

## IN THIS ISSUE

ISSN 2040-3372 CODEN NANOHL 15(40) 16231–16502 (2023)

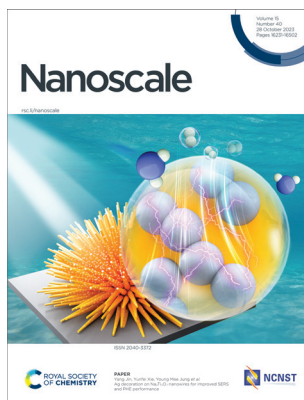


### Cover

See Mallar Ray *et al.*, pp. 16268–16277.

Image reproduced by permission of Mallar Ray, Aida Zahra Taravatfard & Sergio O. Martinez-Chapa. from *Nanoscale*, 2023, **15**, 16268.

Image created using Adobe Firefly.



### Inside cover

See Yang Jin, Yunfei Xie, Young Mee Jung *et al.*, pp. 16278–16289.

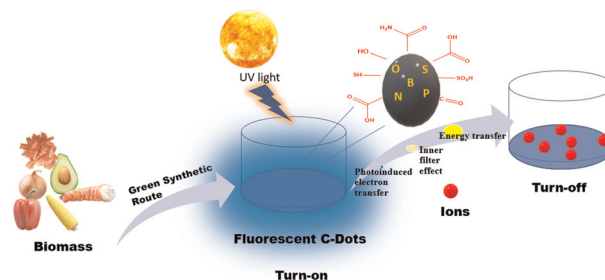
Image reproduced by permission of Young Mee Jun from *Nanoscale*, 2023, **15**, 16278.

## REVIEW

16241

### Assessment of biomass-derived carbon dots as highly sensitive and selective templates for the sensing of hazardous ions

Permender Singh, Arpita, Sandeep Kumar,\* Parmod Kumar, Navish Kataria, Vinita Bhankar, Krishan Kumar,\* Ravi Kumar, Chien-Te Hsieh\* and Kuan Shiong Khoo\*

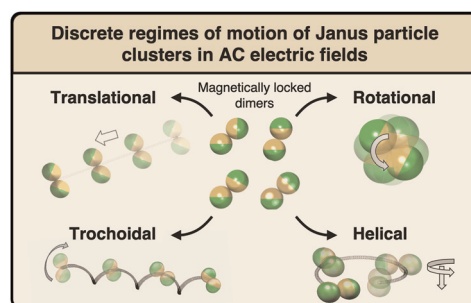


## COMMUNICATION

16268

### Magnetically locked Janus particle clusters with orientation-dependent motion in AC electric fields

Jin Gyun Lee, Cooper P. Thome, Zoe A. Cruse, Arkava Ganguly, Ankur Gupta and C. Wyatt Shields, IV\*



## Editorial Staff

### Executive Editor

Michaela Mühlberg

### Managing Editor

Heather Montgomery

### Editorial Production Manager

Jonathon Watson

### Senior Publishing Editor

Ella White

### Development Editor

Edward Gardner

### Publishing Editors

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

Elizabeth So

### 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](mailto:nanoscale@rsc.org)

For pre-submission queries please contact Michaela Mühlberg, Executive Editor. E-mail: [nanoscale-rsc@rsc.org](mailto: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](mailto: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](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

[rsc.li/nanoscale](http://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 Guld, Friedrich-Alexander-Universität

Erlangen-Nürnberg, Germany

Yue Zhang, University of Science and

Technology Beijing, China

### Associate Editors

Cinzia Casiraghi, University of Manchester, UK

Gianluigi Cuniberti, TU Dresden

(Technische Universität 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,

South Korea

Christian Klink, 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, Jawaharlal Nehru Centre

for Advanced Scientific Research, India

Manzhou Zhu, Anhui University, China

Jin Zou, The University of Queensland,

Australia

## 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

Mingdong Dong, Aarhus University, Denmark

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 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

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,

UK

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

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,

USA

Paolo Samori, 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

Ventsislav Valev, University of Bath, UK

Miriam Vitiello, CNR Nano, Italy

Jianfang Wang, Chinese University of Hong

Kong, Hong Kong SAR

Benjamin Wiley, Duke University, USA

Xiaojuan 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,

China

Miqin 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](http://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

