

Nanoscale Advances

An open access journal publishing across the breadth of nanoscience and nanotechnology
rsc.li/nanoscale-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 2516-0230 CODEN NAADAI 5(24) 6739–7090 (2023)



Cover

See Elena Miliutina et al., pp. 6837–6846. Image reproduced by permission of Katrina Goretskaya from *Nanoscale Adv.*, 2023, 5, 6837. The authors would like to thank Katrina Goretskaya for the cover illustration.



Inside cover

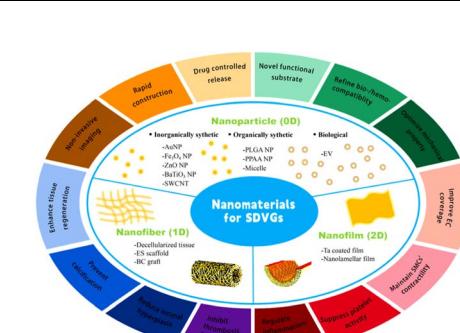
See Nikos Tagmatarchis et al., pp. 6847–6857. Image reproduced by permission of Ioanna Hatzipanigri from *Nanoscale Adv.*, 2023, 5, 6847. Cover image courtesy of Ioanna Hatzipanigri.

REVIEWS

6751

Nanomaterials for small diameter vascular grafts: overview and outlook

Nuoxin Wang,* Haoyuan Wang, Dong Weng, Yanyang Wang, Limei Yu, Feng Wang, Tao Zhang, Juan Liu and Zhixu He*



6768

Plasmonic porous micro- and nano-materials based on Au/Ag nanostructures developed for photothermal cancer therapy: challenges in clinicalization

Reza Taheri-Ledari,* Fatemeh Ganjali, Simindokht Zarei-Shokat, Reihaneh Dinmohammadi, Fereshteh Rasouli Asl, Ali Emami, Zahra Sadat Mojtabapour, Zahra Rashvandi, Amir Kashtiaray, Farinaz Jalali and Ali Maleki*



Nanoscale Advances

rsc.li/nanoscale-advances

Nanoscale Advances publishes experimental and theoretical work across the breadth of nanoscience and nanotechnology.



Published in collaboration with the National Centre for Nanoscience and Technology, Beijing, China

