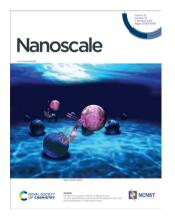
Nanoscale

rsc.li/nanoscale

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 2040-3372 CODEN NANOHL 15(37) 15063-15436 (2023)



Cover

See Hirobumi Sunayama, Toshifumi Takeuchi et al., pp. 15171-15178.

Image reproduced by permission of Toshifumi Takeuchi from Nanoscale, 2023, 15, 15171.



Inside cover

See Vikas Rishi, Bhupesh Goyal, Ajay Kumar Srivastava, Nitin Kumar Singhal et al., pp. 15179-15195.

Image reproduced by permission of Nitin Kumar Singhal from Nanoscale, 2023, 15, 15179.

EDITORIAL

15075

Introduction to halide perovskite optoelectronics

Lakshminarayana Polavarapu, Maria Antonietta Loi, Haibo Zeng and Joseph M. Luther

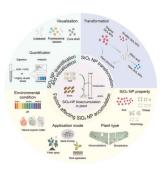


REVIEWS

15079

Silica nanoparticle accumulation in plants: current state and future perspectives

Wei Pan, Hong-Jie Zhang, Yu-Feng Zhang, Mei Wang, Martin Tsz-Ki Tsui, Liuyan Yang and Ai-Jun Miao*



Open Access

Editorial Staff

Executive Editor

Michaela Mühlberg

Managing Editor

Heather Montgomery

Editorial Production Manager

Ionathon Watson

Senior Publishing Editor

Ella White

Development Editor

Matthew Blow, Chris Dias, Hemna Fathima, Juan Gonzalez, Eleanor Griffiths, Rob Hinde, Sam Howell, Clara Humann, Ash Hyde, Francesca Jacklin, Shruti Karnik, Sophie Koh, Tamara Kosikova, Evie Karkera, Brian Li, Sam Mansell, Carole Martin, Kirsty McRoberts, Tiffany Rogers, Cat Schofield, Charu Storr-Vijay, Manman Wang, Tom Williams

Editorial Assistant

Publishing Assistant

Lee Colwill

Assistant Editor

Jie Gao, Yu Zhang

Publisher

Sam Keltie

For queries about submitted papers, please contact Jonathon Watson, Editorial Production Manager in the first instance.

E-mail: nanoscale@rsc.org

For pre-submission queries please contact Michaela Mühlberg, Executive Editor. E-mail: nanoscale-rsc@rsc.org Nanoscale (electronic: ISSN 2040-3372) is published 48 times a year by the Royal Society of Chemistry, Thomas Graham House, Science Park, Milton Road, Cambridge, UK CB4 0WF.

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: £1936/\$3155.

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 W1I 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

rsc.li/nanoscale

Nanoscale 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 Cuniberti, TU Dresden (Technische Universität 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,

Christian Klinke, 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, Jawaharlal Nehru Centre for Advanced Scientific Research, India Manzhou Zhu, Annhui University, China Jin Zou, The University of Queensland,

Advisory Board

Zhenan Bao, Stanford University, USA Amanda Barnard, Australian National University, Australia

Suryasarathi Bose, Indian Institute of Science Bangalore, India

Stephanie Brock, Wayne State University, USA Raffaella Buonsanti, EPFL, Switzerland Chunying Chen, National Center for Nanoscience and Technology of China, China Jingyi Chen, University of Arkansas, USA Wenlong Chen, Monash University, Australia Xiaodong Chen, Nanyang Technological University, Singapore

Serena Cussen, University of Sheffield, UK Mita Dasog, Dalhousie University, Canada Kristen Fichthorn, Penn State University, USA Christy Haynes, University of Minnesota, USA Niko Hildebrandt, Université de Rouen Normandie / Seoul National University, France / South Korea

Guohua Jia, Curtin University, Australia Xingyu Jiang, Southern University of Science and Technolog, 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 Svdnev. Australia

Yamuna Krishnan, University of Chicago, USA Katharina Landfester, Max Planck Institute for Polymer Research, Germany

Dattatray Late, CSIR National Chemical Laboratory, India Pooi See Lee, Nanyang Technological

University, Singapore Graham Leggett, The University of Sheffield,

Changming Li, Southwest University, China Jie Liu, Duke University, USA Laura Na Liu, Max Planck Institute for Intelligent Systems, Germany Yunqi Liu, Institute of Chemistry, Chinese Academy of Sciences, China Wei Lu, University of Michigan, USA Liberato Manna, Istituto Italiano di Tecnologia, Italy Anna Fontcuberta i Morral, EPFL, Switzerland

Catherine Murphy, University of Illinois at Urbana-Champaign, USA Kostya (Ken) Ostrikov, Queensland University

of Technology, Australia So-Jung Park, Ewha Womans University, Korea T Pradeep, Indian Institute of Technology

