

Materials Advances

An open access journal publishing across the breadth of materials science

rsc.li/materials-advances

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 2633-5409 CODEN MAADC9 4(6) 1407–1614 (2023)



Cover

See Susan J. Quinn *et al.*, pp. 1481–1489. Image reproduced by permission of Helen Towrie.



Inside cover

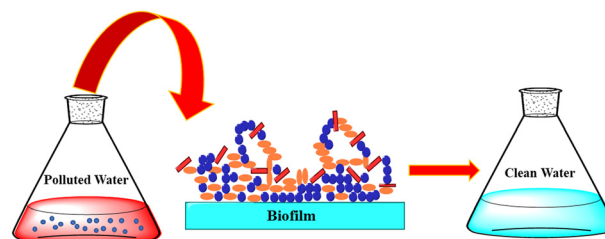
See Zhenxing Chen, Ziwei Li, *et al.*, pp. 1490–1501. Image reproduced by permission of Zhenxing Chen and Qingchong Xu from *Mater. Adv.*, 2023, 4, 1490.

REVIEWS

1415

Biofilm-mediated wastewater treatment: a comprehensive review

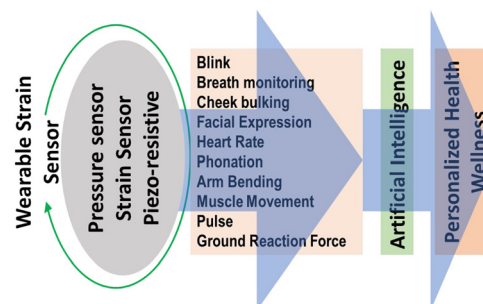
Sonia Saini, Sanjana Tewari, Jaya Dwivedi* and Vivek Sharma*



1444

Wearable strain sensors: state-of-the-art and future applications

Ashish Yadav,* Neha Yadav, Yongling Wu, Seeram RamaKrishna and Zheng Hongyu



Editorial Staff

Executive Editor

Jeremy Allen

Deputy Editor

Hannah Kerr

Editorial Production Manager

Christopher Goodall

Assistant Editors

Zita Zachariah and Serra Arslançan Sengelen

Editorial Assistant

Rosie Hague

Publishing Assistant

Allison Holloway

Publisher

Neil Hammond

For queries about submitted papers, please contact Christopher Goodall, Editorial Production Manager in the first instance. E-mail: materialsadvances@rsc.org

For pre-submission queries please contact Jeremy Allen, Executive Editor.

E-mail: materialsadvances-rsc@rsc.org

Materials Advances (electronic: ISSN 2633-5409) is published 24 times a year by the Royal Society of Chemistry, Thomas Graham House, Science Park, Milton Road, Cambridge, UK CB4 0WF.

Materials Advances 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 0WF, 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: +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

Materials Advances

rsc.li/materials-advances

Materials Advances publishes experimental and theoretical work across the breadth of materials science.

Editorial Board

Editors-in-Chief

Anders Hagfeldt, EPFL, Switzerland
Jeroen Cornelissen, University of Twente, The Netherlands
Natalie Stingelin, Georgia Institute of Technology, USA

Associate Editors

Veronica Augustyn, North Carolina State University, USA
Viola Birss, University of Calgary, Canada
Jiang Chang, Shanghai Institute of Ceramics, China
Elizabeth Cosgriff-Hernandez, University of Texas at Austin, USA
Rachel Crespo-Otero, Queen Mary University of London, UK
Gemma-Louise Davies, University College London, UK
Goutam De, S N Bose National Centre for Basic Sciences, India
Renaud Demadrille, Interdisciplinary Research Institute of Grenoble, France
Antonio Facchetti, Northwestern University and Flexterra Corporation, USA
Ghim Wei Ho, National University of Singapore, Singapore
Luis Hueso, CIC nanoGUNE, Spain
Yun Jeong Hwang, Korea Institute of Science

and Technology, South Korea
Unyong Jeong, POSTECH, South Korea
Ji Jian, Zhejiang University, China
Oana Jurchescu, Wake Forest University, USA
Kisuk Kang, Seoul National University, South Korea
Subrata Kundu, Central Electrochemical Research Institute (CECRI), India
Dan Li, Jinan University, China
Shaoqin Liu, Harbin Institute of Technology, China
David Lou, Nanyang Technological University, Singapore
Yi-Chun Lu, The Chinese University of Hong Kong, Hong Kong
Martyn McLachlan, Imperial College London, UK
Yoshiko Miura, Kyushu University, Japan
Kasper Moth-Poulsen, Chalmers University of Technology, Sweden
Ana Flavia Nogueira, University of Campinas, Brazil
Marc in het Panhuis, University of Wollongong, Australia
Shizhang Qiao, University of Adelaide, Australia
Xiaogang Qu, Changchun Institute of Applied Chemistry, Chinese Academy of Sciences,

