

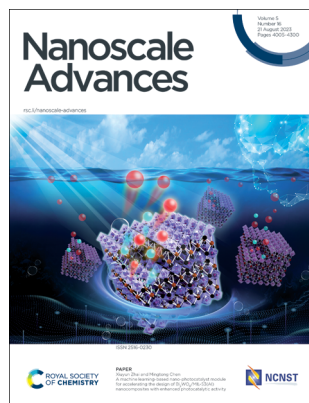
Nanoscale Advances

An open access journal publishing across the breadth of nanoscience and nanotechnology
rsc.li/nanoscale-advances

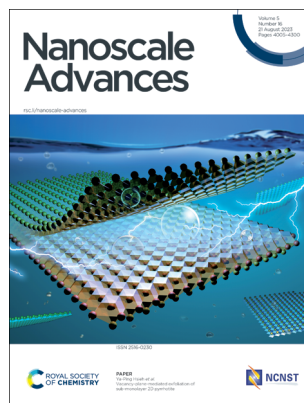
The Royal Society of Chemistry is the world's leading chemistry community. Through our high impact journals and publications we connect the world with the chemical sciences and invest the profits back into the chemistry community.

IN THIS ISSUE

ISSN 2516-0230 CODEN NAADAI 5(16) 4005–4300 (2023)



Cover
See Xiuyun Zhai and Mingtong Chen, pp. 4065–4073. Image reproduced by permission of Xiuyun Zhai and Mingtong Chen from *Nanoscale Adv.*, 2023, 5, 4065.



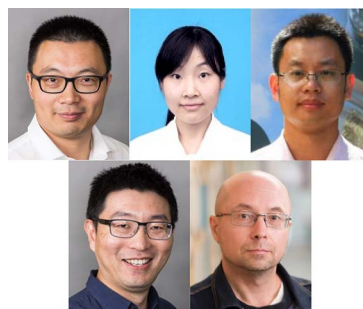
Inside cover
See Ya-Ping Hsieh et al., pp. 4074–4079. Image reproduced by permission of Ya-Ping Hsieh from *Nanoscale Adv.*, 2023, 5, 4074.

EDITORIAL

4015

Introduction to Supercapacitors

Zhaojun Han, Ruopian Fang, Dewei Chu, Da-Wei Wang and Kostya (Ken) Ostrikov



REVIEWS

4018

Recent advances of nanocrystals in cancer theranostics

Devyani Yenurkar, Malay Nayak and Sudip Mukherjee*



Editorial Staff

Executive Editor

Jeremy Allen

Deputy Editor

Hannah Kerr

Editorial Assistant

Rosie Hague

Editorial Production Manager

Christopher Goodall

Assistant Editors

Zita Zachariah and Serra Arslanlan Sengelen

Publisher

Neil Hammond

For queries about submitted papers, please contact Christopher Goodall, 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 0WE.

Nanoscale 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 0WE, 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

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

Editors-in-chief

Chunli Bai, National Centre for Nanoscience and Nanotechnology, China

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

Associate Editors

Cinzia Casiraghi, University of Manchester, UK

Gianurelio (Giovanni) Cuniberti, TU Dresden, Germany

Qing Dai, National Center for Nanoscience and Technology of China, China

Yves Dufrene, Université Catholique de Louvain, Belgium

Andrea Ferrari, University of Cambridge, UK

Dong Ha Kim, Ewha Womens University, Korea

Christian Klinko, University of Rostock, Germany

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

Zhiqun Lin, National University of Singapore, Singapore

Xing Yi Ling, Nanyang Technological University, 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, JNCASR, 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

Kristen Fichthorn, Penn State University, USA

Christy Haynes, University of Minnesota, USA

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 Kalantar-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

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 Ostrikov, Queensland University of Technology, Australia

So-Jung Park, Ewha Womens 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

Xiaoqun 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

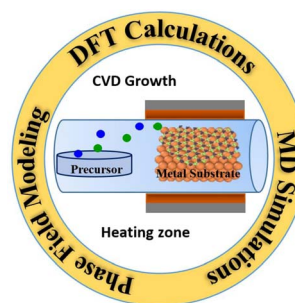


REVIEWS

4041

Growth mechanisms of monolayer hexagonal boron nitride (*h*-BN) on metal surfaces: theoretical perspectives

