

Materials Advances

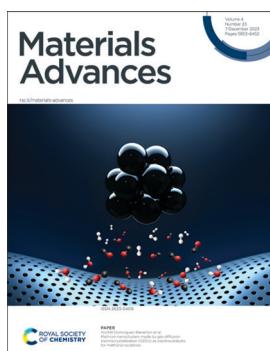
An open access journal publishing across the breadth of materials science

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(23) 5853–6452 (2023)



Cover

See Xochitl Dominguez-Benetton et al., pp. 6183–6191. Image reproduced by permission of Bart van Gompel from *Mater. Adv.*, 2023, 4, 6183.



Inside cover

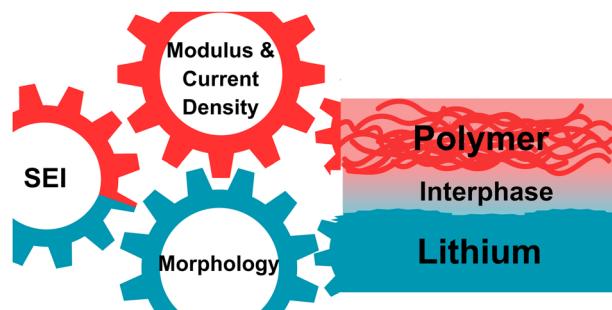
See Ashok M. Sajjan et al., pp. 6192–6198. Image reproduced by permission of Ashok M. Sajjan from *Mater. Adv.*, 2023, 4, 6192.

PERSPECTIVE

5867

Understanding and controlling lithium morphology in solid polymer and gel polymer systems: mechanisms, strategies, and gaps

Kyra D. Owensby, Ritu Sahore, Wan-Yu Tsai and X. Chelsea Chen*

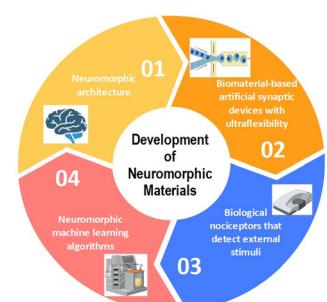


REVIEWS

5882

Computing of neuromorphic materials: an emerging approach for bioengineering solutions

Chander Prakash,* Lovi Raj Gupta, Amirinder Mehta, Hitesh Vasudev, Roman Tominov, Ekaterina Korman, Alexander Fedotov, Vladimir Smirnov and Kavindra Kumar Kesari*



Editorial Staff**Executive Editor**

Jeremy Allen

Deputy Editor

Hannah Kerr

Editorial Production Manager

Daniella Ferluccio

Assistant Editors

Zita Zachariah, Serra Arslançan Sengelen, Zifei Lu and Ashley Mitchinson

Editorial Assistant

Rosie Hague

Publishing Assistant

Allison Holloway

Publisher

Neil Hammond

For queries about submitted papers, please contact Daniella Ferluccio, 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

A. S. Achalkumar, Indian Institute of Technology, India
Veronica Augustyn, North Carolina State University, USA
Viola Birss, University of Calgary, Canada
Kaushik Chatterjee, Indian Institute of Science, India
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 Demadral, Interdisciplinary Research Institute of Grenoble, France
Håkan Engqvist, Uppsala University, Sweden
Antonio Facchetti, Georgia Institute of Technology, USA

Ghim Wei Ho, National University of Singapore, Singapore

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

Subrat Kundu, Central Electrochemical Research Institute (CECRI), India
Dan Li, Jilin University, China
Mingzhu Li, Technical Institute of Physics and Chemistry, Chinese Academy of Sciences, 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

Erin Ratcliff, University of Arizona, USA
Jennifer Rupp, Massachusetts Institute of Technology, USA
Miriam Unterlass, Vienna University of Technology, Austria
Yana Vaynzof, Technical University of Dresden, Germany
Maia Vergniory, Max Planck Institute for Chemical Physics of Solids, 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
Chengzhong Yu, University of Queensland, Australia
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

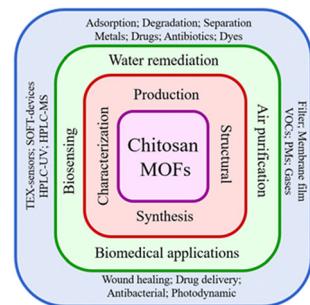


REVIEWS

5920

Chitosan/metal organic frameworks for environmental, energy, and bio-medical applications: a review

