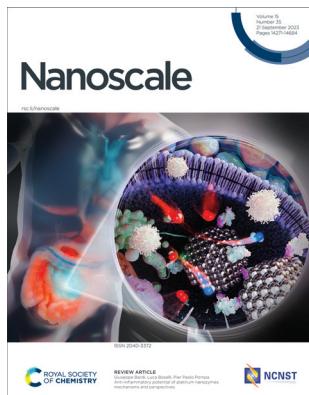


## IN THIS ISSUE

ISSN 2040-3372 CODEN NANOHL 15(35) 14271-14684 (2023)



### Cover

See Giuseppe Bardi,  
Luca Boselli,  
Pier Paolo Pompa,  
pp. 14284–14300.

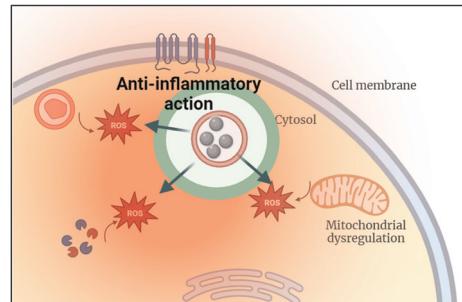
Image reproduced by  
permission of  
Pier Paolo Pompa from  
*Nanoscale*, 2023, **15**, 14284.

## REVIEWS

14284

### Anti-inflammatory potential of platinum nanozymes: mechanisms and perspectives

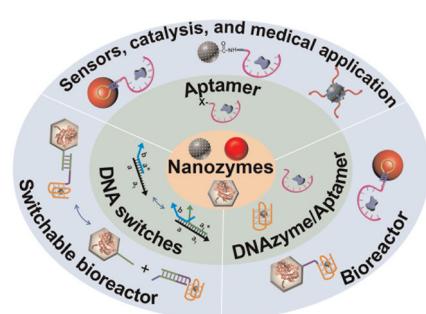
Giuseppe Bardi,\* Luca Boselli\* and Pier Paolo Pompa\*



14301

### Nucleic acid-functionalized nanozymes and their applications

Yunlong Qin, Yu Ouyang and Itamar Willner\*



**Editorial Staff****Executive Editor**

Michaela Mühlberg

**Managing Editor**

Heather Montgomery

**Editorial Production Manager**

Jonathon Watson

**Senior Publishing Editor**

Daniella Ferlucio

**Development Editor**

Edward Gardner

**Publishing Editors**

Matthew Blow, Chris Dias, Hemma 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, Ella White

**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 0WE.

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 0WE, 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 Guldi, Friedrich-Alexander-Universität Erlangen-Nürnberg, Germany

Yue Zhang, University of Science and Technology Beijing, China

**Associate Editors**

Cinzia Casiraghi, University of Manchester, UK

Gianluca 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, South Korea

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

Renzhii 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

Suryaswathi Bose, Indian Institute of Science Bangalore, India

Stephanie Brock, Wayne State University, USA

Raffaello 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 Fitchhorn, 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

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

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) Ostriork, 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

Zhihang 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

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

Ta 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/repubish 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.