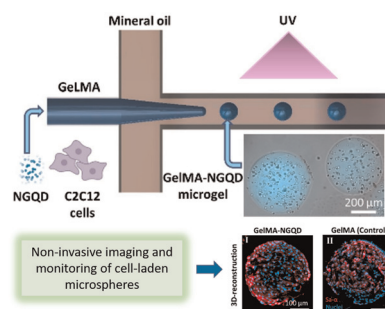


## PAPERS

16277

### Nitrogen-functionalized graphene quantum dot incorporated GelMA microgels as fluorescent 3D-tissue Constructs

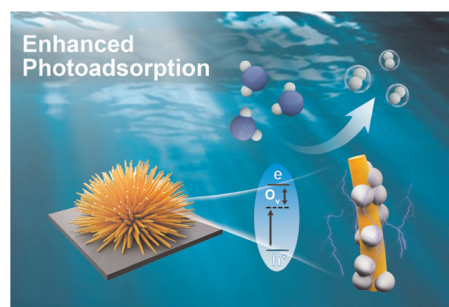
Aida Zahra Taravatfard, Carlos Ceballos-Gonzalez, Abu Bakar Siddique, Johana Bolivar-Monsalve, Masoud Madadelahi, Grissel Trujillo-de Santiago, Mario Moisés Alvarez, Ashit Kumar Pramanick, Eduardo Martinez Guerra, Lawrence Kulinsky, Marc J. Madou, Sergio O. Martinez and Mallar Ray\*



16287

### Ag decoration on $\text{Na}_2\text{Ti}_3\text{O}_7$ nanowires for improved SERS and PHE performance

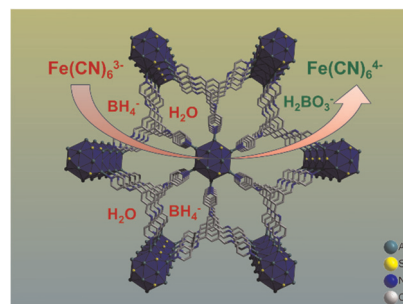
Lei Chen, Yang Jin,\* Shuang Guo, Eungyeong Park, Yunfei Xie\* and Young Mee Jung\*



16299

### A new two-dimensional luminescent $\text{Ag}_{12}$ cluster-assembled material and its catalytic activity for reduction of hexacyanoferrate(III)

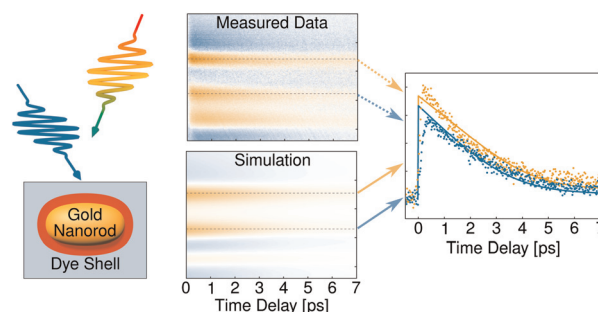
Riki Nakatani, Sourav Biswas, Tsukasa Irie, Jin Sakai, Daisuke Hirayama, Tokuhisa Kawawaki, Yoshiki Niihori, Saikat Das\* and Yuichi Negishi\*



16307

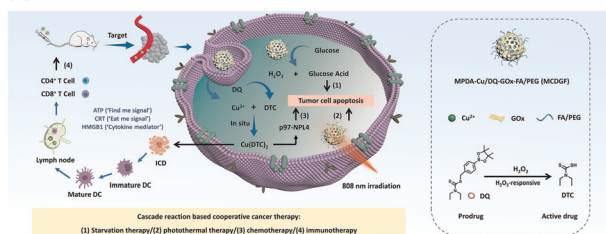
### Ultrafast dynamics in plasmon–exciton core–shell systems: the role of heat

Felix Stete, Matias Bargheer and Wouter Koopman\*



## PAPERS

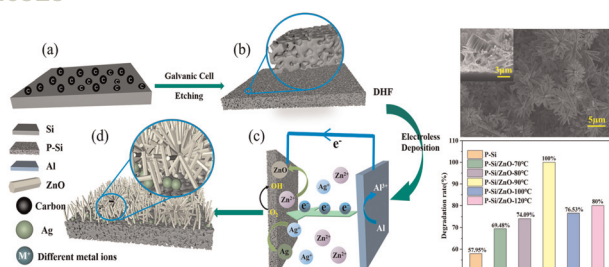
16314



## A cascade nanoplatfor for the regulation of the tumor microenvironment and combined cancer therapy

Xiaochun Hu, Wenrong Zhao, Ruihao Li, Keke Chai, Fangjian Shang, Shuo Shi\* and Chunyan Dong\*