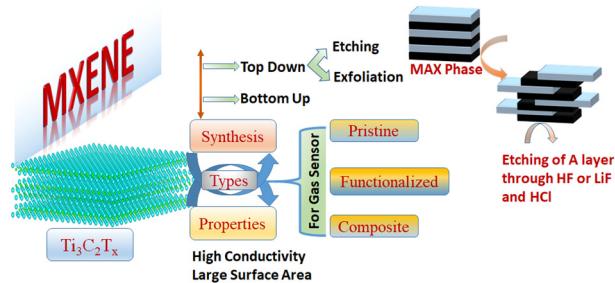
Akash Balakrishnan, Meenu Mariam Jacob, Nanditha Dayanandan, Mahendra Chinthalal,^{*} Muthamilselvi Ponnuchamy, Dai-Viet N. Vo,^{*} Sowmya Appunni and Adaikala Selvan Gajendhran



5948

Unveiling the potential of $Ti_3C_2T_x$ MXene for gas sensing: recent developments and future perspectives

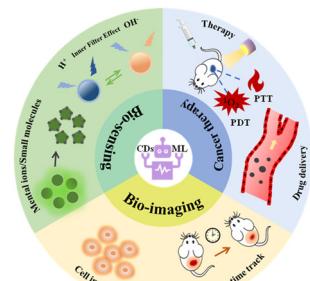
Nitesh K. Chourasia, Ankita Rawat, Ritesh Kumar Chourasia, Hemant Singh, Ramesh Kumar Kulriya, Vinod Singh and Pawan Kumar Kulriya*



5974

Utilizing machine learning to expedite the fabrication and biological application of carbon dots

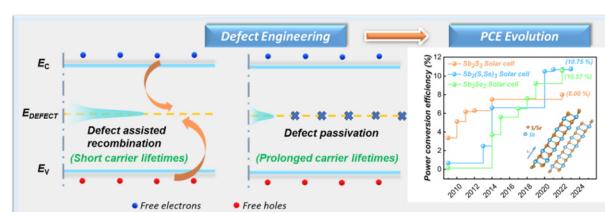
Yaoyao Tang, Quan Xu,* Peide Zhu, Rongye Zhu and Juncheng Wang*



5998

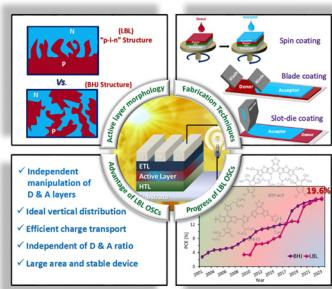
A comprehensive insight into deep-level defect engineering in antimony chalcogenide solar cells

Swapnil Barthwal, Siddhant Singh, Abhishek K. Chauhan, Nimutha S. Prabhu, Akila G. Prabhudessai and K. Ramesh*



REVIEWS

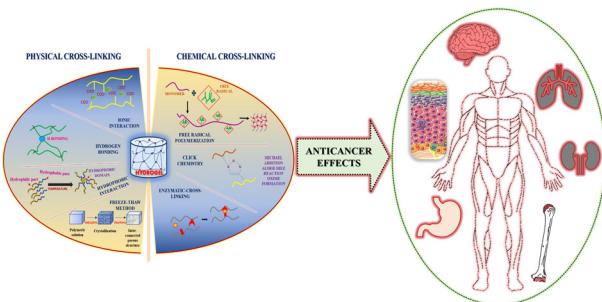
6031



Advances in layer-by-layer processing for efficient and reliable organic solar cells

Amaresh Mishra,* Nirmala Niharika Bhuyan, Haijun Xu and Ganesh D. Sharma*

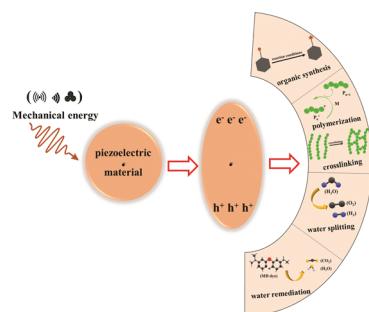
6064



Natural cationic polymer-derived injectable hydrogels for targeted chemotherapy

Sabya Sachi Das,* Devanshi Sharma, Balaga Venkata Krishna Rao, Mandeep Kumar Arora, Janne Ruokolainen, Mukesh Dhanka, Hemant Singh and Kavindra Kumar Kesari*

