

Sustainable Energy & Fuels

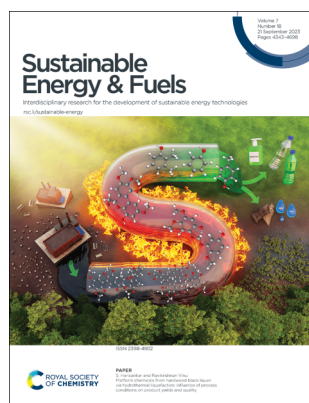
Interdisciplinary research for the development of sustainable energy technologies

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.

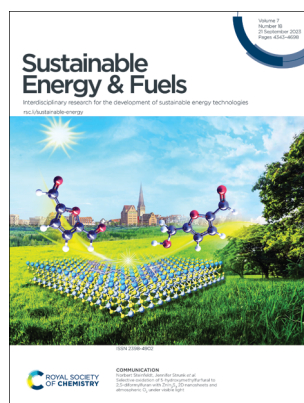
IN THIS ISSUE

ISSN 2398-4902 CODEN SEFUA7 7(18) 4343–4698 (2023)



Cover

See S. Harisankar and Ravikrishnan Vinu, pp. 4423–4441. Image reproduced by permission of Ravikrishnan Vinu from *Sustainable Energy Fuels*, 2023, 7, 4423.



Inside cover

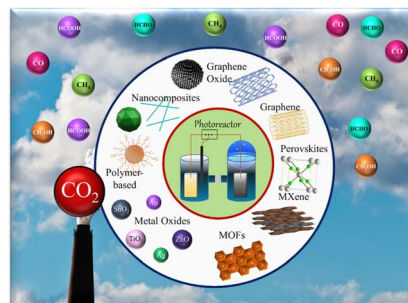
See Norbert Steinfeldt, Jennifer Strunk et al., pp. 4396–4400. Image reproduced by permission of Shuoping Ding from *Sustainable Energy Fuels*, 2023, 7, 4396.

REVIEW

4354

Catalytic heterostructured materials for CO₂ mitigation and conversion into fuels: a renewable energy approach towards a sustainable environment

Bhawna, Sanjeev Kumar, Ritika Sharma, Shikha Jyoti Borah, Akanksha Gupta,* Manoj Kumar Gupta, Ravinder Kumar, Kashyap Kumar Dubey,* Yogendra Kumar Mishra and Vinod Kumar*

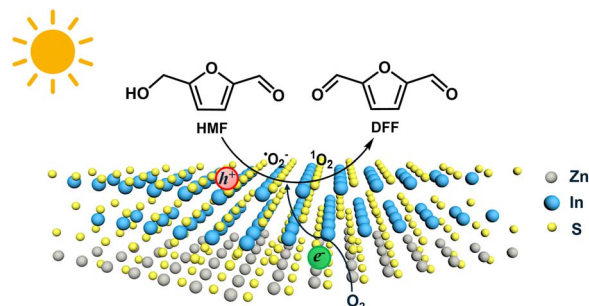


COMMUNICATIONS

4396

Selective oxidation of 5-hydroxymethylfurfural to 2,5-diformylfuran with ZnIn₂S₄ 2D nanosheets and atmospheric O₂ under visible light

Shuoping Ding, José Balena Gabriel Filho, Tim Peppel, Simon Haida, Jabor Rabeah, Norbert Steinfeldt* and Jennifer Strunk*



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 Spenceclay, 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

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

Alissa 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

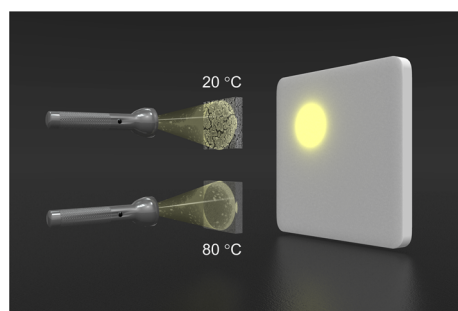


COMMUNICATIONS

4401

Spontaneous mesostructure formation produces optically transmissive Ni–P films that are catalytically active for the photoelectrochemical hydrogen evolution reaction