Editorial Board

Honorary Editor-in-chief

Chunli Bai, National Centre for Nanoscience and Nanotechnology, China

Editors-in-chief

Dirk Guldi, Friedrich-Alexander-Universität Erlangen-Nürnberg, Germany

Yue Zhang, University of Science and Technology Beijing, China

Associate Editors

Cinzia Casiraghi, University of Manchester, UK

Gianaurelio (Giovanni) Cuniberti, TU Dresden, Germany

Qing Dai, National Center for Nanoscience and

Technology of China, China

Yves Dufrêne, Université Catholique de Louvain, Belgium

Andrea Ferrari, University of Cambridge, UK

Dong Ha Kim, Ewha Womens University, Korea

Christian Klinke, University of Rostock, Germany

Quan Li, The Chinese University of Hong Kong, Hong Kong

Zhiqun Lin, National University of Singapore, Singapore

Xiaogang Liu, National University of

Singapore, Singapore

Renzhi Ma, National Institute for Materials Science, Japan

Janet Macdonald, Vanderbilt University, USA

Teresa Pellegrino, Istituto Italiano di Tecnologia, Italy

Elena Shevchenko, Argonne National Laboratory, USA

Jonathan Veinot, University of Alberta, Canada

Umesh Waghmare, INCAr, India

Jinlan Wang, Southeast University, China

Manzhou Zhu, Anhui University, China

Jin Zou, University of Queensland, Australia

Advisory Board

Suryasarathi Bose, Indian Institute of Science Bangalore, India

Stephanie Brock, Wayne State University, USA

Raffaella Buonsanti, EPFL, Switzerland

Chunying Chen, National Centre for

Nanoscience and Technology of China, China

Jingyi Chen, University of Arkansas, USA

Xiaodong Chen, Nanyang Technological

University, Singapore

Wenlong Cheng, Monash University, Australia

Serena Cussen, University of Sheffield, UK

Mita Dasog, Dalhousie University, Canada

Mingdong Dong, Aarhus University, Denmark

Kristen Fitchthorn, Penn State University, USA

Christy Haynes, University of Minnesota, USA

Niko Hildebrandt, McMaster University/

Seoul National University, Canada / South

Korea

Guohua Jia, Curtin University, Australia

Xingyu Jiang, Southern University of Science and Technology, China

Rongchao Jin, Carnegie Mellon University, USA

Song Jin, University of Wisconsin, USA

Jesse Jokerst, University of California San

Diego, USA

Kourosh Kalantari-zadeh, The University of

Sydney, Australia

Katharina Landfester, Max Planck Institute for

Polymer Research, Germany

Dattatray Late, CSIR - National Chemical

Laboratory, India

Pooi See Lee, Nanyang Technological

University, Singapore

Changming Li, Southwest University, China

Xing Yi Ling, Nanyang Technological

University, Singapore

Jie Liu, Duke University, USA

Laura Na Liu, Max Planck Institute for

Intelligent Systems, Germany

Liberato Manna, Istituto Italiano di

Tecnologia, Italy

Anna Fontcuberta i Morral, EPFL, Switzerland

Catherine Murphy, University of Illinois at Urbana-Champaign, USA

Kostya Ostrivok, Queensland University of

Technology, Australia

So-Jung Park, Ewha Womans University, Korea

Lakshmi Polavarapu, University of Vigo, Spain

Thalappil Pradeep, Indian Institute of

Technology Madras, India

Narayan Pradhan, Indian Association for the

Cultivation of Science, India

Dong Qin, Georgia Tech University, USA

Michael Sailor, University of California, San

Diego, USA

Hyeon Suk Shin, Ulsan National Institute of

Science and Technology, South Korea

Zhigang Shuai, Tsinghua University, China

Sara Skrabalak, Indiana University, USA

Francesco Stellacci, EPFL, Switzerland

Hong-Bo Sun, Jilin University, China

Shouheng Sun, Brown University, USA

Xiaoming Sun, Beijing University of Chemical

Technology, China

Dmitri Talapin, University of Chicago, USA

Zhiyong Tang, National Center for

NanoScience and Technology, China

Mauricio Terrones, The Pennsylvania State

University, USA

Sarah Tolbert, University of California, Los

Angeles, USA

Ventsislav Valev, University of Bath, UK

Miriam Vitiello, CNR Nanotec, Italy

Jianfang Wang, Chinese University of Hong

Kong, Hong Kong SAR

Benjamin Wiley, Duke University, USA

Xiaojun Wu, University of Science and

Technology of China, China

Yujie Xiong, University of Science and

Technology of China, China

Hongxing Xu, Wuhan University, China

Lin Xu, Nanjing Normal University, China

Ya Yang, Beijing Institute of Nanoenergy and

Nanosystems, Chinese Academy of Sciences, China

Jinhua Ye, National Institute for Materials

Science, Japan

Xiao Cheng Zeng, University of Nebraska-

Lincoln, USA

Gang Zhang, Institute of High Performance

Computing, Singapore

Hua Zhang, City University of Hong Kong, China

Miqin Zhang, University of Washington, USA

Information for Authors

Full details on how to submit material for publication in *Nanoscale 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/nanoscale-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

Editorial Staff

Executive Editor

Jeremy Allen

Deputy Editor

Hannah Kerr

Editorial Assistant

Rosie Hague

Editorial Production Manager

Daniella Ferlucio

Assistant Editors

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

Publisher

Neil Hammond

For queries about submitted papers, please contact Daniella Ferlucio, Editorial Production Manager in the first instance. E-mail: nanoscaleadvances@rsc.org

For pre-submission queries please contact Jeremy Allen, Executive Editor. E-mail: nanoscaleadvances-rsc@rsc.org

Nanoscale Advances (electronic: ISSN 2516-0230) is published 24 times a year by the Royal Society of Chemistry, Thomas Graham House, Science Park, Milton Road, Cambridge, UK CB4 0WF, telephone: +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

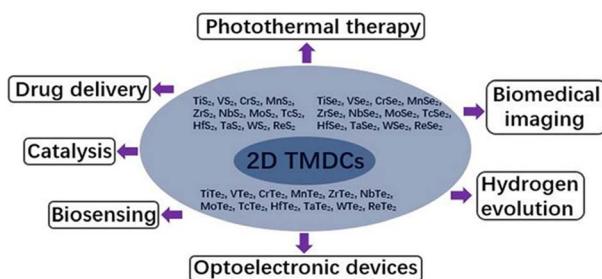
For marketing opportunities relating to this journal, contact marketing@rsc.org