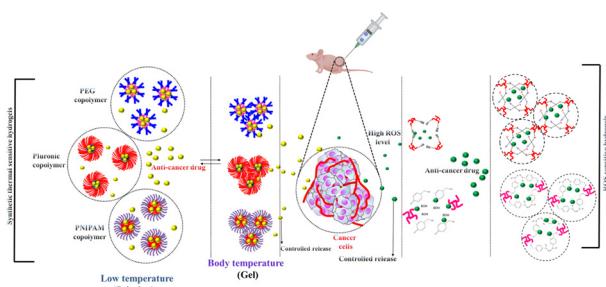
6092



Electron/hole piezocatalysis in chemical reactions

Shadi Asgari, Ghodsi Mohammadi Ziarani,* Alireza Badiei* and Siavash Iravani*

6118



Role of thermal and reactive oxygen species-responsive synthetic hydrogels in localized cancer treatment (bibliometric analysis and review)

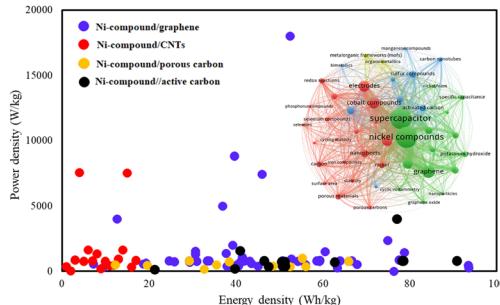
Yohannis Wondwosen Ahmed, Hsieh-Chih Tsai,* Tsung-Yun Wu, Haile Fentahun Darge and Yu-Shuan Chen*



6152

Recent advances in Ni-materials/carbon nanocomposites for supercapacitor electrodes

Ghobad Behzadi Pour,* Hamed Nazarpour Fard,
Leila Fekri Aval and Deepak Dubal

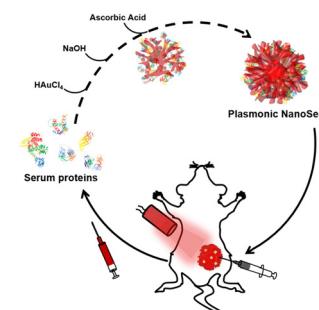


COMMUNICATION

6175

Plasmonic nanodendrites stabilized with autologous serum proteins for sustainable host specific photothermal tumor ablation

Mimansa, Smriti Bansal, Pranjali Yadav and Asifkhan Shanavas*

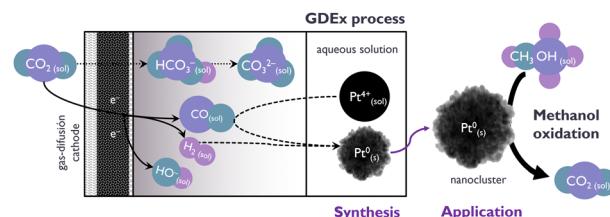


PAPERS

6183

Platinum nanoclusters made by gas-diffusion electrocrystallization (GDE) as electrocatalysts for methanol oxidation

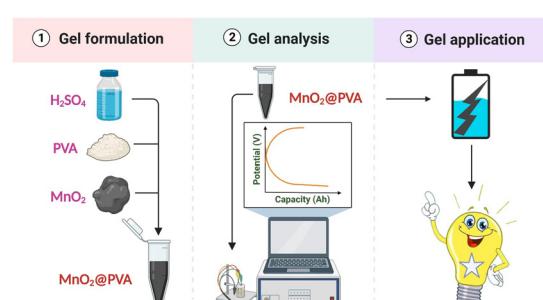
Omar Martinez-Mora, Luis F. Leon-Fernandez,
Milica Velimirovic, Frank Vanhaecke, Kristof Tirez,
Jan Fransaer and Xochitl Dominguez-Beneton*