Madras, India Lakshmi Polavarapu, University of Vigo, Spain Narayan Pradhan, Indian Association for the Cultivation of Science, India

Dong Qin, Georgia Institute of Technology,

Paolo Samorì, Université de Strasbourg, France Michael Sailor, University of California, San Diego, USA

Zhigang Shuai, Tsinghua University, China Sara Skrabalak, Indiana University, USA Francesco Stellacci, EPFL, Switzerland Hong-Bo Sun, Jilin University, China Ling-Dong Sun, Peking 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

Ventsislay Valey, University of Bath, UK Miriam Vitiello, CNR Nano, 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, China Jinhua Ye, National Institute for Materials Science, Japan

Xiao Cheng Zeng, University of Nebraska-Lincoln, USA

Gang Zhang, Agency for Science, Technology and Research, Singapore Hua Zhang, City University of Hong Kong,

Migin Zhang, University of Washington, USA Yuliang Zhao, National Center for Nanoscience and Technology, China

Information for Authors

Full details on how to submit material for publication in Nanoscale 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

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

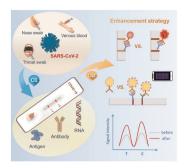


REVIEWS

15092

Immunochromatographic enhancement strategy for SARS-CoV-2 detection based on nanotechnology

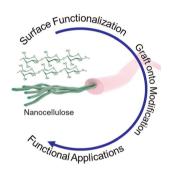
Qingwen Sun, Qihong Ning, Tangan Li, Qixia Jiang, Shaoqing Feng, Ning Tang, Daxiang Cui and Kan Wang*



15108

Graft onto approaches for nanocellulose-based advanced functional materials

Chandravati Yadav, Jeong-Min Lee, Paritosh Mohanty, Xinping Li and Woo-Dong Jang*

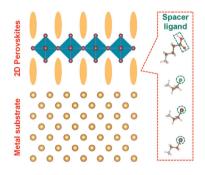


COMMUNICATIONS

15146

Modulating the Schottky barriers of metal-2D perovskite junctions through molecular engineering of spacer ligands

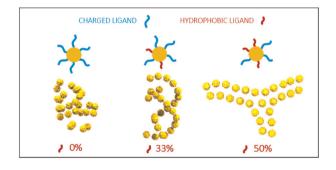
Zhuo Xu,* Weidong Luo, Songyan Guo and Shengzhong Frank Liu*



15153

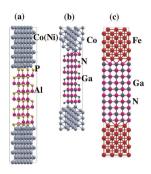
Dumbbells, chains, and ribbons: anisotropic self-assembly of isotropic nanoparticles

Enrico Lavagna, Sebastian Salassi, Davide Bochicchio and Giulia Rossi*



COMMUNICATIONS

15161

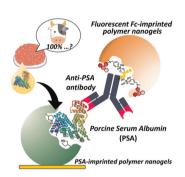


Potential of AIP and GaN as barriers in magnetic tunnel junctions

Gokaran Shukla,* Hasan M. Abdullah and Udo Schwingenschlögl*

PAPERS

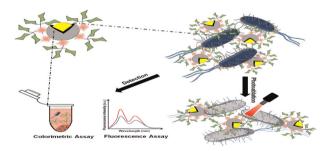
15171



A rapid abiotic/biotic hybrid sandwich detection for trace pork adulteration in halal meat extract

Chehasan Cheubong, Hirobumi Sunayama,* Eri Takano, Yukiya Kitayama, Hideto Minami and Toshifumi Takeuchi*

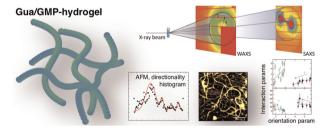
15179



Multiepitope glycan based laser assisted fluorescent nanocomposite with dual functionality for sensing and ablation of Pseudomonas aeruginosa

Priyanka Garg, Nitesh Priyadarshi, Mayur D. Ambule, Gurmeet Kaur, Sunaina Kaul, Ritika Gupta, Poonam Sagar, Geetika Bajaj, Binduma Yadav, Vikas Rishi,* Bhupesh Goyal,* Ajay Kumar Srivastava* and Nitin Kumar Singhal*

15196



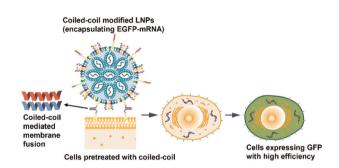
Self-oriented anisotropic structure of G-hydrogels as a delicate balance between attractive and repulsive forces

Alessia Pepe,* Paolo Moretti, Juliana S. Yoneda, Federica Carducci, Rosangela Itri and Paolo Mariani*

15206

Efficient mRNA delivery using lipid nanoparticles modified with fusogenic coiled-coil peptides