Md. Sherajul Islam,* Abdullah Al Mamun Mazumder, Minhaz Uddin Sohag, Md. Mosarof Hossain Sarkar, Catherine Stampfl and Jeongwon Park

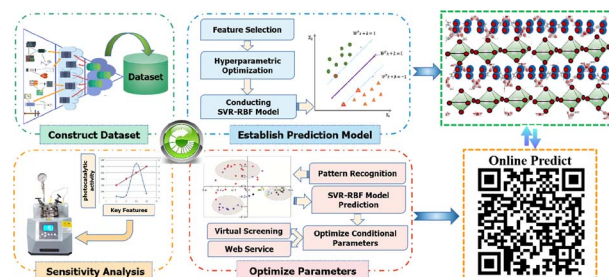


PAPERS

4065

A machine learning-based nano-photocatalyst module for accelerating the design of Bi₂WO₆/MIL-53(Al) nanocomposites with enhanced photocatalytic activity

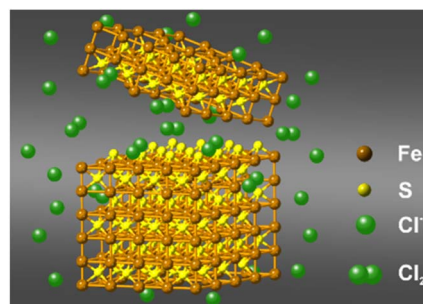
Xiuyun Zhai* and Mingtong Chen



4074

Vacancy-plane-mediated exfoliation of sub-monolayer 2D pyrrhotite

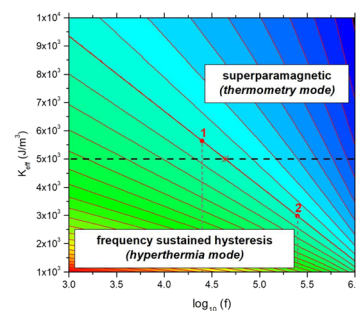
Jian-Jhang Lee, Yi-Hung Chu, Zhi-Long Yen, Jeyavelan Muthu, Chu-Chi Ting, Ssu-Yen Huang, Mario Hofmann and Ya-Ping Hsieh*



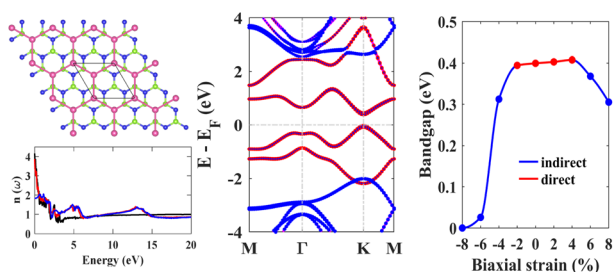
4080

Multifunctional effects in magnetic nanoparticles for precision medicine: combining magnetic particle thermometry and hyperthermia

Gabriele Barrera,* Paolo Allia and Paola Tiberto



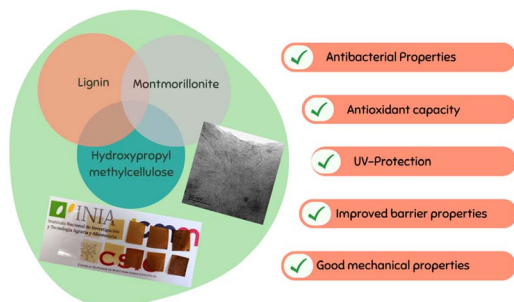
4095



Numerical characterization of the electronic and optical properties of plumbene/hBN heterobilayer using first-principles study

Nishat Tasnim Hiramony, Tanshia Tahreen Tanisha, Sumaiya Jahan Tabassum and Samia Subrina*

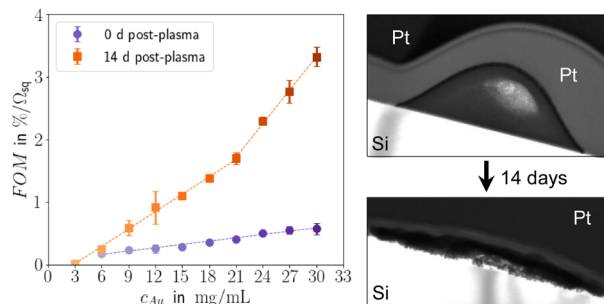
4107



Effect of the combined addition of ultrasonicated kraft lignin and montmorillonite on hydroxypropyl methylcellulose bionanocomposites