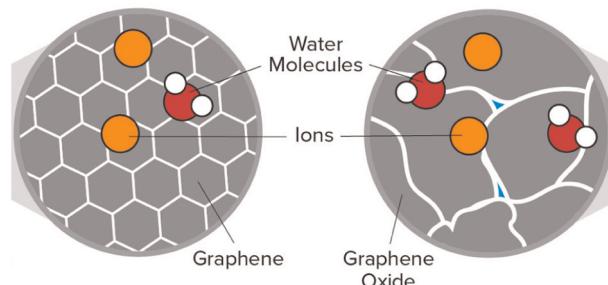
Registered charity number: 207890

## MINIREVIEW

14319

## Ion and water adsorption to graphene and graphene oxide surfaces

Amanda J. Carr,\* Seung Eun Lee and Ahmet Uysal

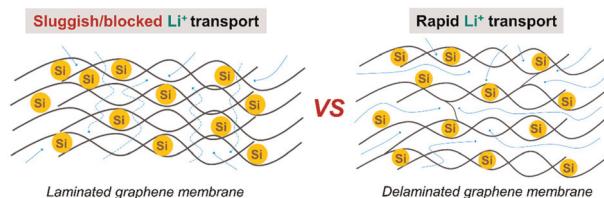


## COMMUNICATION

14338

Scalable engineering of hierarchical layered micro-sized silicon/graphene hybrids *via* direct foaming for lithium storage

Mathar Hamza, Siyuan Zhang, Wenqiang Xu, Denghui Wang, Yingjie Ma\* and Xianglong Li\*

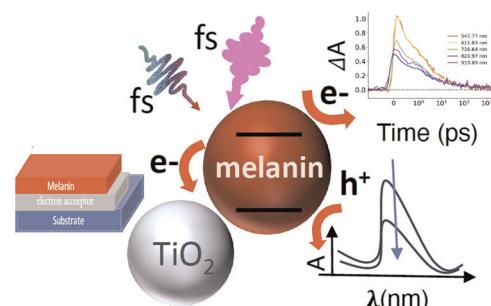


## PAPERS

14346

## Enhanced photochemical activity and ultrafast photocarrier dynamics in sustainable synthetic melanin nanoparticle-based donor–acceptor inkjet-printed molecular junctions

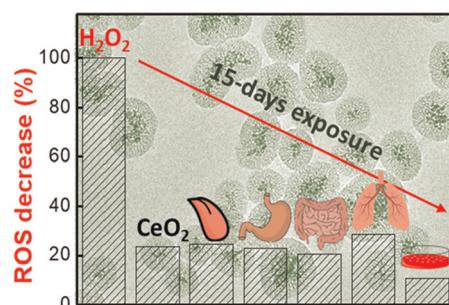
Max DeMarco, Matthew Ballard, Elinor Grage, Farnoush Nourigheimas, Lillian Getter, Ashkan Shafiee and Elham Ghadiri\*



14365

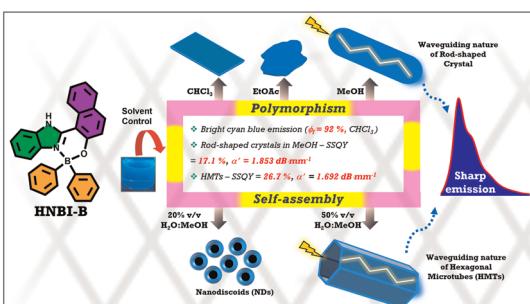
Conservation of the enzyme-like activity and biocompatibility of CeO<sub>2</sub> nanozymes in simulated body fluids

Muling Zeng, Xu Zhang, Jie Tang, Xingfei Liu, Yichao Lin, Dongdong Guo, Yuping Zhang, Shijie Ju, Guillermo Fernández-Varo, Ya-Chao Wang,\* Xiangyu Zhou,\* Gregori Casals\* and Eudald Casals\*



## PAPERS

14380



### Luminescent hexagonal microtubes prepared through water-induced self-assembly of a polymorphic organoboron compound: formation mechanism and waveguide behaviour

Pradip A. Gaikwad, Prodipta Samadder, Shubham Som, Deepak Chopra,\* Prakash P. Neelakandan\* and Aasheesh Srivastava\*

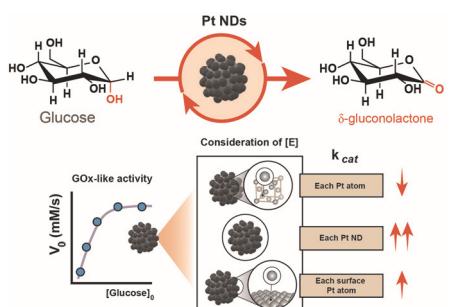
14388



### Self-assembly of cellulose nanocrystals confined to square capillaries

Amanda J. Ackroyd, Adam De Paolis, Yi-Tao Xu, Arash Momeni, Wadood Y. Hamad and Mark J. MacLachlan\*