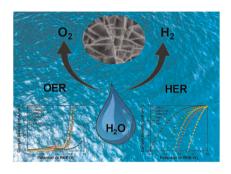
Ye Zeng, Mengjie Shen, Roy Pattipeiluhu, Xuequan Zhou, Yun Zhang, Thomas Bakkum, Thomas H. Sharp, Aimee L. Boyle and Alexander Kros*



15219

Heterointerface engineering of cobalt molybdenum suboxide for overall water splitting

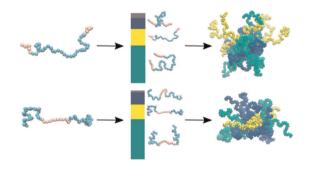
Renjith Nadarajan, Anju V. Gopinathan, Naduvile Purayil Dileep, Akshaya S. Sidharthan and Manikoth M. Shaijumon*



15230

Topology-controlled self-assembly of amphiphilic block copolymers

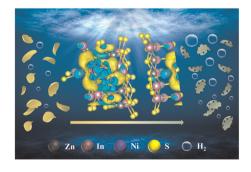
Raquel López-Ríos de Castro, Robert M. Ziolek and Christian D. Lorenz*



15238

Interfacial electron modulation of 2D nanopetal ZnIn₂S₄ with edge-decorated Ni clusters for accelerated photocatalytic H2 evolution

Nan Zhang, Gang Li,* Zhichao Yu, Zhenguo Tang, Xiaoyan Liu, Congwei Wang* and Kaiying Wang*



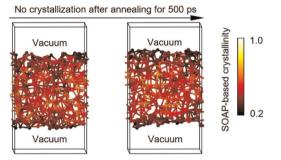
15249



Graphene oxide fiber microelectrodes with controlled sheet alignment for sensitive neurotransmitter detection

Romana Jarosova, Blaise J. Ostertag and Ashley E. Ross*

15259



Surface effects on the crystallization kinetics of amorphous antimony

Xueyang Shen, Yuxing Zhou, Hanyi Zhang, Volker L. Deringer, Riccardo Mazzarello and Wei Zhang*

70K cycles Capacity retention Colombic Efficiency 135% capacity retention

High rate capability Excellent cycling stability Better ionic diffusion

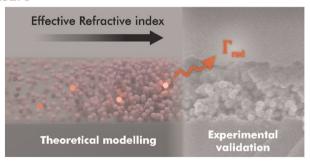
Laser-irradiated carbonized polyaniline-N-doped graphene heterostructure improves the cyclability of on-chip microsupercapacitor

Bharat Bhushan Upreti, Navpreet Kamboj and Ramendra Sundar Dey*

15279

%

15268



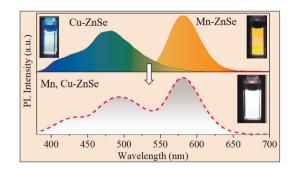
Effect of the effective refractive index on the radiative decay rate in nanoparticle thin films

Manuel Romero, Juan Ramón Sánchez-Valencia, Gabriel Lozano* and Hernán Míguez*

15288

Electronic structure study of dual-doped II-VI semiconductor quantum dots towards single-source white light emission

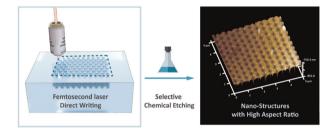
Payel Mondal, Sowmeya Sathiyamani, Subham Das and Ranjani Viswanatha*



15298

Femtosecond-laser-assisted high-aspect-ratio nanolithography in lithium niobate

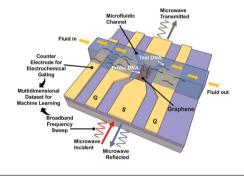
Tianxin Wang, Xiaoyan Cheng, Xuan Li, Jianan Ma, Shuo Yan, Xueli Hu, Kai Qi, Weiwen Fan, Manman Liu, Xiaoyi Xu, Xiaomei Lu, Xiaoshun Jiang and Yong Zhang*



15304

Electrochemically-gated graphene broadband microwave waveguides for ultrasensitive biosensing

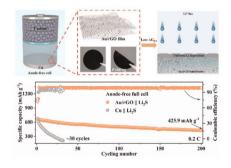
Patrik Gubeljak, Tianhui Xu, Lorenzo Pedrazzetti, Oliver J. Burton, Luca Magagnin, Stephan Hofmann, George G. Malliaras and Antonio Lombardo*

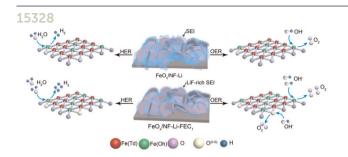


15318

Scalable fabrication of ultra-fine lithiophilic nanoparticles encapsulated in soft buffered hosts for long-life anode-free Li₂S-based cells