Raquel Martín-Sampedro,* Pilar Aranda, Gustavo del Real, Eduardo Ruiz-Hitzky and Margarita Darder

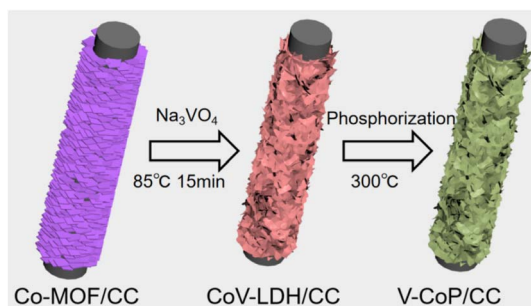
4124



Consolidation and performance gains in plasma-sintered printed nanoelectrodes

Lukas F. Engel, Lola González-García* and Tobias Kraus*

4133



V-doped porous CoP nanoarrays grown on carbon cloth with optimized electronic structure for the hydrogen evolution reaction

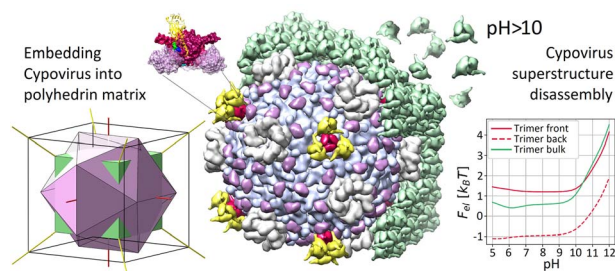
Wenzhi Jia, Qian Lu, Wenjun Zheng, Kunyan Wang, Xinhua Liu, Shichun Yang and Bin He*



4140

Integration of Cypoviruses into polyhedrin matrix

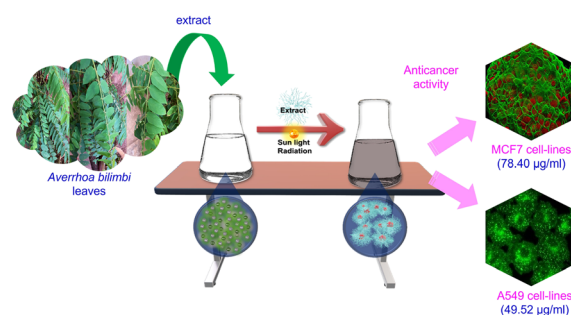
Olga V. Konevtsova, Ivan Yu. Golushko, Rudolf Podgornik* and Sergei B. Rochal*



4149

Phytofabrication of silver nanoparticles using *Averrhoa bilimbi* leaf extract for anticancer activity

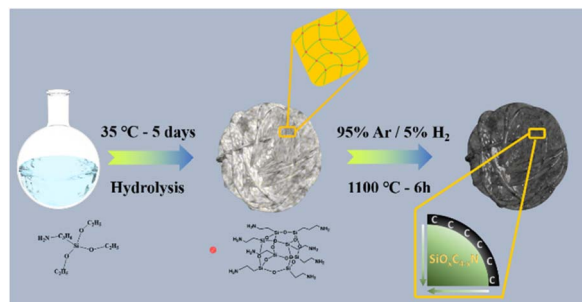
Leena V. Hublikar, Sharanabasava V. Ganachari* and Veerabhadragouda B. Patil*



4158

In situ preparation of double gradient anode materials based on polysiloxane for lithium-ion batteries

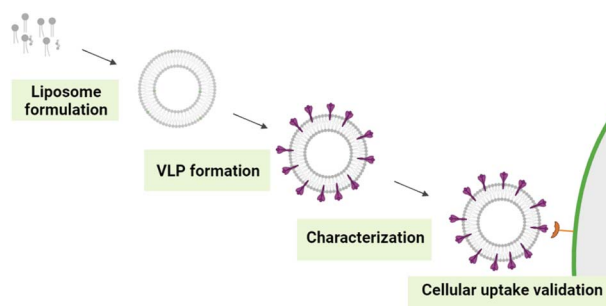
Siqi Guan, Chen Xu, Yuanjiang Chen, Yongjin Zhang, Lixiang Li, Han Zhang, Baigang An,* Haiming Yang, Weimin Zhou, Chengguo Sun, Dongying Ju and Xin Geng*