6192

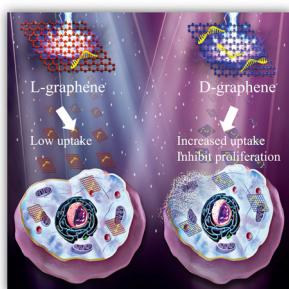
The state of understanding of the electrochemical behaviours of a valve-regulated lead–acid battery comprising manganese dioxide-impregnated gel polymer electrolyte

Bipin S. Chikkatti, Ashok M. Sajjan* and
Naqarai R. Banapurmath



PAPERS

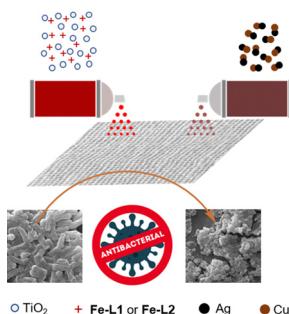
6199



One-step simultaneous liquid phase exfoliation-induced chirality in graphene and their chirality-mediated microRNA delivery

Pranav, Eswara N. H. K. Ghali, Neeraj Chauhan, Rahul Tiwari, Marco Cabrera, Subhash C. Chauhan and Murali M. Yallapu*

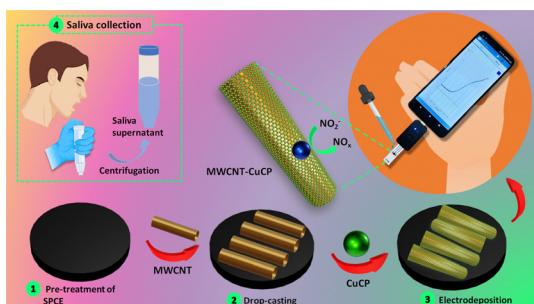
6213



Oxide anchored multi-charged metal complexes with binary nanoparticles for stable and efficient anti-bacterial coatings on cotton fabrics

Anjali Nirmala, Suja Pottath, Adarsh Velayudhanpillai Prasannakumari, Valan Rebinro Gnanaraj, Jubi Jacob, B. S. Dileep Kumar, Saju Pillai, Rajeev Kumar Sukumaran,* U. S. Hareesh,* Ayyappanpillai Ajayaghosh* and Sreejith Shankar*

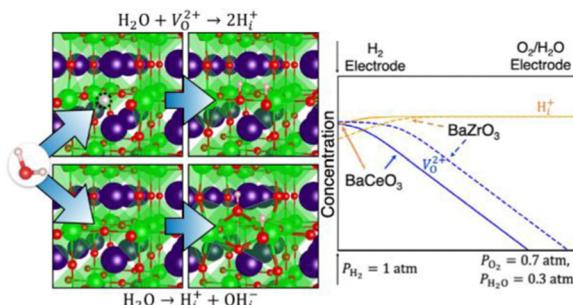
6223



Enzyme mimetic electrochemical sensor for salivary nitrite detection using copper chlorophyllin and carbon nanotubes-functionalized screen printed electrodes

Sriraja Subhasri Paramasivam, Siva Ananth Mariappan, Niroj Kumar Sethy and Pandiaraj Manickam*

6233



Incorporation of protons and hydroxide species in BaZrO_3 and BaCeO_3

Andrew J. E. Rowberg,* Meng Li, Tadashi Ogitsu and Joel B. Varley

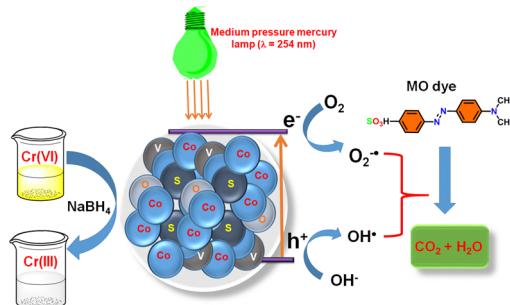


PAPERS

6244

Cobalt oxide decked with inorganic-sulfur containing vanadium oxide for chromium(vi) reduction and UV-light-assisted methyl orange degradation