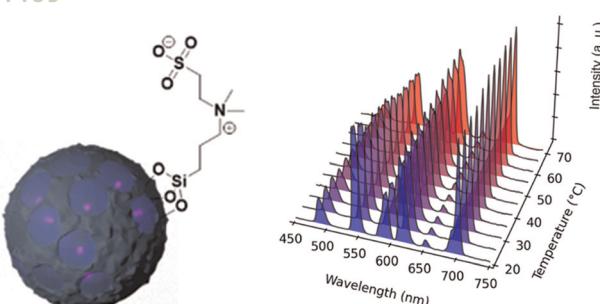
14399



### Platinum-based nanodendrites as glucose oxidase-mimicking surrogates

Jose I. Garcia-Peiro, Javier Bonet-Aleta, Maria L. Tamayo-Fraile, Jose L. Hueso\* and Jesus Santamaria\*

14409



### Hybrid multifunctionalized mesostructured stellate silica nanoparticles loaded with $\beta$ -diketonate Tb<sup>3+</sup>/Eu<sup>3+</sup> complexes as efficient ratiometric emissive thermometers working in water

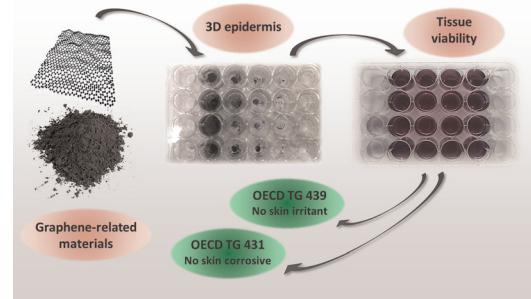
Tristan Pellau, Saad Sene, Lamiaa M. A. Ali, Gautier Félix, Faustine Manhes, Albano N. Carneiro Neto, Luis D. Carlos,\* Belén Albela, Laurent Bonneviot, Erwan Oliviero, Magali Gary-Bobo, Yannick Guari\* and Joulia Larionova\*

## PAPERS

14423

***In vitro* assessment of skin irritation and corrosion properties of graphene-related materials on a 3D epidermis**

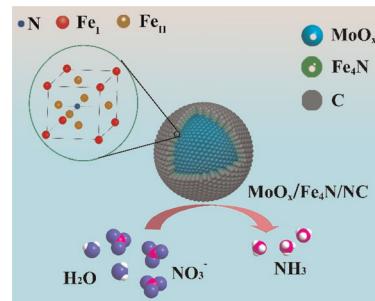
Michela Carlin, Marina Garrido, Silvio Sosa, Aurelia Tubaro, Maurizio Prato and Marco Pelin\*



14439

**Multi-layer core–shell metal oxide/nitride/carbon and its high-rate electroreduction of nitrate to ammonia**

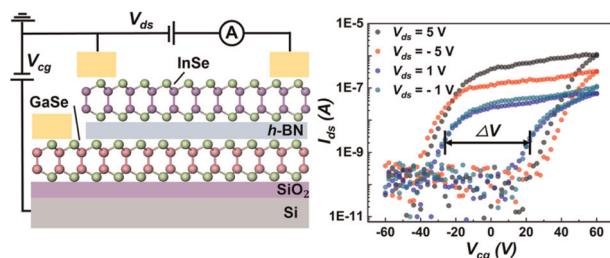
Xiaoyu Li, Ping Deng, Mengqiu Xu, Zhenbo Peng, Yuhu Zhou, Gan Jia, Wei Ye,\* Peng Gao\* and Wei Wang\*