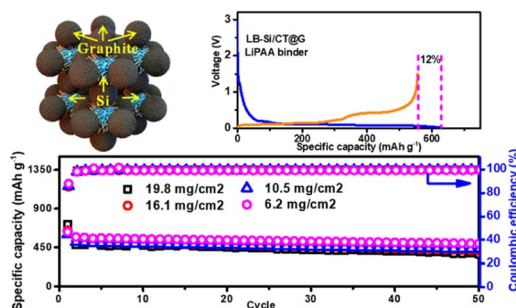
Zachary P. Ifkovits, Jillian T. Reed, Paul A. Kempler, Madeline C. Meier, Sean T. Byrne, Shaoyang Lin, Alexandre Z. Ye, Azhar I. Carim and Nathan S. Lewis*



4407

An ultrahigh mass-loading integrated high coulombic efficiency Si–graphite electrode for high-energy-density lithium ion batteries

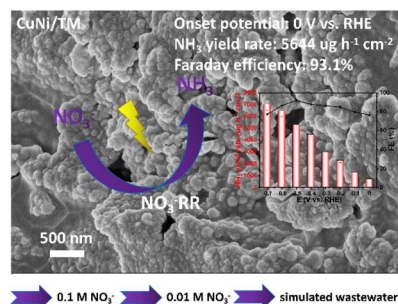
Shu Zhang, Yi Zhu, Xiandi Zhang, Fanglin Hu, Wengao Zhao,* Jianxuan Du, Shuyue Xue, Peng Li* and Yu-Jia Zeng*



4417

Electrodeposited copper–nickel nanoparticles as highly efficient electrocatalysts for nitrate reduction to ammonia

Ruizhi Li, Donglin Zhao, Longcheng Zhang, Kai Dong, Quan Li* and Guangyin Fan*

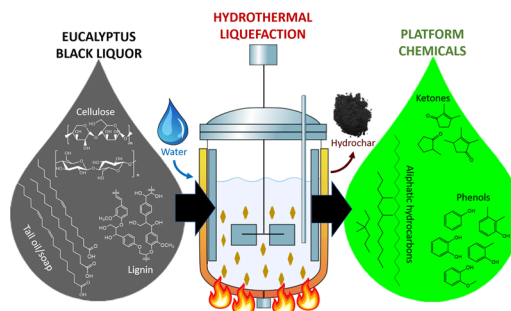


PAPERS

4423

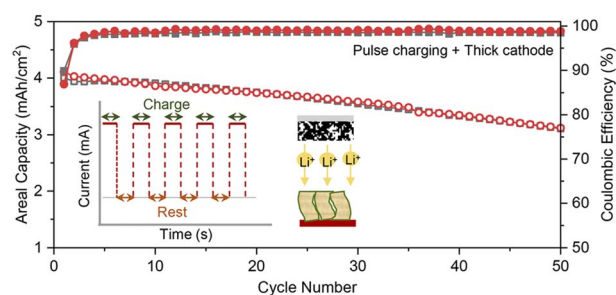
Platform chemicals from hardwood black liquor via hydrothermal liquefaction: influence of process conditions on product yields and quality

S. Harisankar and Ravikrishnan Vinu*



PAPERS

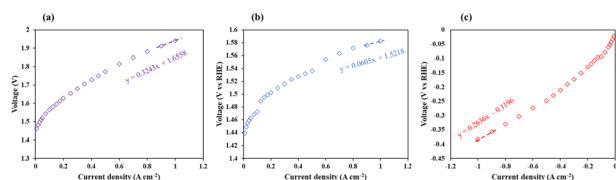
4442



Energy-dense anode-free rechargeable lithium metal batteries based on thick cathodes and pulse charging strategies

Huaqing Yu, Xu Liu, Hua Ma and Qing Zhao*

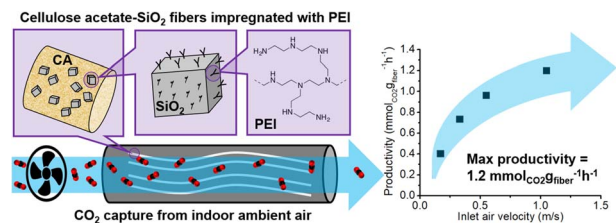
4450



Bubble detection on the cathode and anode of a high-performing capillary-fed water electrolysis cell

Anh Linh Hoang, Rhodri E. Owen, George Tsekouras, Dan J. L. Brett* and Gerhard F. Swiegers*

4461



Dynamic study of direct CO₂ capture from indoor air using poly(ethylenimine)-impregnated fiber sorbents

Fanhe Kong, Guanhe Rim, Pranjali Priyadarshini, MinGyu Song, Matthew J. Realff, Ryan P. Lively* and Christopher W. Jones*

