



## Editorial Staff

### Executive Editor

Michaela Mühlberg

### Managing Editor

Heather Montgomery

### Editorial Production Manager

Jonathon Watson

### Senior Publishing Editor

Alex Metherell

### Development Editor

Edward Gardner

### Publishing Editors

Matthew Blow, Chris Dias, Rob Hinde, Ash Hyde, Evie Karkera, Tamara Kosikova, Carole Martin, Kirsty McRoberts, Cat Schofield, Ella White, Tom Williams

### Editorial Assistant

Elizabeth So

### Assistant Editors

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: [nanoscalehorizons@rsc.org](mailto:nanoscalehorizons@rsc.org)

For pre-submission queries please contact

Michaela Mühlberg, Executive Editor.

E-mail: [nanoscalehorizons-rsc@rsc.org](mailto:nanoscalehorizons-rsc@rsc.org)

Nanoscale Horizons (print: ISSN 2055-6756 electronic:

ISSN 2055-6764) is published 12 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](mailto:orders@rsc.org)

2023 Annual (electronic) subscription price: £2727; \$4500.

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](http://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 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](mailto:advertising@rsc.org)

For marketing opportunities relating to this journal,

contact [marketing@rsc.org](mailto:marketing@rsc.org)

# Nanoscale Horizons

[rsc.li/nanoscale-horizons](http://rsc.li/nanoscale-horizons)

*Nanoscale Horizons* is the home for urgent short reports of exceptionally high quality & innovative nanoscience & nanotechnology



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

## Editorial Board

### Chair

Katharina Landfester, Max Planck Institute for Polymer Research, Germany

### Scientific Editors

Katsuhiko Ariga, National Institute for Materials Science (NIMS), Japan  
Wenlong Cheng, Monash University, Australia

Yves Dufrené, Université Catholique de Louvain, Belgium

Anna Fontcuberta i Morral, École polytechnique fédérale de Lausanne, Switzerland  
Dirk Guldri, Friedrich-Alexander-Universität Erlangen-Nürnberg, Germany  
Zhiyong Tang, National Center for Nanoscience and Technology, China  
Jinlan Wang, Southeast University, China

### Members

Miaofang Chi, Oak Ridge National Laboratory, USA  
Jin-Hong Park, Pohang University of Science and Technology, South Korea  
Miqin Zhang, University of Washington, USA

## Advisory Board

Chunli Bai, Chinese Academy of Sciences, China  
Uri Banin, Hebrew University of Jerusalem, Israel  
Frank Caruso, University of Melbourne, Australia  
Cinzia Casiraghi, The University of Manchester, UK  
Paola Ceroni, University of Bologna, Italy  
Chunying Chen, National Center for Nanoscience and Technology, China  
Xiaodong Chen, Nanyang Technological University, Singapore  
Serena Cussen, University of Sheffield, UK  
Harold Craighead, Cornell University, USA  
Qing Dai, National Center for Nanoscience and Technology, China  
Shuai Dong, Southeast University, China  
Laura Fabris, Rutgers University, USA  
Andrea Ferrari, University of Cambridge, UK  
Raju Kumar Gupta, Indian Institute of Technology Kanpur, India  
Nobuhiko Hosono, University of Tokyo, Japan

Xingyu Jiang, Southern University of Science and Technology, China  
Rongchao Jin, Carnegie Mellon University, USA  
Dong Ha Kim, Ewha Womans University, South Korea  
Jang-Kyo Kim, University of New South Wales, Australia  
Kostas Kostarelos, University of Manchester, UK

Yamuna Krishnan, University of Chicago, USA  
Tai Wei David Leong, National University of Singapore, Singapore  
Li Li, Northeastern University, USA  
Quan Li, Chinese University of Hong Kong, Hong Kong  
Xing Yi Ling, Nanyang Technological University, Singapore  
Jie Liu, Duke University, USA  
Xiaogang Liu, National University of Singapore, Singapore  
Renzhi Ma, National Institute for Materials Science, Japan  
Stefan Maier, Monash University, Australia  
Liberato Manna, Istituto Italiano di Tecnologia, Italy  
Chad Mirkin, Northwestern University, USA  
Paul Mulvaney, University of Melbourne, Australia  
Catherine Murphy, University of Illinois at Urbana-Champaign, USA  
Valeria Nicolosi, Trinity College Dublin, Ireland  
Dong Qin, Georgia Institute of Technology, USA  
Sandra Rosenthal, Vanderbilt University, USA  
Jungki Ryu, Ulsan National Institute of Science and Technology, Korea  
Michael Sailor, University of California, San Diego, USA  
Paolo Samori, Université de Strasbourg, France  
Ester Segal, Technion - Israel Institute of