14448

**Tunable non-volatile memories based on 2D InSe/ *h*-BN/GaSe heterostructures towards potential multifunctionality**

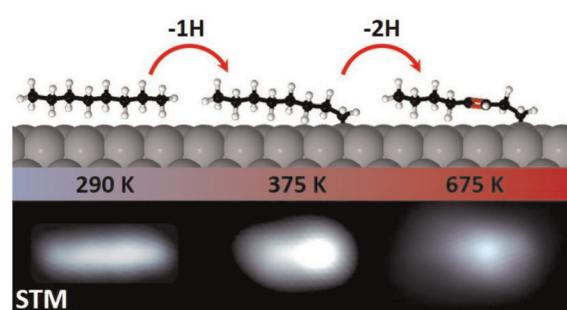
Xiang Gong, Yueying Zhou, Jiangnan Xia, Li Zhang, Lijie Zhang, Long-Jing Yin, Yuanyuan Hu,\* Zhihui Qin\* and Yuan Tian\*



14458

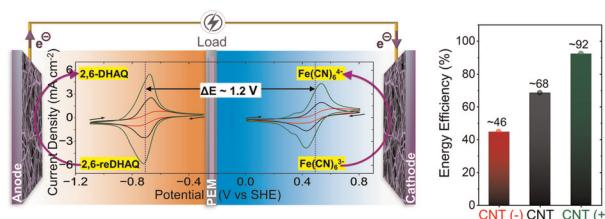
***In situ* observation of the on-surface thermal dehydrogenation of *n*-octane on Pt(111)**

Daniel Arribas, Víctor Villalobos-Vilda, Ezequiel Tosi, Paolo Lacovig, Alessandro Baraldi, Luca Bignardi, Silvano Lizzit, José Ignacio Martínez, Pedro Luis de Andres, Alejandro Gutiérrez, José Ángel Martín-Gago and Pablo Merino\*



## PAPERS

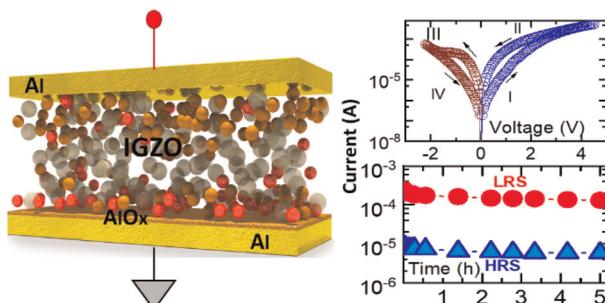
14468



## Electrostatically driven unidirectional molecular flux for high performance alkaline flow batteries

Bhoj Kumar Nayak, Ritwik Mondal and Musthafa Ottakam Thotiyil\*

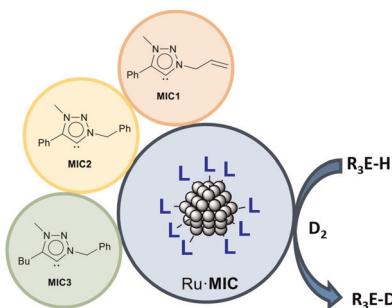
14476



## Interface roughness effects and relaxation dynamics of an amorphous semiconductor oxide-based analog resistance switching memory

G. R. Haripriya, Hee Yeon Noh, Chan-Kang Lee, June-Seo Kim, Myoung-Jae Lee and Hyeyon-Jun Lee\*

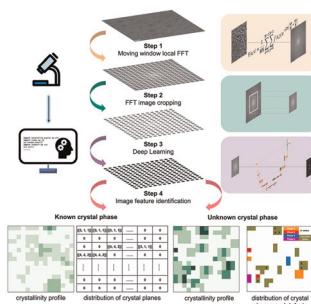
14488



## Ruthenium nanoparticles stabilized by 1,2,3-triazolylidene ligands in the hydrogen isotope exchange of E-H bonds (E = B, Si, Ge, Sn) using deuterium gas