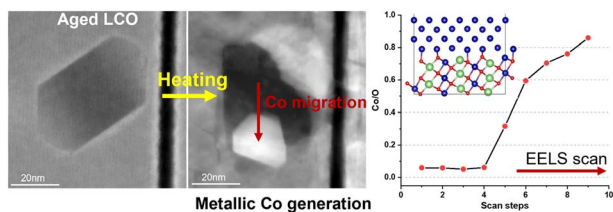
4167

SARS-CoV-2 virus-like-particles via liposomal reconstitution of spike glycoproteins

Sarah McColman,* Klaidi Shkalla, Pavleen Sidhu, Jady Liang, Selena Osman, Norbert Kovacs, Zainab Bokhari, Ana Carolina Forjaz Marques, Yuchong Li, Qiwen Lin, Haibo Zhang and David T. Cramb*



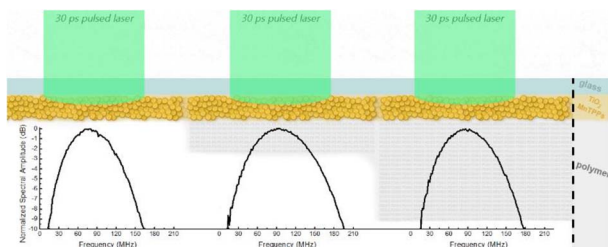
4182



Chip-based *in situ* TEM investigation of structural thermal instability in aged layered cathode

Yuhan Wang, Yuan Yuan,^{*} Xiaobin Liao, Gustaaf Van Tendeloo, Yan Zhao^{*} and Congli Sun^{*}

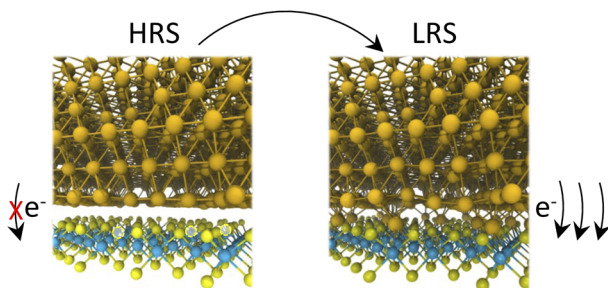
4191



Ultrathin materials for wide bandwidth laser ultrasound generation: titanium dioxide nanoparticle films with adsorbed dye

Tiago B. Pinto, Sara M. A. Pinto, Ana P. Piedade and Carlos Serpa^{*}

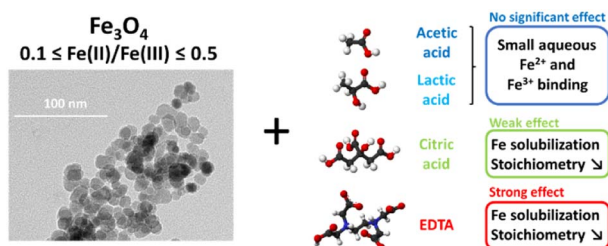
4203



Non-volatile resistive switching mechanism in single-layer MoS₂ memristors: insights from *ab initio* modelling of Au and MoS₂ interfaces

Gabriele Boschetto,^{*} Stefania Carapezzi and Aida Todri-Sanial^{*}

4213



Influence of organic ligands on the stoichiometry of magnetite nanoparticles

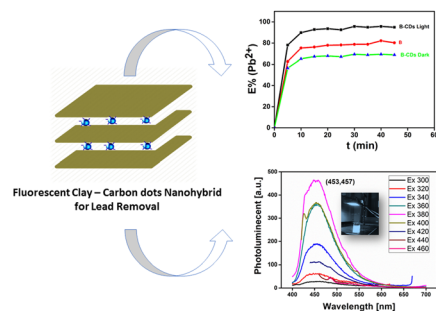
Phoomipat Jungcharoen, Rémi Marsac, Fadi Choueikani, Delphine Masson and Mathieu Pédrot^{*}