REVIEWS

6787

Molybdenum disulfide, exfoliation methods and applications to photocatalysis: a review

Michelle Saliba, Jean Pierre Atanas, Tia Maria Howayek and Roland Habchi*

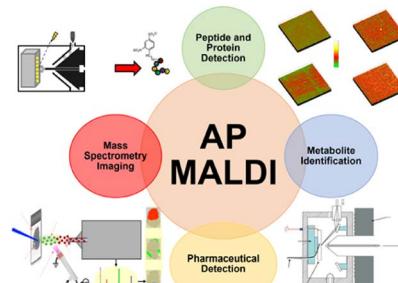


MINIREVIEWS

6804

Nanoparticle-based applications by atmospheric pressure matrix assisted desorption/ionization mass spectrometry

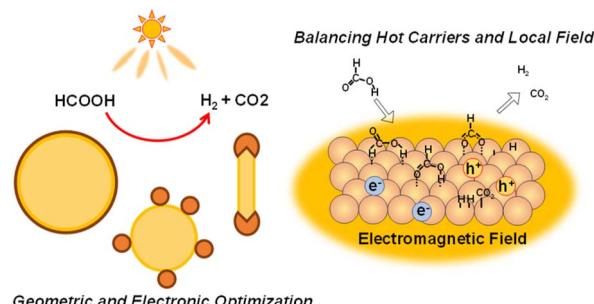
Yihan Wang, Shunxiang Li* and Kun Qian*



6819

Photo-enhanced dehydrogenation of formic acid on Pd-based hybrid plasmonic nanostructures

Jiannan Zhu, Jiawei Dai, You Xu, Xiaoling Liu, Zhengyun Wang, Hongfang Liu and Guangfang Li*

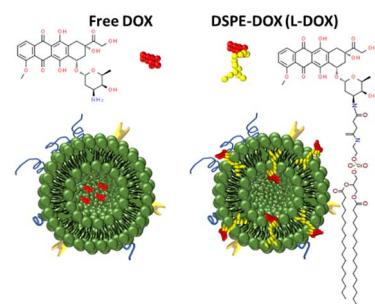


COMMUNICATION

6830

Compartmentalized drug localization studies in extracellular vesicles for anticancer therapy

Arunkumar Pitchaimani,* Miguel Ferreira, Annalisa Palange, Martina Pannuzzo, Claudia De Mei, Raffaele Spano, Roberto Marotta, Beatriz Pelacho, Felipe Prosper and Paolo Decuzzi*



PAPERS

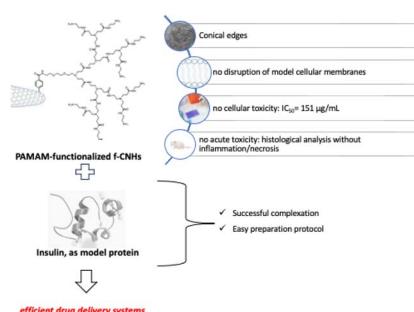
6837



Plasmon assisted $\text{Ti}_3\text{C}_2\text{T}_x$ grafting and surface termination tuning for enhancement of flake stability and humidity sensing performance

Vladislav Buravets, Anastasiia Olshtrem, Vasili Burtsev, Oleg Gorin, Sergii Chertopalov, Andrei Chumakov, Matthias Schwartzkopf, Jan Lancok, Vaclav Svorcik, Oleksiy Lyutakov and Elena Miliutina*

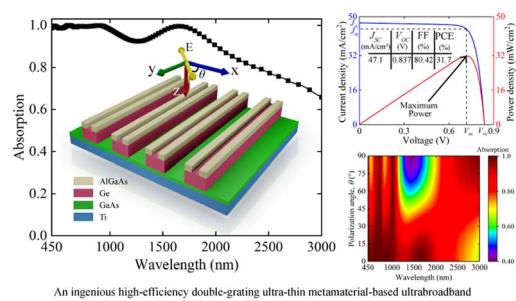
6847



Preclinical evaluation of modified carbon nanohorns and their complexation with insulin