Pablo Molinillo, Maxime Puyo, Florencia Vattier, Bertrand Lacroix, Nuria Rendón,\* Patricia Lara\* and Andrés Suárez\*

14496



## Deep learning-assisted analysis of HRTEM images of crystalline nanoparticles

Xiaoyang Zhu, Yu Mao, Jizi Liu, Yi Chen, Chuan Chen, Yan Li, Xiao Huang\* and Ning Gu\*

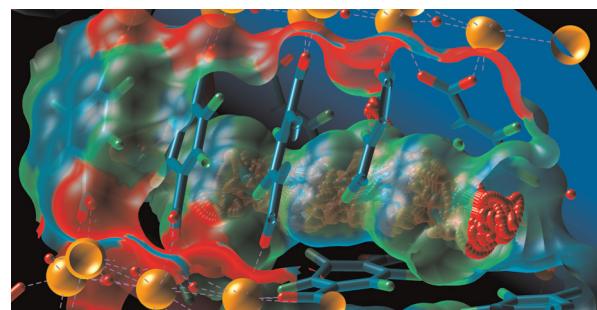


## PAPERS

14505

**Disclosing gate-opening/closing events inside a flexible metal–organic framework loaded with CO<sub>2</sub> by reactive and essential dynamics**

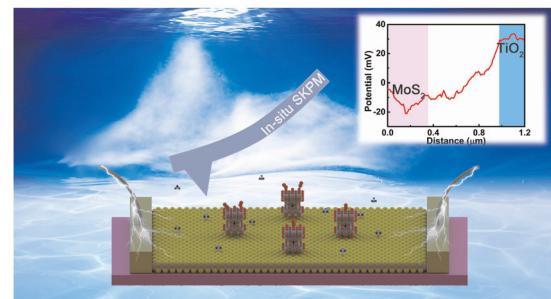
Susanna Monti,\* Cheherazade Trouki and Giovanni Barcaro



14514

**TiO<sub>2</sub>-modified MoS<sub>2</sub> monolayer films enable sensitive NH<sub>3</sub> sensing at room temperature**

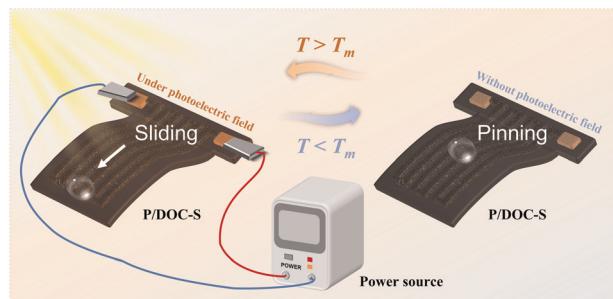
Lun Tan, Xianzhen Liu, Peng Wu, Liwei Cao, Wei Li, Ang Li,\* Zhao Wang\* and Haoshuang Gu\*



14523

**Photoelectric synergistic anisotropic slippery interface for directional droplets manipulation**

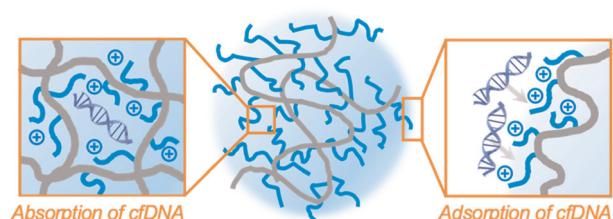
Xu Sun, Xuan Wang, Pu Guo, Lei Jiang and Liping Heng\*



14531

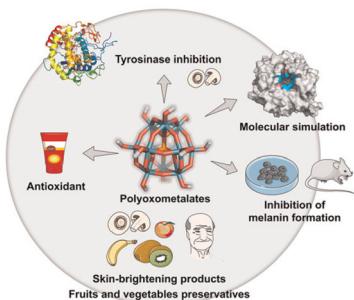
**Nanogels designed for cell-free nucleic acid sequestration**