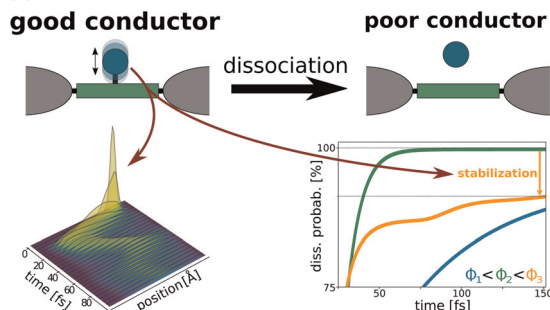
16323



## Fabrication of a P-Si/ZnO heterojunction based on galvanic cell driven and the complete degradation of RhB via fast charge transfer

Xiaoyu Yang, Lin Wu, Baoguo Zhang, Jingwang Li, Yifan Shen, Ying Liu\* and Ya Hu\*

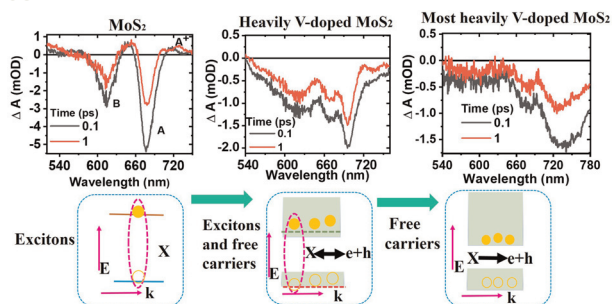
16333



## How an electrical current can stabilize a molecular nanojunction

André Erpenbeck,\* Yaling Ke, Uri Peskin and Michael Thoss

16344



## Ultrafast carrier dynamics in vanadium-doped MoS<sub>2</sub> alloys

Bhuvan Upadhyay, Rahul Sharma, Dipak Maity, Tharangattu N. Narayan and Suman Kalyan Pal\*



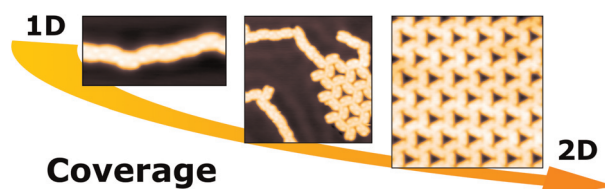


## PAPERS

16354

**Coverage-modulated halogen bond geometry transformation in supramolecular assemblies**

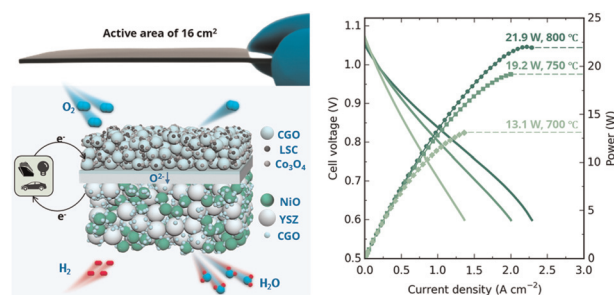
Alejandro Jiménez-Martin, Aurelio Gallardo\* and Bruno de la Torre\*



16362

**Nanoengineering of electrodes *via* infiltration: an opportunity for developing large-area solid oxide fuel cells with high power density**

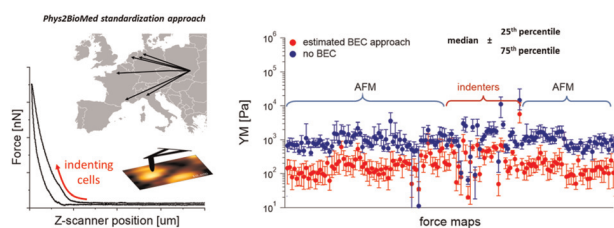
Xiaofeng Tong,\* Chen Li, Kaikuo Xu, Ningling Wang, Karen Brodersen, Zhibin Yang and Ming Chen\*



16371

**Reliable, standardized measurements for cell mechanical properties**

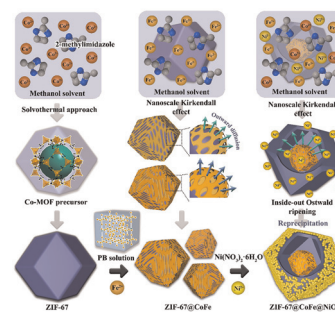
S. Pérez-Domínguez, S. G. Kulkarni, J. Pabijan, K. Gnanachandran, H. Holuigue, M. Eroles, E. Lorenc, M. Berardi, N. Antonovaite, M. L. Marini, J. Lopez Alonso, L. Redonto-Morata, V. Dupres, S. Janel, S. Acharya, J. Otero, D. Navajas, K. Bielawski, H. Schillers, F. Lafont, F. Rico, A. Podestà,\* M. Radmacher\* and M. Lekka\*