Christina Stangel, Antonia Kagkoura, Natassa Pippa, Dimitris Stellas, Minfang Zhang, Toshiya Okazaki, Costas Demetzos and Nikos Tagmatarchis*

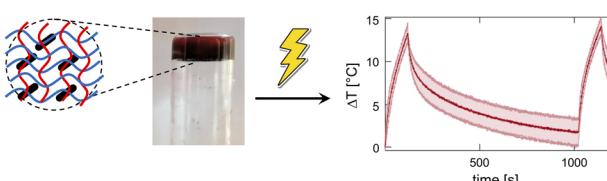
6858



Ultra-broadband near-perfect metamaterial absorber for photovoltaic applications

Partha Pratim Nakti, Dip Sarker, Md Ishfak Tahmid and Ahmed Zubair*

6870



On the role of polymeric hydrogels in the thermal response of gold nanorods under NIR laser irradiation

Elisa Lacroce, Leonardo Bianchi, Laura Polito, Sanzhar Korganbayev, Alessandro Molinelli, Alessandro Sacchetti, Paola Saccoccanti* and Filippo Rossi*

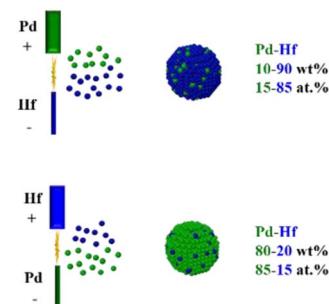


PAPERS

6880

Tuning atomic-scale mixing of nanoparticles produced by atmospheric-pressure spark ablation

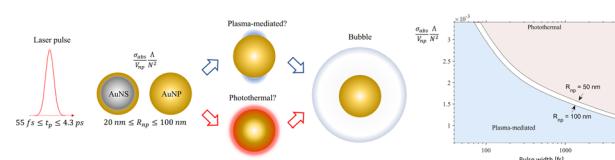
Klito C. Petallidou, Pau Ternero, Maria E. Messing, Andreas Schmidt-Ott and George Biskos*



6887

Influence of photothermal and plasma-mediated nano-processes on fluence thresholds for ultrafast laser-induced cavitation around gold nanoparticles

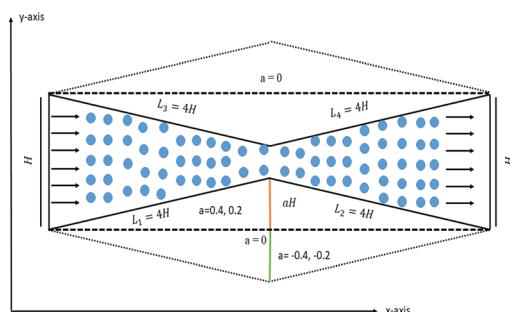
Leonidas Agiotis, Vi Tching De Lille and Michel Meunier*



6897

Numerical investigation of heat transfer and fluid flow characteristics of ternary nanofluids through convergent and divergent channels

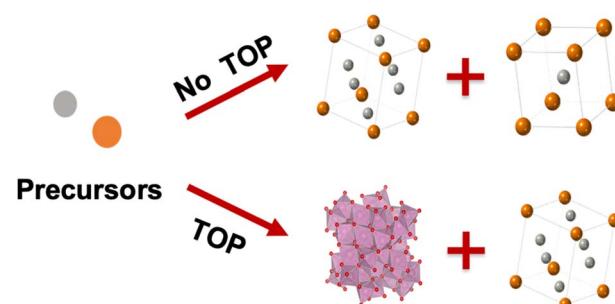
M. M. Alqarni, Abid A. Memon, M. Asif Memon, Emad E. Mahmoud and Armsalu Fenta*



6913

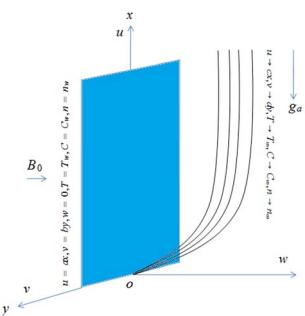
Formation of intermetallic PdIn nanoparticles: influence of surfactants on nanoparticle atomic structure

Baiyu Wang, Jette K. Mathiesen, Andrea Kirsch, Nicolas Schlegel, Andy S. Anker, Frederik L. Johansen, Emil T. S. Kjær, Olivia Aalling-Frederiksen, Tobias M. Nielsen, Maria S. Thomsen, Rasmus K. Jakobsen, Matthias Arenz and Kirsten M. Ø. Jensen*