4224

A carbon dot-based clay nanocomposite for efficient heavy metal removal

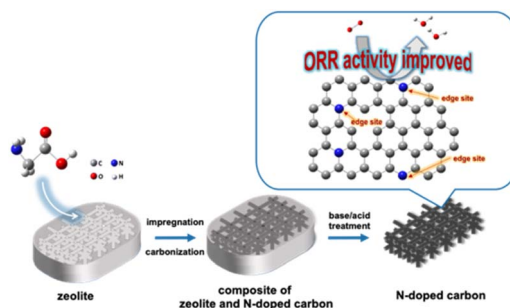
Khouloud Jlassi,^{*} Maryam Al Ejji, Abdelgalil Khalaf Ahmed, Hafsa Mutahir, Mostafa H. Sliem, Aboubakr M. Abdullah,^{*} Mohamed M. Chehimi^{*} and Igor Krupa



4233

A zeolite templating method for fabricating edge site-enriched N-doped carbon materials

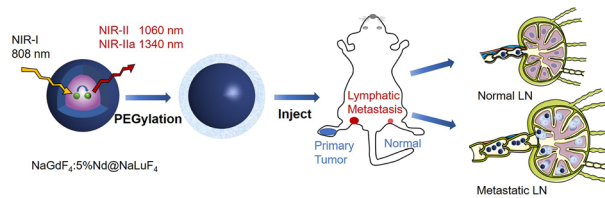
Yurika Taniguchi, Yasuhiro Shu, Ryuji Takada, Koji Miyake,^{*} Yoshiaki Uchida and Norikazu Nishiyama



4240

Intraoperative diagnosis of early lymphatic metastasis using neodymium-based rare-earth NIR-II fluorescence nanoprobe

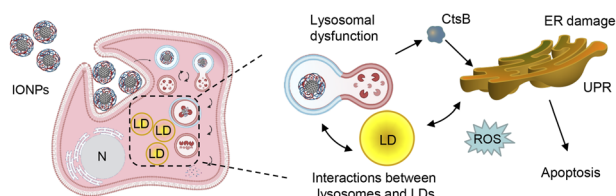
Guangxin Duan, Jingyu Zhang, Zhuxin Wei, Ximing Wang, Jianfeng Zeng, Shuwang Wu, Chunhong Hu^{*} and Ling Wen^{*}



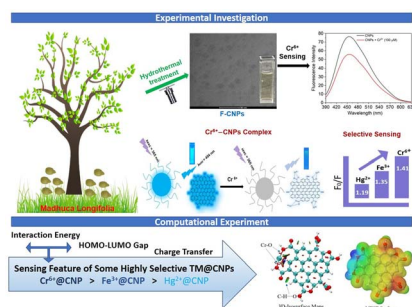
4250

Iron oxide nanoparticles trigger endoplasmic reticulum damage in steatotic hepatic cells

Mariia Uzhytchak, Mariia Lunova, Barbora Smolková, Milan Jirsa, Alexandr Dejnek^{*} and Oleg Lunov^{*}



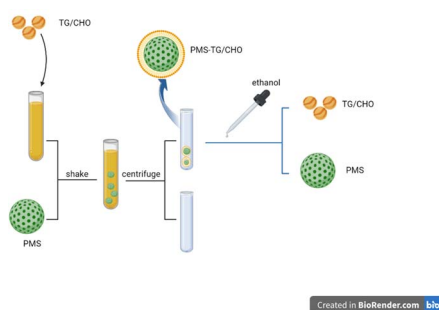
4269



Development of fluorescent carbon nanoparticles from *Madhuca longifolia* flower for the sensitive and selective detection of Cr⁶⁺: a collective experimental–computational approach

Tuhin Mandal, Ashish Kumar Ghosh, Shiv Rag Mishra, Sarvesh Kumar Pandey* and Vikram Singh*

4286



New application of a periodic mesoporous nanocrystal silicon–silica composite for hyperlipidemia

Wenbin Lu,* Hao Jin,* Jiandong Ding, Yahao Zhang and Yong Wu