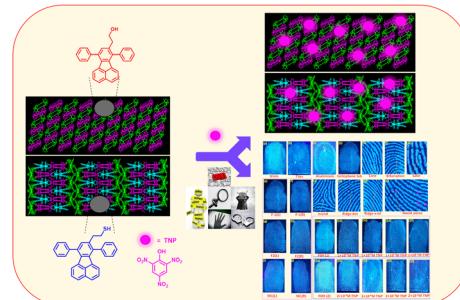
Sayanika Saikia, Manoshi Saikia, Salma A. Khanam, Seonghwan Lee, Young-Bin Park, Lakshi Saikia, Gautam Gogoi and Kusum K. Bania*



6259

Fluoranthene-based derivatives for multimodal anti-counterfeiting and detection of nitroaromatics

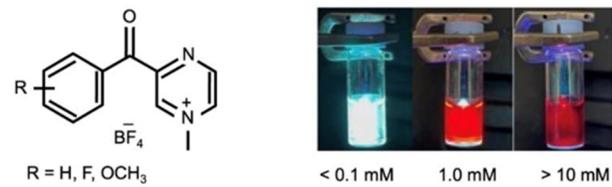
Kasthuri Selvaraj, Prasanth Palanisamy, Marimuthu Manikandan, Praveen B. Managutti, Palanivelu Sangeetha, Sharmarke Mohamed, Rajesh Pamanji, Joseph Selvin, Sohrab Nasiri, Stepan Kment and Venkatramaiyah Nutalapati*



6271

Concentration-dependent emission from low molecular weight benzoyl pyrazinium salts

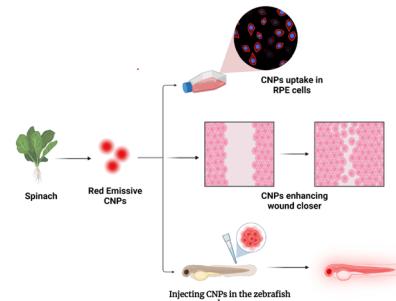
Ryan P. Brisbin, Arya Karappilly Rajan, Md. Imran Khan, Pravien S. Rajaram, Karen M. Russell, Sayantani Ghosh* and Ryan D. Baxter*



6277

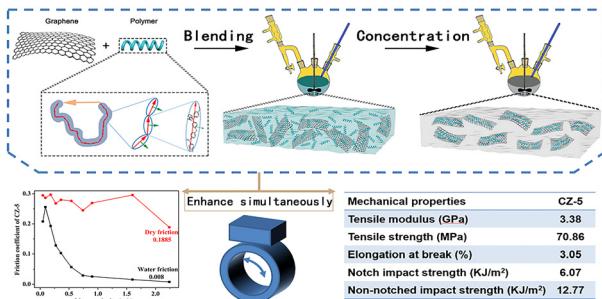
Red fluorescent carbon nanoparticles derived from *Spinacia oleracea L.*: a versatile tool for bioimaging and biomedical applications

Ketki Barve, Udit Singh, Pankaj Yadav, Krupa Kansara, Payal Vaswani, Ashutosh Kumar and Dhiraj Bhatia*



PAPERS

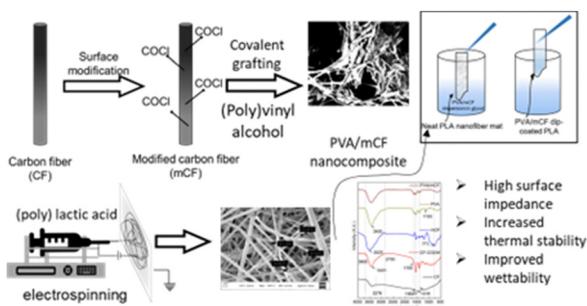
6286



Uniformly distributed graphite with dual attributes to achieve enhanced mechanical and tribological properties of PEK-C/graphite composites *via* a precipitation method

Zengwen Cao, Zhipeng Wang* and Guangyuang Zhou*

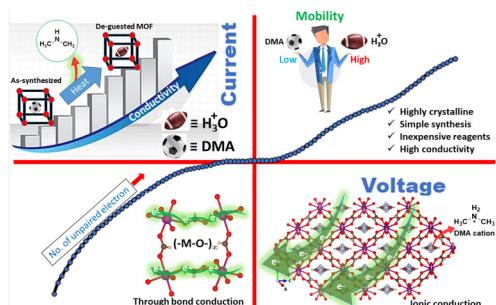
6294



Fabrication and characterization of conductive electrospun nanofiber mats of carbon nanofiber/poly(vinyl alcohol)/poly(lactic acid) ternary nanocomposites for flexible electronics applications