PAPERS

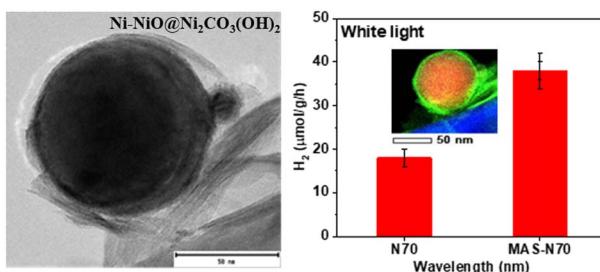
6925



Squeezed Darcy–Forchheimer Casson nanofluid flow between horizontal plates under the effect of inclined magnetic field

M. Asif Memon, Dur-e-Shehwar Sagheer, Mushrifah A. S. Al-Malki, Muhammad Sabeel Khan, Shafqat Hussain, Haseeb ur Rehman and Amsalu Fenta*

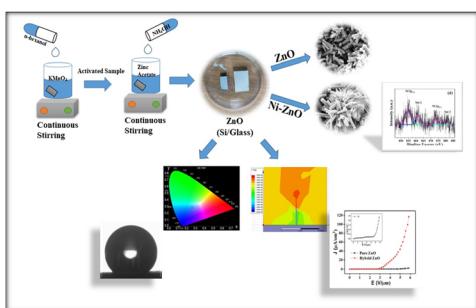
6935



Flexible nanosheets for plasmonic photocatalysis: microwave-assisted organic synthesis of Ni–NiO@Ni₂CO₃(OH)₂ core–shell@sheet hybrid nanostructures

Ekta Rani, Parisa Talebi, Terhi Pulkkinen, Vladimir Pankratov and Harishchandra Singh*

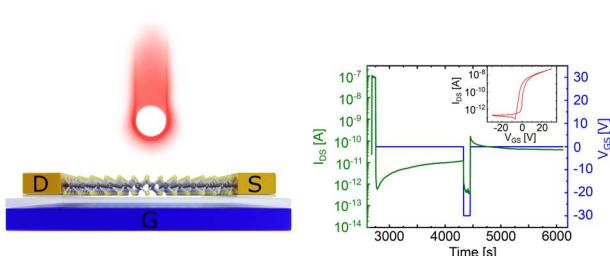
6944



Significant enhancement in the cold emission characteristics of chemically synthesized super-hydrophobic zinc oxide rods by nickel doping

P. Kumar, M. Parashar, K. Chauhan, N. Chakraborty, S. Sarkar, A. Chandra, N. S. Das, K. K. Chattopadhyay, A. Ghoari, A. Adalder, U. K. Ghorai, S. Saini, D. Agarwal, S. Ghosh, P. Srivastava and D. Banerjee*

6958



Manipulation of the electrical and memory properties of MoS₂ field-effect transistors by highly charged ion irradiation

Stephan Sleziona,* Aniello Pelella, Enver Faella, Osamah Kharsah, Lucia Skopinski, André Maas, Yossarian Liebsch, Jennifer Schmeink, Antonio Di Bartolomeo and Marika Schleberger

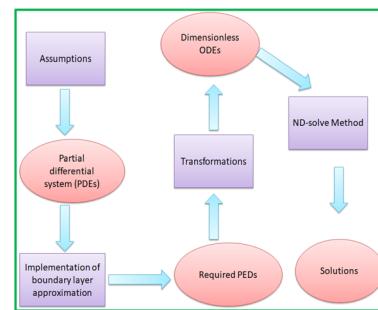


PAPERS

6967

A dissipative and entropy-optimized MHD nanomaterial mixed convective flow for engineering applications

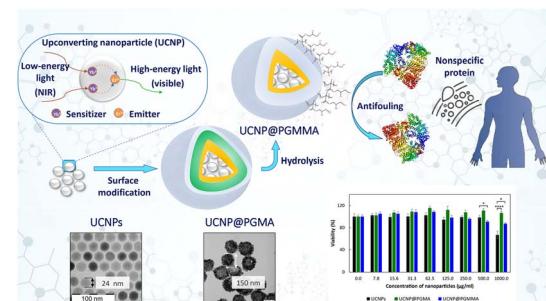
Faqir Shah, Tasawar Hayat, Asad Ullah, Sohail A. Khan* and Shaher Momani