China
Erin Ratcliff, University of Arizona, USA
Neil Robertson, University of Edinburgh, UK
Federico Rosei, National Institute of Scientific Research, University of Quebec, Canada
Jennifer Rupp, Massachusetts Institute of Technology, USA
Miriam Unterlass, Vienna University of Technology, Austria
Yana Vaynzof, Technical University of Dresden, Germany
Jessica Winter, Ohio State University, USA
Lydia Wong, Nanyang Technological University, Singapore
Li-Zhu Wu, Technical Institute of Physics and Chemistry, China
Zhiguo Xia, South China University of Technology, China
Yusuke Yamauchi, University of Queensland, Australia
Yadong Yin, University of California, Riverside, USA
Xiaowei Zhan, Peking University, China
Haoli Zhang, Lanzhou University, China
Ni Zhao, Chinese University of Hong Kong, Hong Kong
Zhen Zhou, Nankai University, China

Advisory Board

Please see the Materials Advances journal webpage for full details of our advisory board: rsc.li/materials-advances

Information for Authors

Full details on how to submit material for publication in Materials Advances 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/materials-advances

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

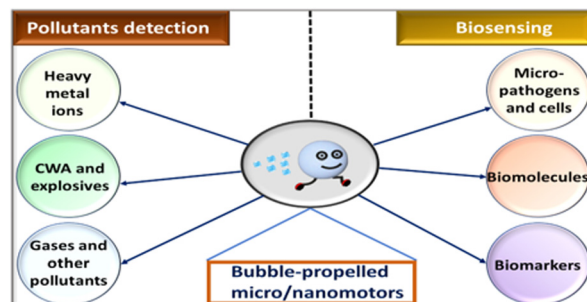


REVIEWS

1460

Bubble-propelled micro/nanomotors: a robust platform for the detection of environmental pollutants and biosensing

Suvendu Kumar Panda, Nomaan Alam Kherani, Srikanta Debata and Dhruv Pratap Singh*

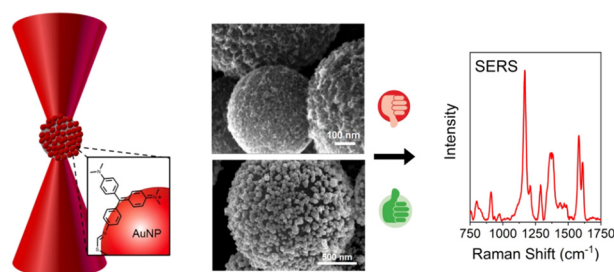


PAPERS

1481

Microsphere-supported gold nanoparticles for SERS detection of malachite green

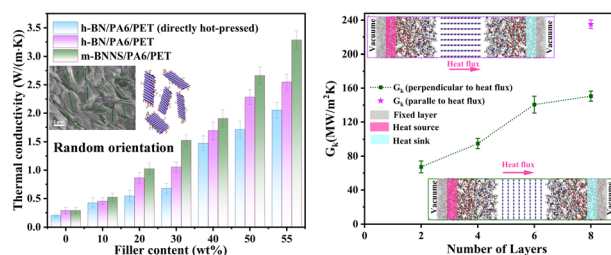
David T. Hinds, Samir A. Belhout, Paula E. Colavita, Andrew D. Ward and Susan J. Quinn*



1490

Improved out-of-plane thermal conductivity of boron nitride nanosheet-filled polyamide 6/polyethylene terephthalate composites by a rapid solidification method

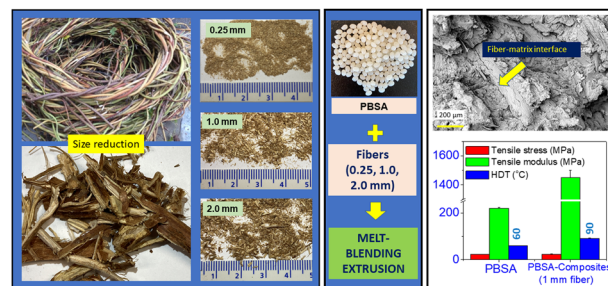
Qingchong Xu, Zhenxing Chen,* Xinxin Li, Jiaxin Hu, Yanling Liao, Yongfeng Liu, Long Li, Shiyang Wei and Ziwei Li*