Victor K Sharma, Gourhari Chakraborty, Soundararajan Narendren and Vimal Katiyar*

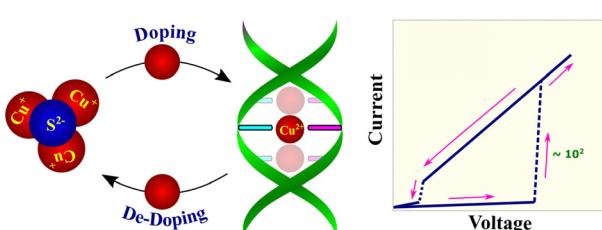
6304



Highly conductive three-dimensional metal organic frameworks from small *in situ* generated ligands

Uddit Narayan Hazarika, Jhorna Borah, Arobinda Kakoti, Rinki Brahma, Kangkan Sarmah, Ankur Kanti Guha and Prithiviraj Khakhlay*

6312



Soft grafting of DNA over hexagonal copper sulfide for low-power memristor switching

Smita Gajanan Naik, M. K. Rabinal* and Shouvik Datta

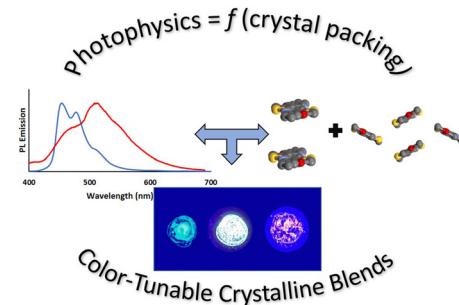


PAPERS

6321

Correlating structure and photophysical properties in thiazolo[5,4-*d*]thiazole crystal derivatives for use in solid-state photonic and fluorescence-based optical devices

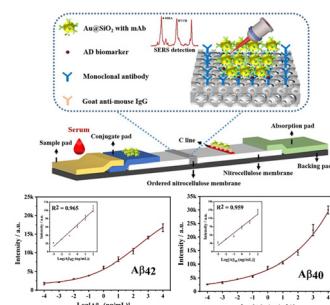
Abhishek Shibu, Sean Jones, P. Lane Tolley, David Diaz, Carly O. Kwiatkowski, Daniel S. Jones, Jessica M. Shivas, Jonathan J. Foley IV, Thomas A. Schmedake and Michael G. Walter*



6333

A nanostructured lateral flow immunoassay strip combined with Au@SiO₂ SERS nanotags for multiplex biomarker detection

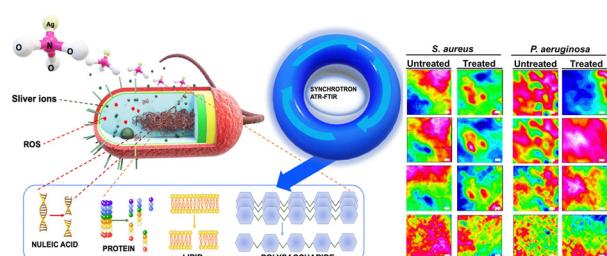
Geng Zhu, Yuanbao Zhan, Yu Lu, Fei Zheng, Yu Wan, Bing Liu, Xi Yang, Yanhui Wan, Qingjiang Sun, Jingjie Sha, Yan Huang* and Xiangwei Zhao*



6342

Synchrotron macro ATR-FTIR micro-spectroscopy to unlock silver ion-induced biochemical alterations in bacteria

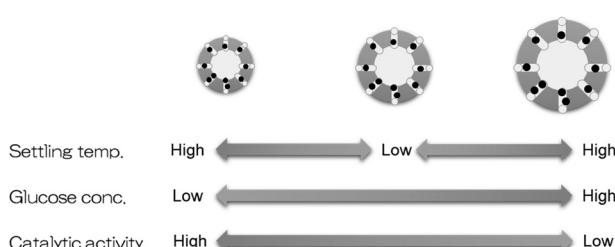
Tien Thanh Nguyen, Ngoc Huu Nguyen, Giang Tuyet Pham, Jitraporn Vongsivut, Melissa H. Brown, Vi Khanh Truong* and Krasimir Vasilev*