6979

Poly(glycerol monomethacrylate)-encapsulated upconverting nanoparticles prepared by miniemulsion polymerization: morphology, chemical stability, antifouling properties and toxicity evaluation

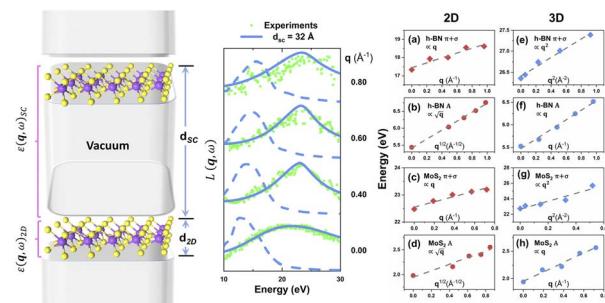
Taras Vasylyshyn, Vitalii Patsula, Marcela Filipová, Rafal Lukasz Konefal and Daniel Horák*



6990

Momentum and thickness dependent excitonic and plasmonic properties of 2D h-BN and MoS₂ restored from supercell calculations

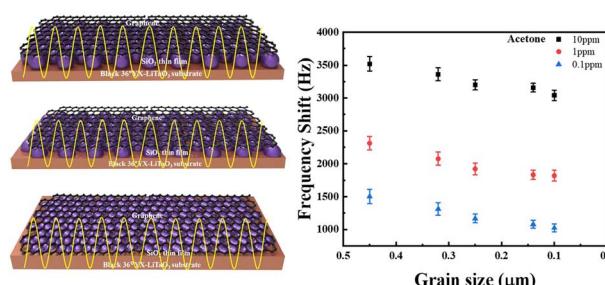
Guang Yang, Jiachen Fan and Shang-Peng Gao*



6999

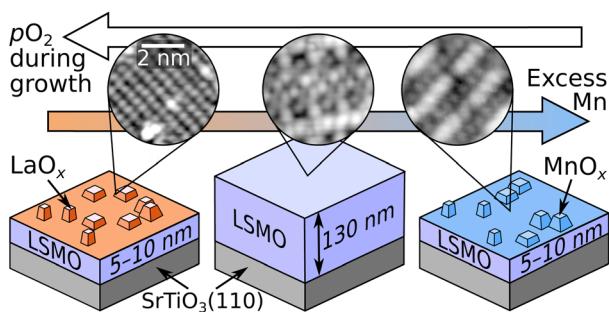
Real-time detection of acetone gas molecules at ppt levels in an air atmosphere using a partially suspended graphene surface acoustic wave skin gas sensor

Haolong Zhou, Sankar Ganesh Ramaraj,* Kaijie Ma, Md Shamim Sarker, Zhiqiang Liao, Siyi Tang, Hiroyasu Yamahara* and Hitoshi Tabata*

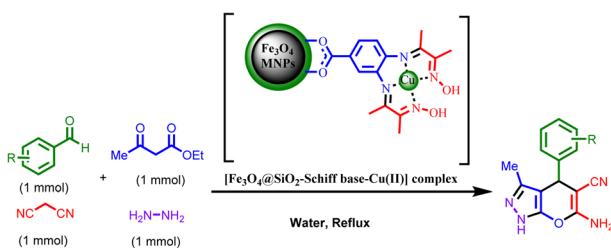


PAPERS

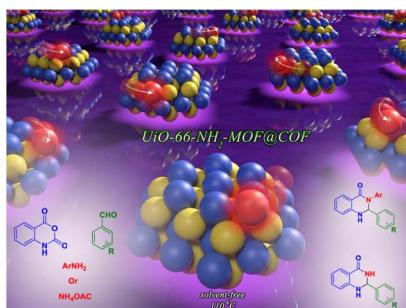
7009



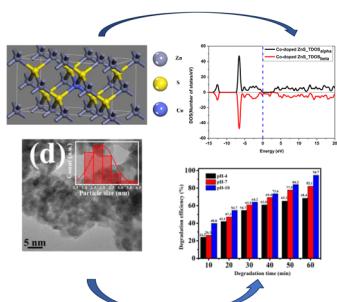
7018



7031



7042



Evolution of the surface atomic structure of multielement oxide films: curse or blessing?