Technology, Israel  
Elena Shevchenko, Argonne National Laboratory, USA  
Hisanori Shinohara, Nagoya University, Japan  
Zuzanna Siwy, University of California, Irvine, USA  
Sara Skrabalak, Indiana University, USA  
Francesco Stellacci, École polytechnique fédérale de Lausanne, Switzerland  
Ling-Dong Sun, Peking University, China  
Shouheng Sun, Brown University, USA  
Sarah Tolbert, University of California, Los Angeles, USA  
Jonathan Veinot, University of Alberta, Canada  
Umesh Waghmare, Jawaharlal Nehru Centre for Advanced Scientific Research, India  
Jianfang Wang, Chinese University of Hong Kong, Hong Kong SAR  
Sharon Weiss, Vanderbilt University, USA  
Benjamin Wiley, Duke University, USA  
Wenzhuo Wu, Purdue University, USA  
Nobuhiro Yanai, Kyushu University, Japan  
Stefan Zauscher, Duke University, USA  
Xiao Cheng Zeng, University of Nebraska-Lincoln, USA  
Hongjie Zhang, Changchun Institute of Applied Chemistry, China  
Hua Zhang, City University of Hong Kong, China  
Manzhou Zhu, Anhui University, China  
Jin Zou, University of Queensland, Australia

## Community Board

Arun Richard Chandrasekaran, The RNA Institute, University at Albany, SUNY, USA  
Yuanxing Fang, Fuzhou University, China  
Azhar Fakharuddin, Interuniversity Microelectronics Centre, Belgium  
Calum T. J. Ferguson, Max Planck Institute for Polymer Research, Germany  
Lucas Güniat, EPFL, Switzerland  
Marilena Hadjijdemetriou, University of Manchester, UK  
Shumeng Hao, Georgia Institute of Technology, USA  
Jundie Hu, Suzhou University of Science and Technology, China

Shuaidong Huo, Xiamen University, China  
Ignacio Insua, University of Santiago de Compostela, Spain  
Education and Research Mohali, Indi  
Zhiyuan Liu, Shenzhen Institute of Advanced Technology, Chinese Academy of Sciences, China  
Saeed Nazemidashtarjandi, The University of Texas at Austin, USA  
Pepita Pla-Vilanova, University of Lleida, Spain  
Satyajit Ratha, Indian Institute of Technology Bhubaneswar, India  
Pengzhan Sun, University of Manchester, UK

Yanlong Wang, Dalian Institute of Chemical Physics, China  
Jiangjiexing Wu, Tianjin University, China  
Tong Wu, Qingdao University, China  
Xiuqiang Xie, Hunan University, China  
Yikai Xu, Queen's University Belfast, UK  
Fei Zhang, Tianjin University, China  
Zishuai Zhang, The University of British Columbia, Canada  
Kai Zhu, Harbin Engineering University, China  
Xiaolu Zhuo, The Chinese University of Hong Kong, China

## Information for Authors

Full details on how to submit material for publication in *Nanoscale Horizons* 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-horizons](http://rsc.li/nanoscale-horizons)

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.

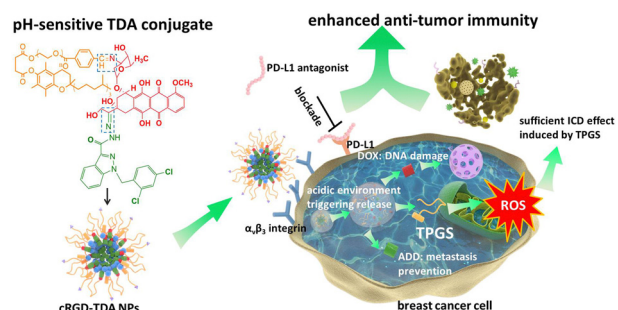
Registered charity number: 207890



870

### cRGD-modified nanoparticles of multi-bioactive agent conjugate with pH-sensitive linkers and PD-L1 antagonist for integrative collaborative treatment of breast cancer

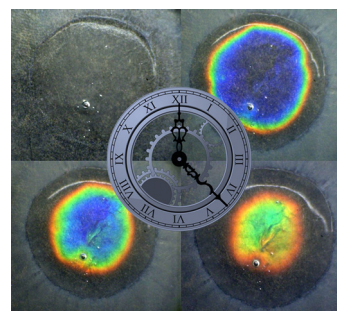
Chenming Zou, Yuepeng Tang, Ping Zeng, Derong Cui, Majdi Al Amili, Ya Chang, Zhu Jin, Yuanyuan Shen,\* Songwei Tan\* and Shengrong Guo\*