6353

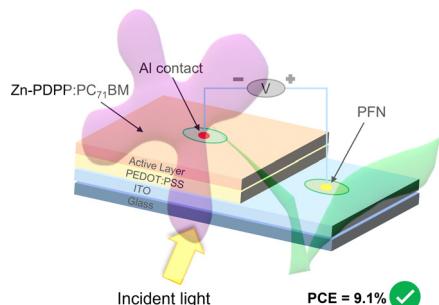
The particle size control of ruthenium-encapsulated hollow silica sphere catalysts for the hydrogenation of carbon dioxide into formic acid

Tetsuo Umegaki,* Eiji Nagakubo, Kenjiro Saeki and Yoshiyuki Kojima



PAPERS

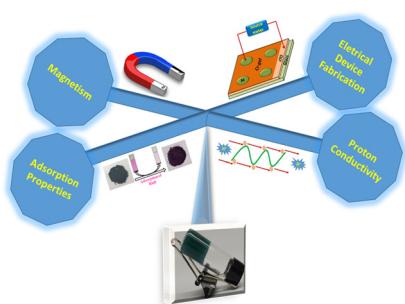
6358



Aza-benzannulated-perylenebisimide-porphyrin dyad as an intensely absorbing donor in bulk-heterojunction organic solar cells

Ayushi Kaushik, Subhrajyoti Bhandary, Ganesh D. Sharma* and Jeyaraman Sankar*

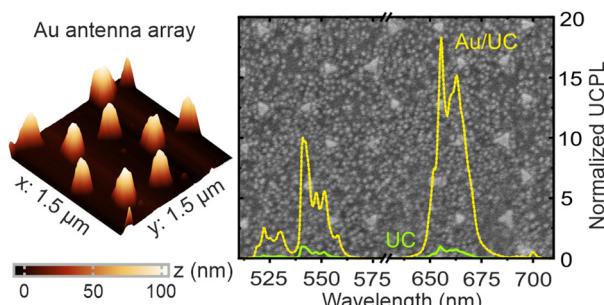
6367



The synthesis and combined electrical-magnetic and toxic dye sequestration properties of a Cr(III)-metallogel

Krishna Sundar Das, Mainak Das, Sayan Saha, Amit Adhikary, Sukhen Bala, Partha Pratim Ray* and Raju Mondal*

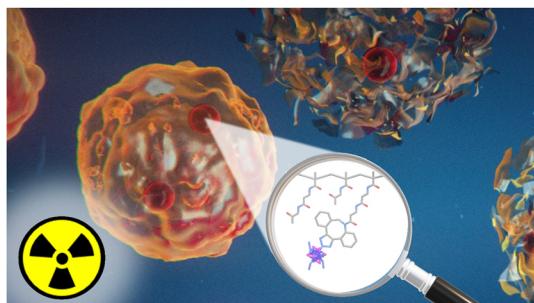
6381



Enhancement of upconversion photoluminescence in phosphor nanoparticle thin films using metallic nanoantennas fabricated by colloidal lithography

Thi Tuyen Ngo, Jose M. Viaña, Manuel Romero, Mauricio E. Calvo, Gabriel Lozano* and Hernán Míguez*

6389



Radiosensitizing molybdenum iodide nanoclusters conjugated with a biocompatible *N*-(2-hydroxypropyl)methacrylamide copolymer: a step towards radiodynamic therapy

Kaplan Kirakci,* Robert Pola,* Marina Rodrigues Tavares, Michal Pechar, Tomáš Přibyl, Ivana Křížová, Jaroslav Zelenka, Tomáš Ruml, Tomáš Etrych and Kamil Lang

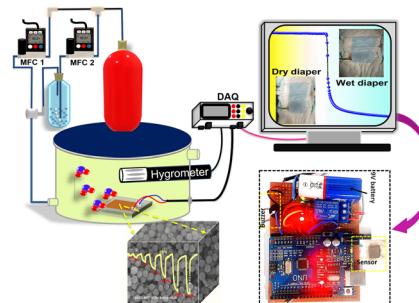


PAPERS

6396

The emergence of MnFe_2O_4 nanosphere-based humidity sensor: a methodical investigation by scanning Kelvin probe and its deployment in multitudinous applications