16381

**A multi-layer core-shell structure CoFe<sub>2</sub>O<sub>4</sub>@Fe<sub>3</sub>C@NiO composite with high broadband electromagnetic wave-absorption performance**

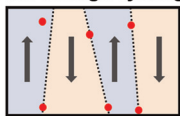
Wei Si, Qingwei Liao,\* Yu Chu, Zhiwei Zhang, Xiangcheng Chu\* and Lei Qin\*



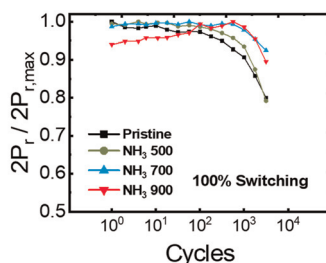
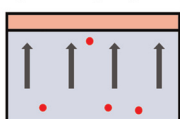
## PAPERS

16390

## Low voltage cycling



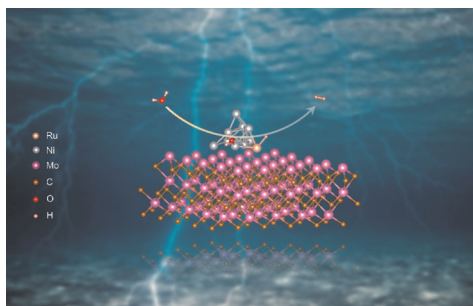
## High voltage cycling



### Impact of operation voltage and NH<sub>3</sub> annealing on the fatigue characteristics of ferroelectric AlScN thin films grown by sputtering

Kyung Do Kim, Yong Bin Lee, Suk Hyun Lee, In Soo Lee, Seung Kyu Ryoo, Seung Yong Byun, Jae Hoon Lee and Cheol Seong Hwang\*

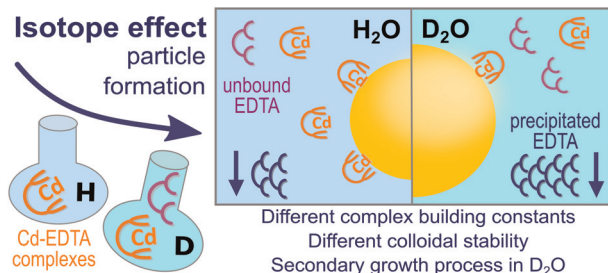
16403



### Regulation of the electronic structure of a RuNi/MoC electrocatalyst for high-efficiency hydrogen evolution in alkaline seawater

Xiaocheng Fan, Bei Li, Chunling Zhu,\* Feng Yan\* and Yujin Chen\*

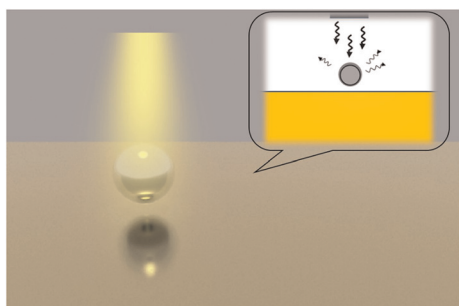
16413



### The H-D-isotope effect of heavy water affecting ligand-mediated nanoparticle formation in SANS and NMR experiments

Sebastian W. Krauss, Mirco Eckardt, Johannes Will, Erdmann Spiecker, Renée Siegel, Martin Dulle, Ralf Schweins, Brian Pauw, Jürgen Senker and Mirjam Zobel\*

16425



### Investigation of high-order resonant modes for aluminium nanoparticles (arrays) using the finite-difference time-domain method

Zhen Wang, Jinqiao Lu, Zilong Wang, Jie Huang, Le Wang, Qiang Chen, Yunfeng Li,\* Yongxing Jin\* and Pei Liang\*

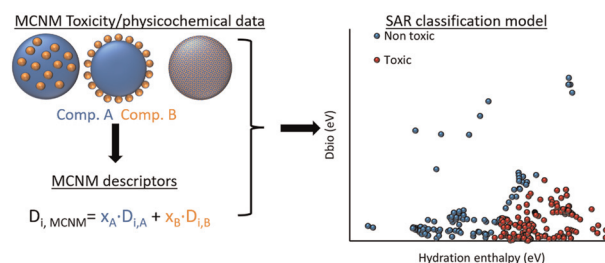


## PAPERS

16432

# A structure–activity approach towards the toxicity assessment of multicomponent metal oxide nanomaterials

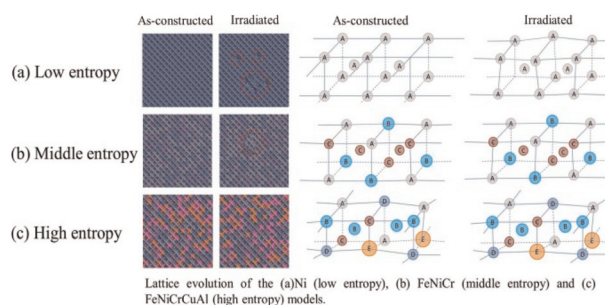
G. P. Gakis, I. G. Aviziotis and C. A. Charitidis\*