1502

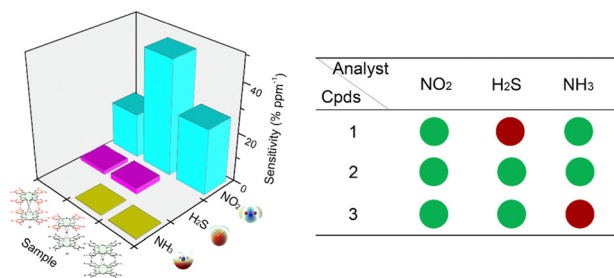
Hop natural fiber-reinforced poly(butylene succinate-co-butylene adipate) (PBSA) biodegradable plastics: effect of fiber length on the performance of biocomposites

Nicole Harder, Arturo Rodriguez-Urbe, Michael R. Snowden, Manjusri Misra* and Amar K. Mohanty



PAPERS

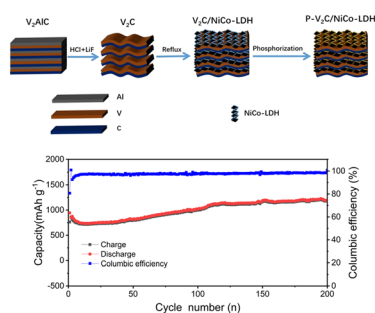
1515



Discrimination and detection of NO₂, NH₃ and H₂S using sensor array based on three ambipolar sandwich tetradiazepinoporphyrazinato/phthalocyaninato europium double-decker complexes

Xia Kong, Ekaterina N. Tarakanova, Xiaoli Du, Larisa G. Tomilova and Yanli Chen*

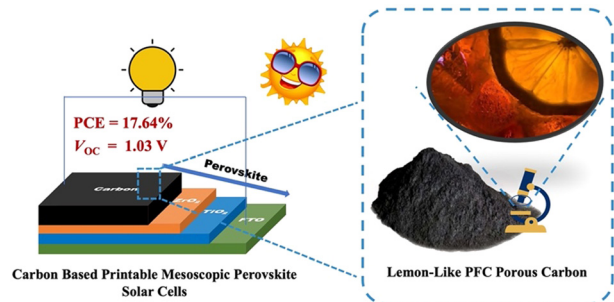
1523



Constructing P-doped self-assembled V₂C MXene/NiCo-layered double hydroxide hybrids toward advanced lithium storage

Xi Guo, Li Li,* Shuo Wang, Jian Shen, Yanan Xu* and Bingqiang Cao

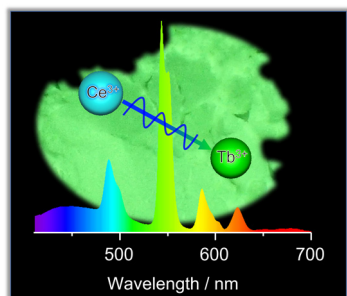
1534



EtOH/H₂O ratio modulation on carbon for high- V_{oc} (1.03 V) printable mesoscopic perovskite solar cells without any passivation

Jie Sheng, Xiaotian Zhu, Xiaoli Xu, Jingshan He, Dun Ma, Jialing Liu and Wenjun Wu*

1546



Near ultraviolet light excitable highly efficient blue-green multicolour warwickite phosphor, ScCaO(BO₃):Ce³⁺, Tb³⁺

Masato Iwaki,* Haruto Sato, Mizuki Watanabe,* Kazuyoshi Uematsu, Mineo Sato and Kenji Toda

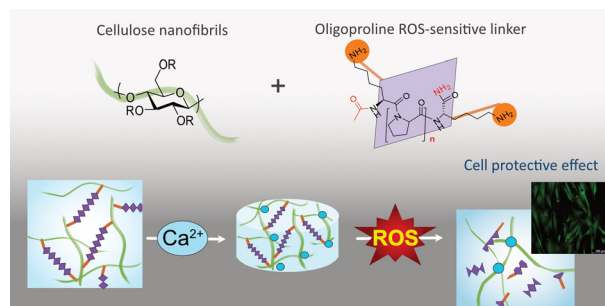


PAPERS

1555

Functionalization of cellulose nanofibrils to develop novel ROS-sensitive biomaterials