Yuhang Huang, Shangyu Li, Logan W. C. Zettle, Yingshan Ma, Hani E. Naguib and Eugenia Kumacheva\*



## PAPERS

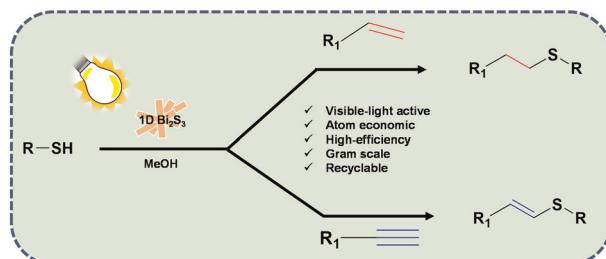
14543



### Mechanism of melanogenesis inhibition by Keggin-type polyoxometalates

Guoxiang Chi, Die Shuai, Jiaxin Li, Xiangsong Chen, Han Yang, Meijuan Zhao, Zedong Jiang, Li Wang\* and Bingnian Chen\*

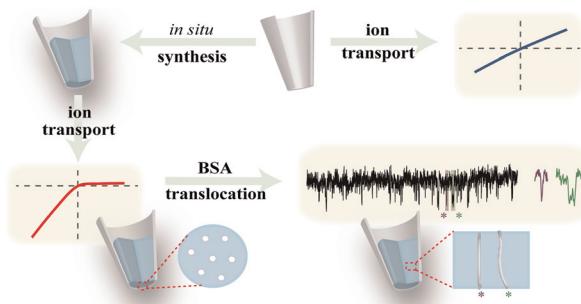
14551



### Visible light-driven photocatalytic thiol–ene/yne reactions using anisotropic 1D $\text{Bi}_2\text{S}_3$ nanorods: a green synthetic approach

Haider Ali, Bhagirath Mahto, Ashok Barhoi and Sahid Hussain\*

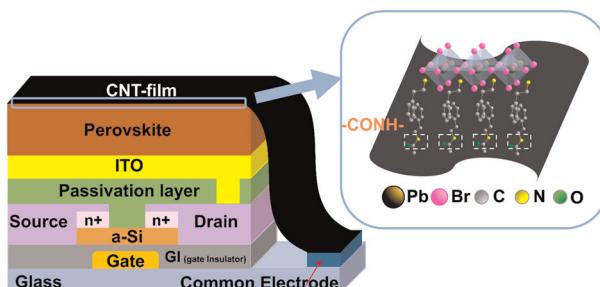
14564



### Ion transport based structural description for *in situ* synthesized SBA-15 nanochannels in a sub-micropipette

Rui Zhang, Qiang Zeng,\* Xuye Liu and Lishi Wang\*

14574



### An interfacial toughening strategy for high stability 2D/3D perovskite X-ray detectors with a carbon nanotube thin film electrode

Liwen Qiu, Mingqiang Wang, Tian Sun, Qiang Lou, Tong Chen, Guoshen Yang, Wei Qian, Zixuan Zhang, Shihe Yang, Min Zhang, Yufeng Jin and Hang Zhou\*

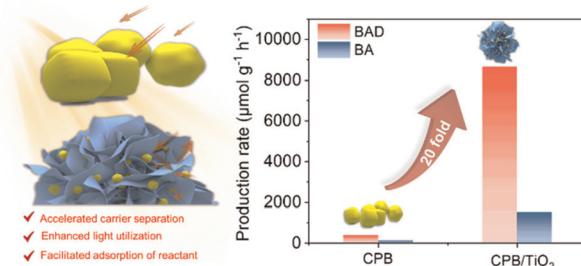


## PAPERS

14584

## High-efficiency visible-light-driven oxidation of primary C–H bonds in toluene over a $\text{CsPbBr}_3$ perovskite supported by hierarchical $\text{TiO}_2$ nanoflakes