4474



Electrification of glucose valorization over NiO/Ni foam

Giancosimo Sanghez de Luna, Tommaso Tabanelli, Juan J. Velasco-Vélez, Eleonora Monti, Francesca Ospitali, Stefania Albonetti, Fabrizio Cavani, Giuseppe Fornasari and Patricia Benito*



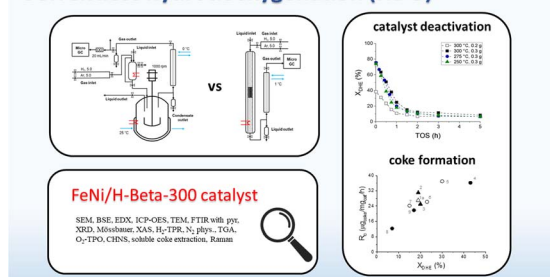
PAPERS

4486

Solventless hydrodeoxygenation of isoeugenol and dihydroeugenol in batch and continuous modes over a zeolite-supported FeNi catalyst

Zuzana Vajglová, Olha Yevdokimova, Ananias Medina, Kari Eränen, Teija Tirri, Jarl Hemming, Johan Lindén, Ilari Angervo, Pia Damlin, Dmitry E. Doronkin, Päivi Mäki-Arvela and Dmitry Yu. Murzin*

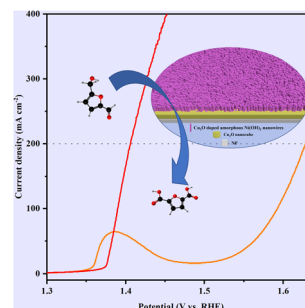
Solventless hydrodeoxygenation (HDO)



4505

Construction of hierarchical NiCu-based bimetallic electrocatalysts for promoting the electrooxidation of biomass derivatives

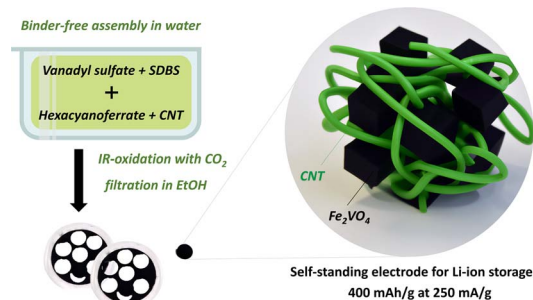
Yunliang Li, Yifang Fu, Yuqing Cao, Feifei Lei, Jun Zhao, Runwei Wang, Shilun Qiu and Zongtao Zhang*



4514

Surfactant stabilization of vanadium iron oxide derived from Prussian blue analog for lithium-ion battery electrodes

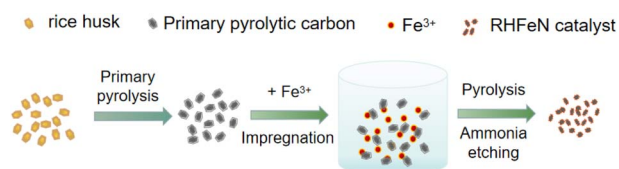
Behnoosh Bornamehr, Hiba El Gaidi, Stefanie Arnold, Emmanuel Pameté and Volker Presser*



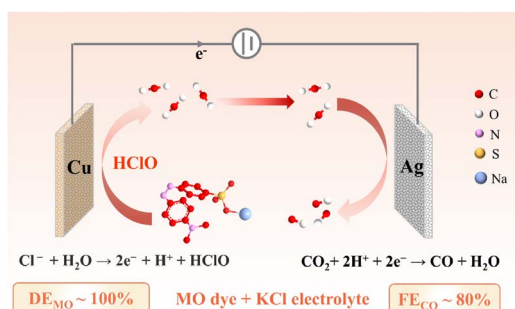
4525

The simple construction of rice-husk-derived carbon catalyst for oxygen reduction reaction by the synergism of iron and nitrogen co-doping

Hong Jin,* Laihong Zhou,* Guojun Zha, Ping Huang, Fahui Wang, Shuigen Li, Minhua Jiang and Chen Liu



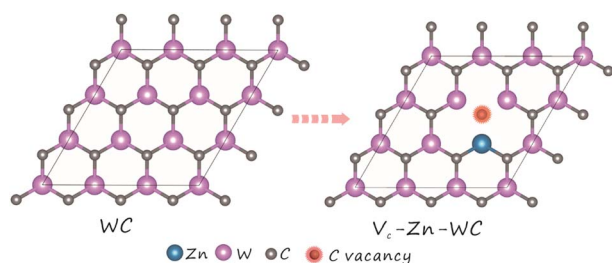
4533



Coupling electrochemical CO₂ reduction to syngas with chloride-mediated dye degradation to CO₂ in a one-compartment cell