16447

# Lattice distortion and re-distortion affecting irradiation tolerance in high entropy alloys

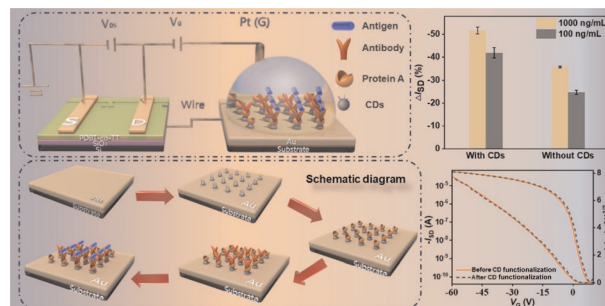
Peng-wei Wang, Ming-fei Li, Babafemi Malomo and Liang Yang\*



16458

# Carbon dots-functionalized extended gate organic field effect transistor-based biosensors for low abundance proteins

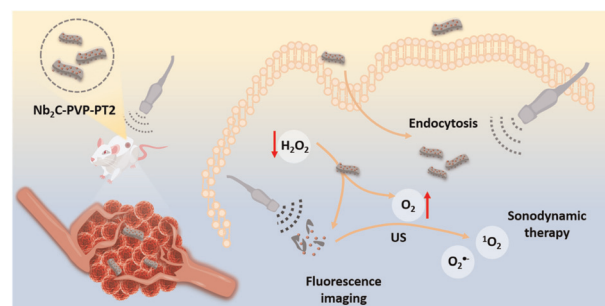
Yanmin Zhang, Chenfang Sun, Yuchen Duan, Shanshan Cheng\* and Wenping Hu



16466

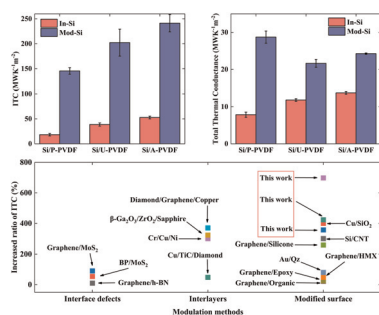
# Catalase-like pleated niobium carbide MXene loaded with polythiophene for oxygenated sonodynamic therapy in solid tumor

E Pang, Baoling Li, Chuanling Zhou, Shaojing Zhao, Yu Tang, Qiuxia Tan, Chaoyi Yao, Benhua Wang, Kai Han,\* Xiangzhi Song, Zheyu Hu, Quchang Ouyang,\* Shiguang Jin\* and Minhuan Lan\*



## PAPERS

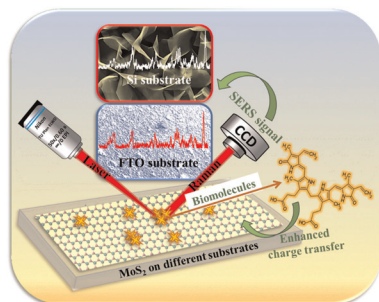
16472



### Enhancing the interfacial thermal conductance of Si/PVDF by strengthening atomic couplings

Zhicheng Zong, Shichen Deng, Yangjun Qin, Xiao Wan, Jiahong Zhan, Dengke Ma and Nuo Yang\*

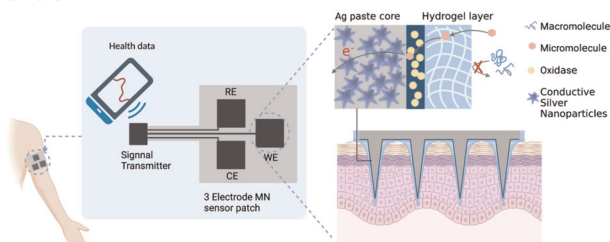
16480



### Large area CVD-grown vertically and horizontally oriented MoS<sub>2</sub> nanostructures as SERS biosensors for single molecule detection

Ankita Singh and Ashish Kumar Mishra\*

16493



### A nanometallic conductive composite-hydrogel core-shell microneedle skin patch for real-time monitoring of interstitial glucose levels

Yuyue Zhang, Guangyao Zhao, Mengjia Zheng, Tianli Hu, Cheng Yang\* and Chenjie Xu\*