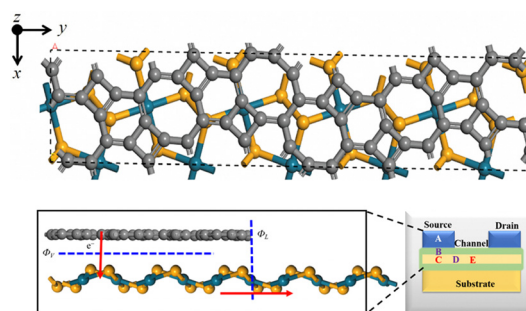
Carlos Palo-Nieto,* Anna Blasi-Romero, Corine Sandström, David Balgoma, Mikael Hedeland, Maria Strømme and Natalia Ferraz*



1566

The electronic and interfacial properties of a vdW heterostructure composed of penta-PdSe₂ and biphenylene monolayers

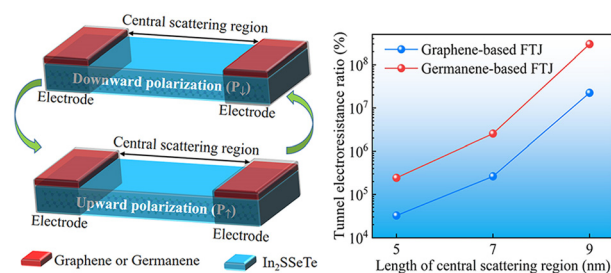
Muhammad Azhar Nazir, Yiheng Shen, Arzoo Hassan and Qian Wang*



1572

The giant tunneling electroresistance effect in monolayer In₂SSeTe-based lateral ferroelectric tunnel junctions

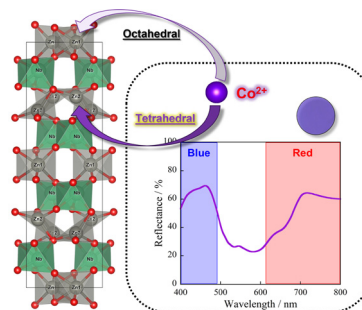
Zhou Cui, Ting Li, Rui Xiong, Cuilian Wen,* Yinggan Zhang, Jingying Zheng, Bo Wu and Baisheng Sa*



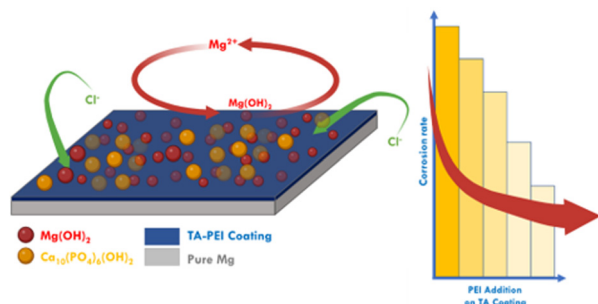
1583

A novel inorganic violet pigment based on zinc niobate

Kazuki Ohnishi, Ryohei Oka,* Yuga Nomura and Toshiyuki Masui*



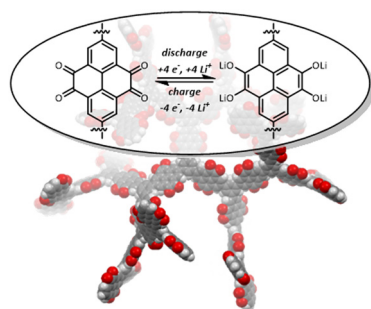
1590



Improving magnesium's corrosion resistance through tannic acid–polyethyleneimine coatings for bioresorbable implant applications

Daniel, Michael Leonardo, Safira Meidina Nursatya, Anggraini Barlian, Ekavianity Prajatelitia* and Hermawan Judawisastra*

1604



Redox-active, porous pyrene tetraone dendritic polymers as cathode materials for lithium-ion batteries

Lucas Ueberricke, Felix Mildner, Yuquan Wu, Elisa Thauer, Tom Wickenhäuser, Wen-Shan Zhang, Yana Vaynzof, Sven M. Elbert, Rasmus R. Schröder, Rüdiger Klingeler* and Michael Mastalerz*

