Department, Royal Society of Chemistry, Thomas Graham House, Science Park, Milton Road, Cambridge, CB4 0WF, UK

Tel +44 (0) 1223 432398; E-mail orders@rsc.org

2023 Annual (electronic) subscription price: £3218; US\$5447. Customers in Canada will be subject to a surcharge to cover GST. Customers in the EU subscribing to the electronic version only will be charged VAT.

If you take an institutional subscription to any Royal Society of Chemistry journal you are entitled to free, site-wide web access to that journal. You can arrange access via Internet Protocol (IP) address at www.rsc.org/ip

Customers should make payments by cheque in sterling payable on a UK clearing bank or in US dollars payable on a US clearing bank.

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: +44 (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

Sustainable Energy & Fuels

rsc.li/sustainable-energy

Sustainable Energy & Fuels publishes high quality scientific research that will drive development of sustainable energy technologies, with a particular emphasis on innovative concepts and approaches.

Editorial Board

Editor-in-Chief

Garry Rumbles, National Renewable Energy Laboratory and University of Colorado Boulder, USA

Associate Editors

Ryu Abe, Kyoto University, Japan
Francesca Brunetti, University of Rome Tor Vergata, Italy
David Mitlin, The University of Texas at Austin, USA
Marta Sevilla, Instituto Nacional del Carbón - CSIC, Spain

Carsten Streb, Johannes Gutenberg University Mainz, Germany
Xinchen Wang, Fuzhou University, China
Karen Wilson, Griffith University, Australia

Members

Tharamani Nagaiah, Bangalore University, India

Advisory Board

Jessica Allen, University of Newcastle, Australia
Vincent Artero, Université Grenoble Alpes, CNRS, CEA, France
Chunmei Ban, University of Colorado, USA
Christoph Brabec, University of Erlangen-Nuremberg, Germany
Jaephil Cho, Ulsan National Institute of Science and Technology (UNIST), South Korea
Cyrille Costentin, Université Grenoble Alpes, France
Seth Darling, Argonne National Laboratory, USA
Benjamin Dietzek, Jena Institute of Photonics, Germany
Gordana Dukovic, University of Colorado Boulder, USA
James Durrant, Imperial College London and Swansea University, UK
Heinz Frei, Lawrence Berkeley National Laboratory, USA
Elizabeth Gibson, University of Newcastle, UK
Susan Habas, National Renewable Energy Laboratory, USA
Anders Hagfeldt, Uppsala University, Sweden
Justin Hodgkiss, Victoria University of Wellington, New Zealand
Osamu Ishitani, Tokyo Institute of Technology,

Japan
Anne Jones, Arizona State University, USA
Kisuk Kang, Seoul National University, South Korea
Frédéric Laquai, KAUST, Saudi Arabia
Lieve Laurens, National Renewable Energy Laboratory, USA
Xianfeng Li, Dalian Institute of Chemical Physics, China
Doug MacFarlane, Monash University, Australia
Chris McNeill, Monash University, Australia
Shirley Meng, University of Chicago, USA
Johannes Messinger, Uppsala University, Sweden
Robert Mokaya, University of Nottingham, UK
Annamma Odaneth, Institute of Chemical Technology, India
Satishchandra Ogale, Indian Institute of Science Education and Research, Pune, India
Jude Onwudili, Aston University, UK
Martin Oschatz, Friedrich-Schiller-University Jena, Germany
Emilio Palomares, Catalan Institute of Chemical Research, Spain
Xiulian Pan, Dalian Institute of Chemical Physics, China

Allissa Park, Columbia University, USA
Nam-Gyu Park, Sungkyunkwan University, South Korea
Volker Presser, Leibniz Institute for New Materials, Germany
Amy Prieto, Colorado State University, USA
Liangti Qu, Tsinghua University, China
Erin Ratcliff, University of Arizona, USA
Srinivasan Sampath, Indian Institute of Science, India
Kimberley See, California Institute of Technology, USA
Uwe Schroder, TU-Braunschweig, Germany
Wendy Shaw, Pacific Northwest National Laboratory, USA
Adalgisa Sinicropi, University of Siena, Italy
Junwang Tang, University College London, UK
Roel van de Krol, Helmholtz-Zentrum Berlin für Materialien und Energie, Germany
Koen Vandewal, Dresden University of Technology, Germany
Aron Walsh, Imperial College London, UK
Aiqin Wang, Dalian Institute of Chemical Physics, China
Michael Wasielewski, Northwestern University, USA
Yan Yao, University of Houston, USA