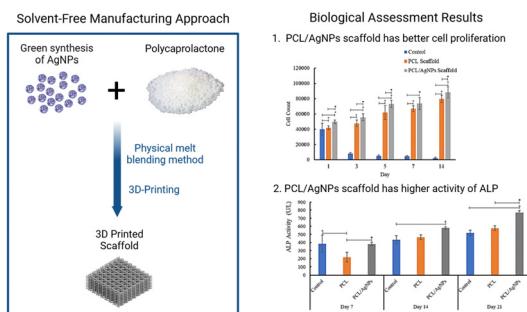
Rahul S. Ghuge, Manish D. Shinde, V. Hajeesh Kumar, Sudhir S. Arbjur, Velappa Jayaraman Surya, Sunit B. Rane,* Corrado Di Natale and Yuvaraj Sivalingam*



6407

Osteogenic potential of a 3D printed silver nanoparticle-based electroactive scaffold for bone tissue engineering using human Wharton's jelly mesenchymal stem cells

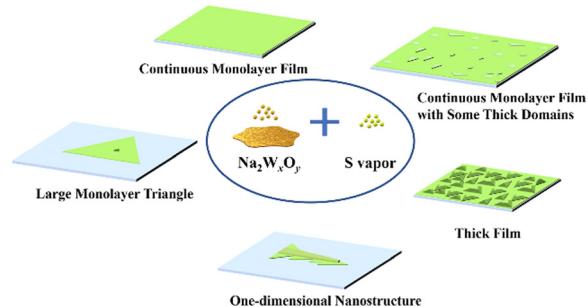
Mira Mira, Arie Wibowo,* Gusti Umindya Nur Tajalla, Glen Cooper, Paulo Jorge Da Silva Bartolo and Anggraini Barlian*



6419

Further insights into the Na_2WO_4 -assisted synthesis method for WS_2

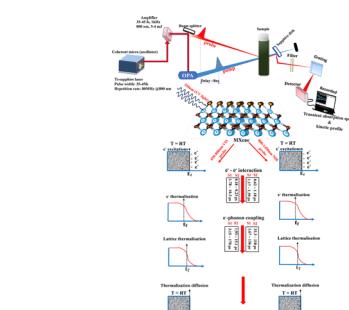
Changyong Lan,* Xinyu Jia, Yiyang Wei, Rui Zhang, Shaofeng Wen, Chun Li, Yi Yin and Johnny C. Ho



6427

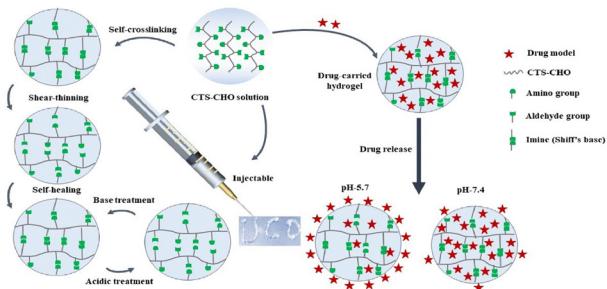
Investigation of charge carrier dynamics in a $\text{Ti}_3\text{C}_2\text{T}_x$ MXene for ultrafast photonics applications

Ankita Rawat, Nitesh K. Chourasia, Saurabh K. Saini, Gaurav Rajput, Aditya Yadav, Ritesh Kumar Chourasia, Govind Gupta and P. K. Kulriya*



PAPERS

6439



Stimuli-responsive chitosan-based injectable hydrogel for “on-demand” drug release

Xiaoyu Wang, Melissa Johnson, Nan Zhang, Pingping Shen, Lizhu Yang, Cameron Milne, Irene Lara-Sáez, Rijian Song,* Sigen A* and Wenxin Wang

CORRECTION

6449

Correction: DFT investigation of the oxygen reduction reaction over nitrogen (N) doped graphdiyne as an electrocatalyst: the importance of pre-adsorbed OH* and the solvation effect

Yuelin Wang, Thanh Ngoc Pham, Harry H. Halim, Likai Yan and Yoshitada Morikawa*