887

### Edible cellulose-based colorimetric timer

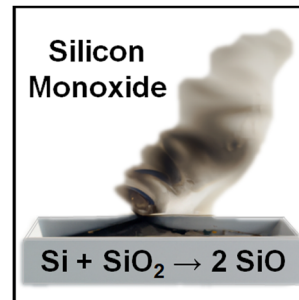
Gen Kamita, Silvia Vignolini\* and Ahu Gümrah Dumanli\*



892

### Understanding silicon monoxide gas evolution from mixed silicon and silica powders

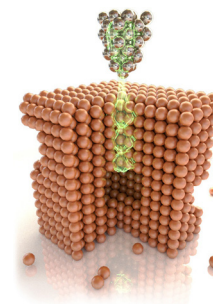
Kevin M. O'Connor, Abbie Rubletz, Jonathan Trach, Cole Butler and Jonathan G. C. Veinot\*



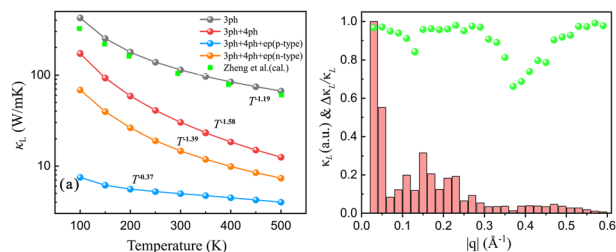
900

### Bringing ultimate depth to scanning tunnelling microscopy: deep subsurface vision of buried nano-objects in metals

Oleg Kurnosikov,\* Muriel Sicot, Emilie Gaudry, Danielle Pierre, Yuan Lu and Stéphane Mangin



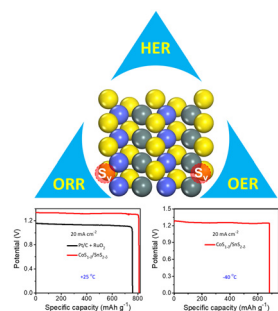
912



### Intervalley scattering induced significant reduction in lattice thermal conductivities for phosphorene

Yu Wu,\* Ying Chen, Lei Peng, Hao Zhang\* and LiuJiang Zhou\*

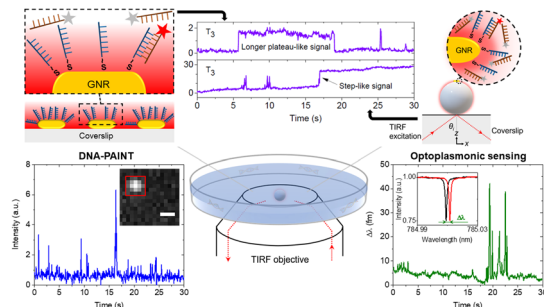
921



### Heterointerface promoted trifunctional electrocatalysts for all temperature high-performance rechargeable Zn–air batteries

Nayantara K. Wagh, Dong-Hyung Kim, Chi Ho Lee, Sung-Hae Kim, Han-Don Um, Joseph Sang-Il Kwon, Sambhaji S. Shinde,\* Sang Uck Lee and Jung-Ho Lee\*

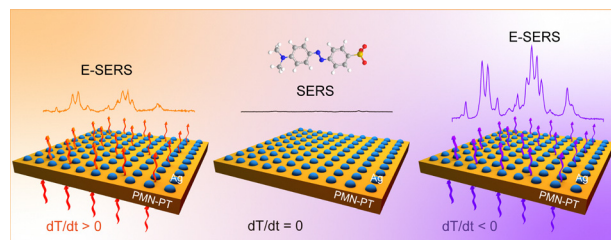
935



### Anomalous DNA hybridisation kinetics on gold nanorods revealed *via* a dual single-molecule imaging and optoplasmonic sensing platform

Narima Eerqing,\* Hsin-Yu Wu, Sivaraman Subramanian, Serge Vincent and Frank Vollmer

948



### Giant enhancement of the initial SERS activity for plasmonic nanostructures *via* pyroelectric PMN-PT

Mingrui Shao, Di Liu, Jinxuan Lu, Xiaofei Zhao, Jing Yu, Chao Zhang, Baoyuan Man,\* Hui Pan\* and Zhen Li\*



958

## Nonvolatile electro-mechanical coupling in two-dimensional lattices

Xilong Xu, Ting Zhang, Ying Dai,\* Baibiao Huang and Yandong Ma\*