Information for Authors

Full details on how to submit material for publication in Sustainable Energy & Fuels 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/sustainable-energy

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

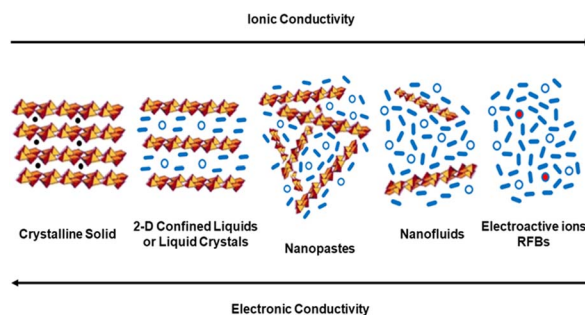


PERSPECTIVES

5473

To flow or not to flow. A perspective on large-scale stationary electrochemical energy storage

Anukriti Pokhriyal, Daniel Rueda-García and Pedro Gómez-Romero*

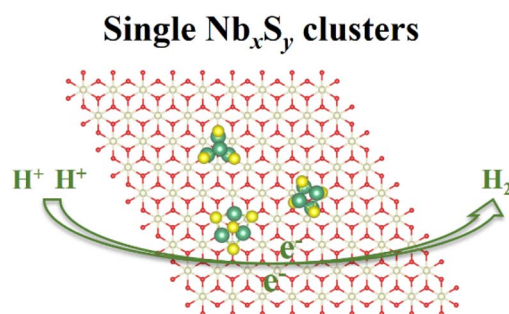


COMMUNICATIONS

5483

CeO₂-supported multi-nuclear Nb_xS_y clusters for hydrogen evolution reaction

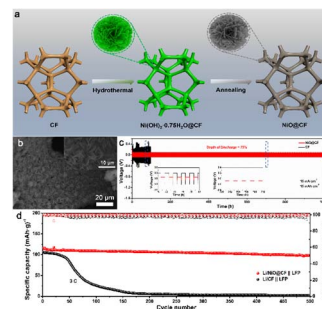
Hongxian Liu,* Chencheng Zhao, Hong Li, Xuelan Li, Xianfeng Mu, Dunhua Hong, Furu Zhong, Zhenxing Fang* and Yanning Zhang*



5492

Three-dimensional flower-like NiO on Cu foam as a lithiophilic current collector for high-performance lithium metal batteries

Jiping Ma, Zhanling Zhang,* Bin Zhang,* Changyong Huang, Xiaoqian Shi, Yong Li and Guangmin Zhou

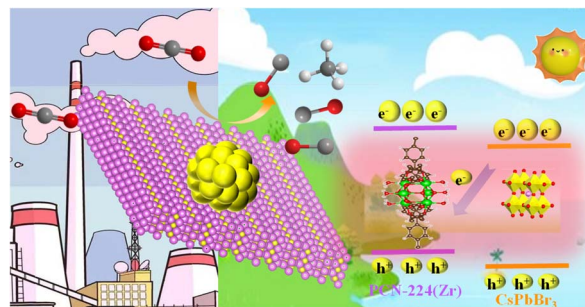


PAPERS

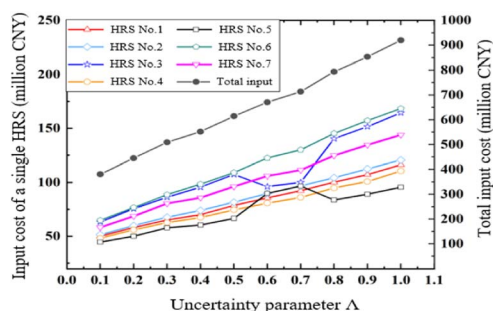
5499

Modulating CsPbBr₃ nanocrystals encapsulated in PCN-224(Zr) for boosting full-spectrum-driven CO₂ reduction: S-scheme transfer, photothermal-synergistic effect, and DFT calculations

Yan-He Chen, Jin-Qiu Shen, Xiao-Lu Chen, Luobing Tang, Na Zhang, Jian-Yong Zhang* and Zhen-Jiang Liu*