Honglei Chen, Jiahong Zeng, Yanming Li, Caitao Kang, Chenglong Ding, Yao Li, Changli Li* and Jingfu He*

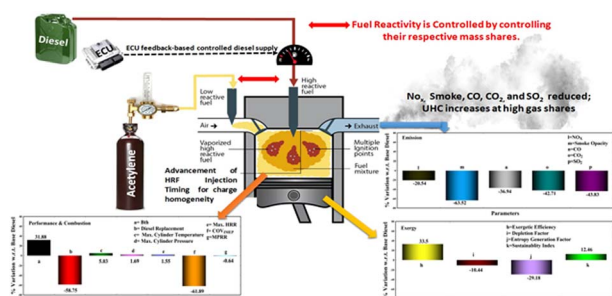
4540



Synergistic tailoring of doping and vacancies in tungsten carbide for efficient hydrogen evolution

Chenfan Yang,* Guoling Mao,* Chuangen Zhu, Ning Ding, Bowen Pu, Lei Zhong and Bo Wu

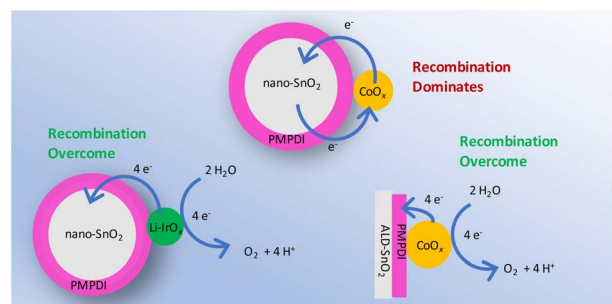
4547



Effect of acetylene as a low reactivity fuel on performance, combustion, exergy and emissions of an acetylene/diesel RCCI engine with variable premix ratios

Parthasarathi Deb and Abhishek Paul*

4567



Overcoming residual carbon-induced recombination in water-oxidation catalysis: combining a superior catalyst with low-carbon-content atomic layer deposition of SnO₂ for improved catalysis

Carly F. Jewell, Ashwanth Subramanian, Won-Il Lee, Chang-Yong Nam* and Richard G. Finke*

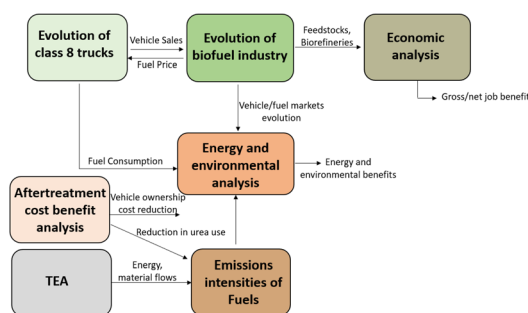


PAPERS

4580

Energy, economic, and environmental impacts assessment of co-optimized on-road heavy-duty engines and bio-blendstocks

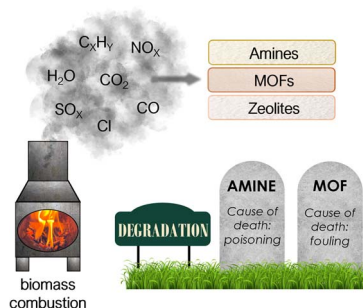
Doris Oke, Lauren Sittler, Hao Cai, Andre Avelino, Emily Newes, George G. Zaimes, Yimin Zhang, Longwen Ou, Avantika Singh, Jennifer B. Dunn and Troy R. Hawkins*



4602

Evaluating degradation of CO₂ adsorbents in flue gas from bioenergy with carbon capture and storage

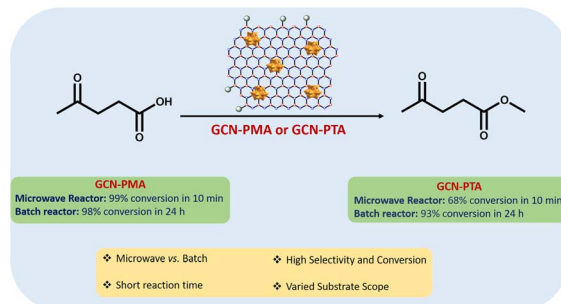
Hannah E. Holmes, Robert D. Schreck, Pavithra Narayanan, Shreya Ghosh, Wenting Sun, Matthew J. Realff and Ryan P. Lively*



4608

Microwave *versus* conventional promoted synthesis of fuel additives using graphitic carbon nitride supported catalysts