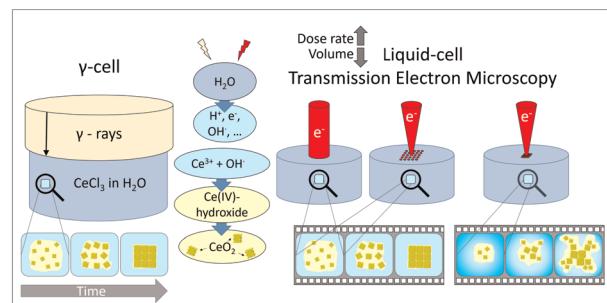
Jiayu Yi, Sunzai Ke, Suwei Lu, Bo Weng, Lijuan Shen, Xuhui Yang, Hun Xue, Min-Quan Yang\* and Qingrong Qian\*



14595

## Non-classical crystallization of $\text{CeO}_2$ by means of *in situ* electron microscopy

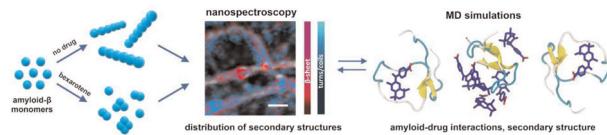
Hannes Zschiesche,\* Inna L. Soroka, Mats Jonsson and Nadezda V. Tarakina\*



14606

## Nanoscale insights into the local structural rearrangements of amyloid- $\beta$ induced by bexarotene

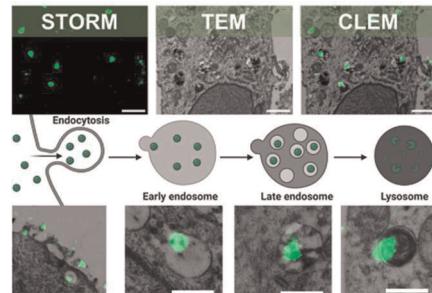
Kamila Sofińska, Piotr Batys, Adrian Cernescu, Dhiman Ghosh, Katarzyna Skirlińska-Nosek, Jakub Barbasz, Sara Seweryn, Natalia Wilkosz, Roland Riek, Marek Szymoński and Ewelina Lipiec\*



14615

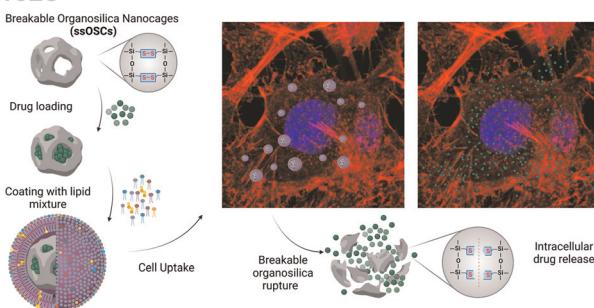
## A super-resolution and transmission electron microscopy correlative approach to study intracellular trafficking of nanoparticles

Teodora Andrian, Yolanda Muela, Lidia Delgado, Lorenzo Albertazzi\* and Silvia Pujals\*



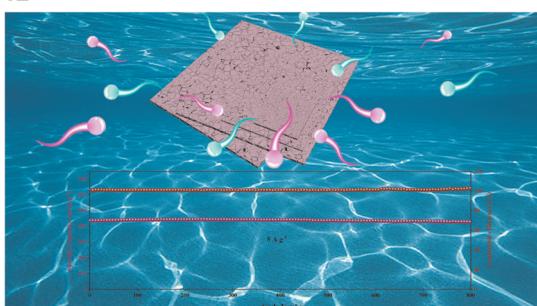
## PAPERS

14628


**Cargo-loaded lipid-shielded breakable organosilica nanocages for enhanced drug delivery**

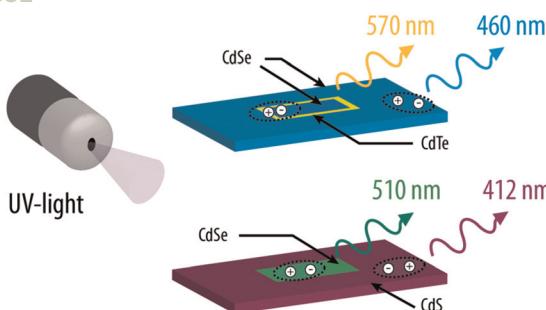
María Sancho-Albero, Giada Rosso, Luisa De Cola\* and Valentina Cauda\*