Giada Franceschi,* René Heller, Michael Schmid, Ulrike Diebold and Michele Riva

An Fe_3O_4 supported *O*-phenylenediamine based tetraaza Schiff base- $\text{Cu}(\text{II})$ complex as a novel nanomagnetic catalytic system for synthesis of pyrano[2,3-*c*]pyrazoles

Rehab Tahseen alhayo, Ghufran Sh. Jassim, Hasanain Amer Naji, A. H. Shather, Israa Habeeb Naser, Luay Ali Khaleel and Haider Abdulkareem Almashhadani*

Unique and outstanding catalytic behavior of a novel MOF@COF composite as an emerging and powerful catalyst in the preparation of 2,3-dihydroquinazolin-4(1H)-one derivatives

Mohammad Ali Ghasemzadeh* and Boshra Mirhosseini-Eshkevari

Cobalt-substituted ZnS QDs: a diluted magnetic semiconductor and efficient photocatalyst

Rahul Sonkar, Nur Jalal Mondal, Samir Thakur, Eeshankur Saikia, Mritunjay Prasad Ghosh* and Devasish Chowdhury*

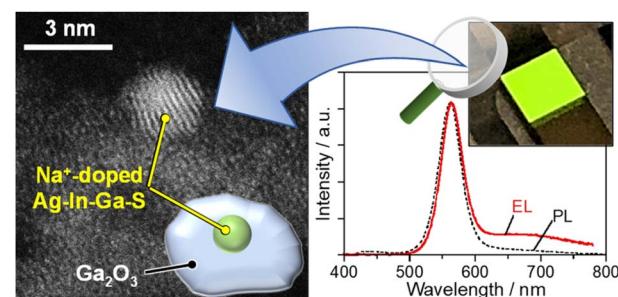


PAPERS

7057

One-pot synthesis of Ag–In–Ga–S nanocrystals embedded in a Ga_2O_3 matrix and enhancement of band-edge emission by Na^+ doping

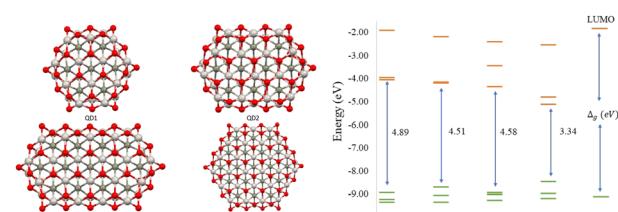
Makoto Tozawa, Chie Miyamae, Kazutaka Akiyoshi, Tatsuya Kameyama, Takahisa Yamamoto, Genichi Motomura, Yoshihide Fujisaki, Taro Uematsu, Susumu Kuwabata and Tsukasa Torimoto*



7067

Modeling size and edge functionalization of MXene-based quantum dots and their effect on electronic and magnetic properties

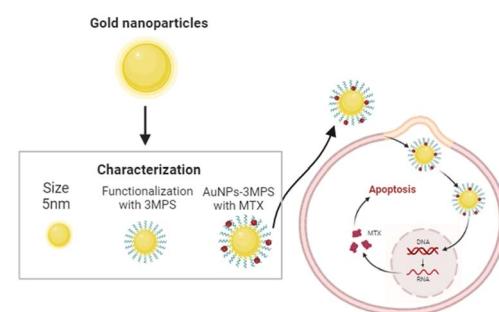
Barbora Vénosová and František Karlický*



7077

Hybrid AuNPs-3MPS-MTX nanosystem and its evaluation for treating cervical cancer and melanoma

M. J. Hernández-Esparza, Ilaria Fratoddi, Sara Cerra, K. Juarez-Moreno* and R. Huirache-Acuña*



EXPRESSION OF CONCERN

7086

Expression of concern: Tin–zinc–oxide nanocomposites (SZO) as promising electron transport layers for efficient and stable perovskite solar cells

Ahmed E. Shalan,* Ayat N. El-Shazly, Mohamed M. Rashad and Nageh K. Allam*



CORRECTION

7087

Correction: A hierarchical integrated 3D carbon electrode derived from gingko leaves *via* hydrothermal carbonization of H₃PO₄ for high-performance supercapacitors

Han Liu, Fumin Zhang, Xinyu Lin, Jinggao Wu and Jing Huang*