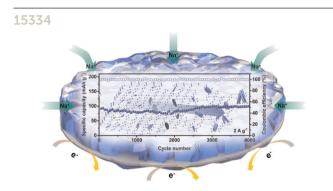
Bo Zhou, Ting Li, Anjun Hu,* Baihai Li, Runjing Li, Chuan Zhao, Nian Chen,* Miao He, Jing Liu and Jianping Long*





Electrolyte modification method induced atomic arrangement in FeO_x/NF nanosheets for efficient overall water splitting

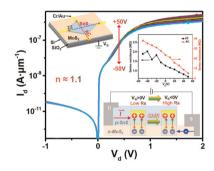
Xiaoping Zhang,* Xiaonan Fu, Weifeng Tian, Yanzhi Bai, Liya Zhu* and Junwen Si



Synchronous embedded growth of Mo₂C nanodisk arrays immobilized on porous carbon nanosheets for ultra-stable sodium storage

Minyu Jia, Jingxuan Wei, Yamin Zhang, Linrui Hou, Jinfeng Sun* and Changzhou Yuan*

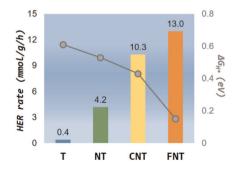




Anisotropic charge transfer and gate tuning for p-SnS/n-MoS₂ vertical van der Waals diodes

Hui Yuan, Ruihan Xu, Jiale Ren, Jielin Yang, Shouyang Wang, Dongwen Tian, Yingshuang Fu, Quan Li,* Xiaoniu Peng and Xina Wang*

15352



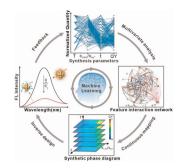
Synergistic material modification-induced optimization of interfacial charge transfer and surface hydrogen adsorption

Mingyan Du, Lingling Cui, Panpan Wang, Chunyao Niu,* Young Soo Kang and Xiao Li Zhang*

15358

An explainable machine-learning approach for revealing the complex synthesis path-property relationships of nanomaterials

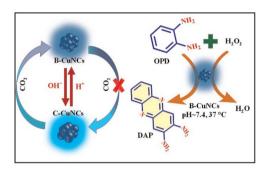
Kun Jin, Wentao Wang, Guangpei Qi, Xiaohong Peng, Haonan Gao, Hongjiang Zhu, Xin He, Haixia Zou, Lin Yang, Junjie Yuan, Liyuan Zhang, Hong Chen* and Xiangmeng Qu*



15368

pH-Switchable phenylalanine-templated copper nanoclusters: CO₂ probing and efficient peroxidase mimicking activity

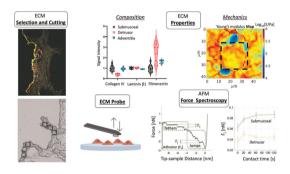
Shashi Shekhar, Raibat Sarker, Paritosh Mahato, Sameeksha Agrawal and Saptarshi Mukherjee*



15382

Native extracellular matrix probes to target patient- and tissue-specific cell-microenvironment interactions by force spectroscopy

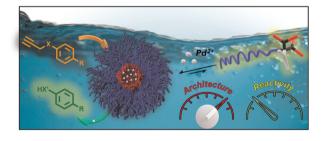
H. Holuigue, L. Nacci, P. Di Chiaro, M. Chighizola, I. Locatelli, C. Schulte,* M. Alfano,* G. R. Diaferia* and A. Podestà*



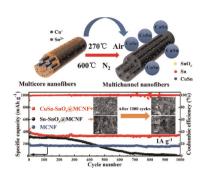
15396

Polymeric architecture as a tool for controlling the reactivity of palladium(II) loaded nanoreactors

Shreyas S. Wagle, Parul Rathee, Krishna Vippala, Shahar Tevet, Alexander Gordin, Roman Dobrovetsky and Roey J. Amir*



15405



Hybrid CuSn nanosphere-functionalized Cu/Sn co-doped hollow carbon nanofibers as anode materials for sodium-ion batteries

Xuwu Xiao, Wenli Yao, * Tingting Yan, Wenyao Zhang, Qian Zhang, Shengwen Zhong and Zhengguan Yan*

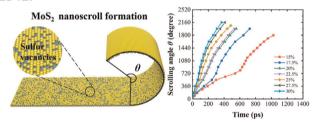
15415



Cu²⁺@metal-organic framework-derived amphiphilic sandwich catalysts for enhanced hydrogenation selectivity of ketenes at the oil-water interface

Jia-Lu Sun, Feng-Di Ren, Yu-Zhen Chen* and Zhibo Li*

15427



Spontaneous formation of MoS₂ nanoscrolls from flat monolayers with sulfur vacancies: a molecular dynamics investigation

Ruhao Yang, Han Ye,* Naizhang Sun and Wenjun Liu