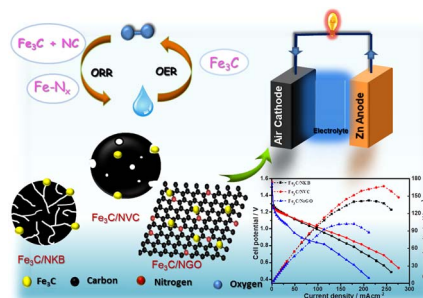
Daniele Polidoro, Alina M. Balu, Maurizio Selva, Rafael Luque,* Sameh M. Osman and Tripti Chhabra*



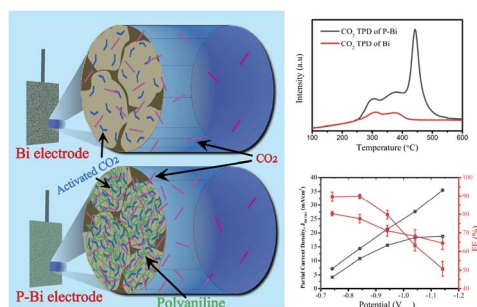
4618

Unravelling the role of iron carbide in oxygen reduction catalysts for rechargeable zinc–air batteries: a comprehensive kinetics & mechanistic study

S. Arya Gopal, Anook Nazer Eledath and Azhagumuthu Muthukrishnan*



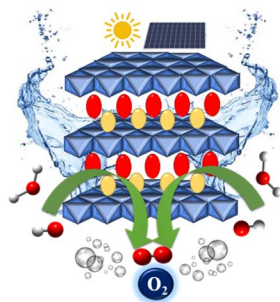
4630



Strategic catalyst modification for boosting CO₂ concentration at electrode surface and easing selective CO₂ reduction at higher potential

Shuvojit Mandal and Praveen Kumar*

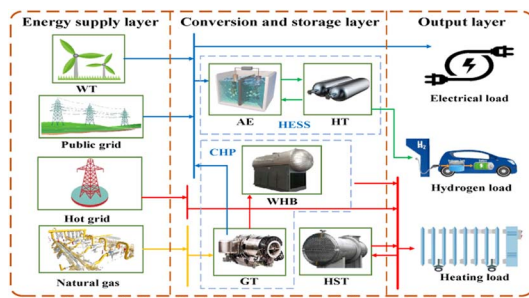
4638



A green synthetic approach: crystalline–amorphous interface CoFe-LDH as a sustainable electrocatalyst for water oxidation with low cell voltage and evaluation of its sustainability standards

Bakthavachalam Vishnu, Sundarraj Sriram and Jayaraman Jayabharathi*

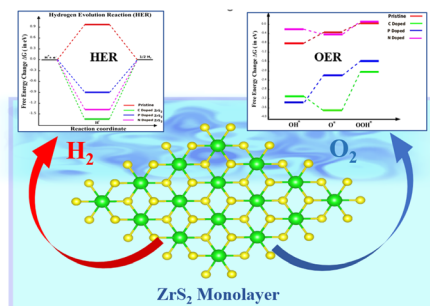
4654



Integrated energy system operation considering building thermal inertia and hydrogen storage systems

Yongli Wang, Yumeng Qin,* Yanan Wang, Ziben Ma, Zhonghua Zhao and Yinuo Wang

4668



Chalcogen composition driven enhancement of catalytic efficiency in zirconium based monolayers: insight from reaction coordinate mapping

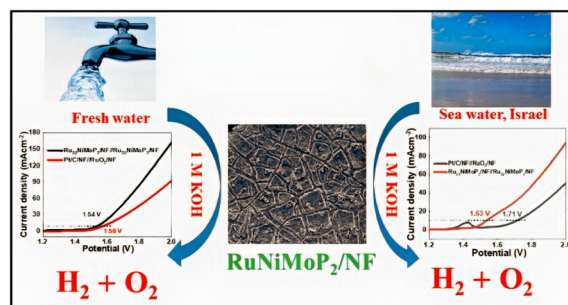
Shalini Tomar and Sudip Chakraborty*



4677

A bifunctional electrocatalyst for alkaline seawater splitting using ruthenium doped nickel molybdenum phosphide nanosheets

Hari Krishna Sadhanala,* Akanksha Gupta and Aharon Gedanken*



4687

From crude glycerol and volatile fatty acids to biodiesel and other bioproducts using *Yarrowia lipolytica* NCYC 2904 as a cell factory

Ana S. Pereira, Marlene Lopes* and Isabel Belo