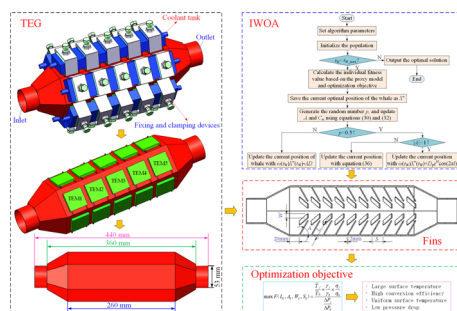
5513



Site planning and selection of hydrogen refueling stations considering the life cycle and demand uncertainty

Yan Zhou, Xunpeng Qin, Cenglin Yao,* Mao Ni, Jun Zhou, Ling Liu, Wenyi Li and Wenlong Yang

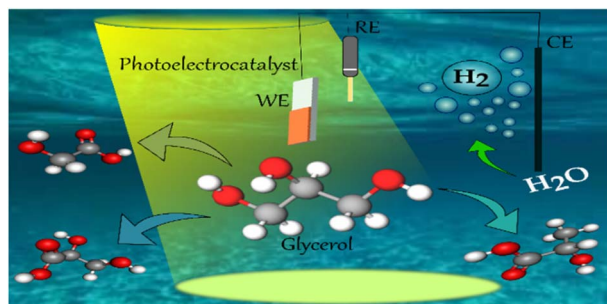
5528



Performance optimization of a thermoelectric generator for automotive application using an improved whale optimization algorithm

Rui Quan,* Haifeng Guo, Dazhi Liu, Yufang Chang and Hang Wan

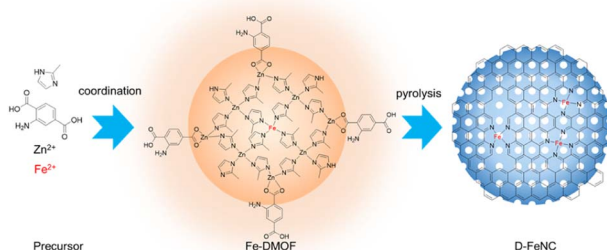
5546



Photoelectrochemical conversion of glycerol aqueous solution to value-added chemicals using $Bi_2Fe_4O_9$ as a photoanode

Bruno L. da Silva, Saulo A. Carminati, Matheus B. C. Souza, Leonardo C. Soares, Claudia Longo, Pablo S. Fernández and Ana F. Nogueira*

5557



MOF-derived Fe–N–C electrocatalyst via a dual ligand strategy for efficient oxygen reduction in acidic media

Yi Sheng, Hongmei Zheng, Jingting Hou, Wanying Zhang, Hong Chen, Luanjie Nie, Jing Zheng and Qingxue Lai*

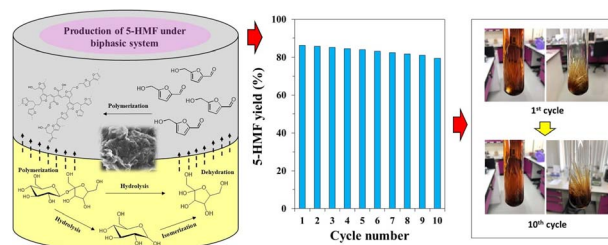


PAPERS

5565

Selective regression models for the rapid upgrading of raw sugar into 5-HMF bio-fuel additive under a sustainable/reusable system

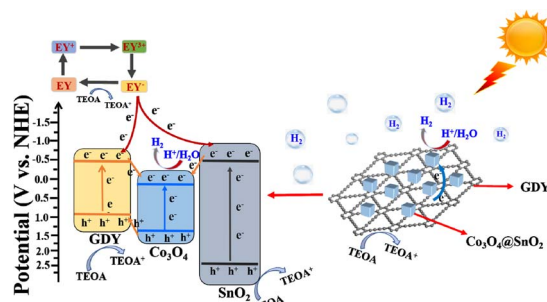
Panya Maneechakr,^{*} Irwan Kurnia, Asep Bayu, Obie Farobie, Chanatip Samart, Suwadee Kongparakul, Guoqing Guan and Surachai Karnjanakom^{*}



5578

Co₃O₄@SnO₂/graphdiyne type-II heterojunction and p–n heterojunction jointly enhance photocatalytic hydrogen production: Co–O–Sn bond as a bridge for electron transfer

Xin Guo,^{*} Qian Xiao, Tingting Yang, Yantao Sun and Zhiliang Jin^{*}



CORRECTION

5598

Correction: Closing the balance – on the role of integrating biorefineries in the future energy system

Julia Granacher,^{*} Rafael Castro-Amoedo, Jonas Schnidrig and François Maréchal