14641


***In situ* Cu doping of ultralarge CoSe nanosheets with accelerated electronic migration for superior sodium-ion storage**

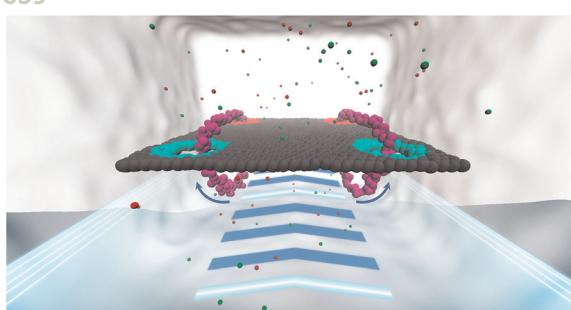
Jitao Geng, Hui long Dong, Jing Liu, Chengkui Lv, Huaixin Wei, Yafei Cheng,\* Jun Yang\* and Hongbo Geng\*

14651


**Expanding the color palette of bicolor-emitting nanocrystals**

Corentin Dabard, Hong Po, Ningyuan Fu, Lina Makke, Henri Lehouelleur, Leonardo Curti, Xiang Zhen Xu, Emmanuel Lhuillier, Benjamin T. Diroll and Sandrine Ithurria\*

14659


**Nanopore actuation of a DNA-tracked nanovehicle**

Wei Si,\* Xiaojing Lin, Liwei Wang, Gensheng Wu, Yin Zhang, Yunfei Chen and Jingjie Sha\*

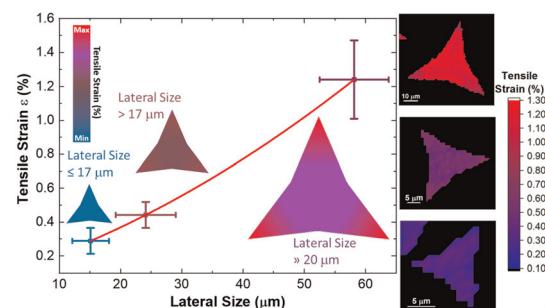


## PAPERS

14669

**Built-in tensile strain dependence on the lateral size of monolayer MoS<sub>2</sub> synthesized by liquid precursor chemical vapor deposition**

L. Seravalli, F. Esposito, M. Bosi, L. Aversa, G. Trevisi, R. Verucchi, L. Lazzarini, F. Rossi and F. Fabbri\*



## CORRECTIONS

14679

**Correction: Ion and water adsorption to graphene and graphene oxide surfaces**

Amanda J. Carr,\* Seung Eun Lee and Ahmet Uysal

14680

**Correction: *In situ* observation of the on-surface thermal dehydrogenation of *n*-octane on Pt(111)**

Daniel Arribas, Víctor Villalobos-Vilda, Ezequiel Tosi, Paolo Lacovig, Alessandro Baraldi, Luca Bignardi, Silvano Lizzit, José Ignacio Martínez, Pedro Luis de Andres, Alejandro Gutiérrez, José Ángel Martín-Gago and Pablo Merino\*

14681

**Correction: Probing antiferromagnetism in exfoliated Fe<sub>3</sub>GeTe<sub>2</sub> using magneto-transport measurements**

Stasiu T. Chyczewski,\* Ji Shi, Hanwool Lee, Paolo F. Ferrari, Kai Xu, Arend M. van der Zande and Wenjuan Zhu\*

