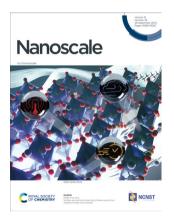
# **Nanoscale**

# 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(36) 14685-15062 (2023)



#### Cover

See Paola Vivo et al., pp. 14764-14773.

Image reproduced by permission of . Anastasia Matuhina from Nanoscale, 2023, 15, 14764.



#### Inside cover

See Juliane Simmchen et al., pp. 14774-14781.

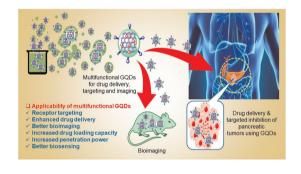
Image reproduced by permission of . Juliane Simmchen from Nanoscale, 2023, 15, 14774.

#### **REVIEWS**

#### 14698

# Multifunctional GQDs for receptor targeting, drug delivery, and bioimaging in pancreatic cancer

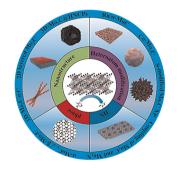
Monu Kumar Shukla, Arpana Parihar, Chandrabose Karthikeyan, Deepak Kumar and Raju Khan\*



### 14717

Recent progress of molybdenum carbide based electrocatalysts for electrocatalytic hydrogen evolution reaction

Yuping Tong,\* Zhuo Zhang, Yuxin Hou, Liang Yan, Xi Chen, Hailong Zhang, Xiao Wang and Yangiang Li\*



# **Editorial Staff**

Executive Editor

Michaela Mühlberg

Managing Editor

Heather Montgomery

**Editorial Production Manager** 

Ionathon Watson

Senior Publishing Editor

Daniella Ferluccio

**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, Ella White

**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

Ionathan 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 Guohua Jia, Curtin University, Australia Xingyu Jiang, Southern University of Science and Technolog, China RongChao Jin, Carnegie Mellon University,

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,

Changming Li, Southwest University, China Jie Liu, Duke University, USA Laura Na Liu, Max Planck Institute for Intelligent Systems, Germany Yungi 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

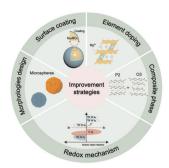


#### **REVIEWS**

#### 14737

# Structural and electrochemical progress of O3-type layered oxide cathodes for Na-ion batteries

Xiaowei Ma, Chen Yang, Ziyang Xu, Ruiqi Li, Li Song, Mingdao Zhang,\* Mei Yang\* and Yachao Jin\*

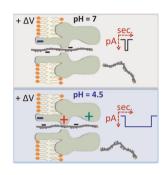


#### COMMUNICATION

#### 14754

Considerable slowdown of short DNA fragment translocation across a protein nanopore using pH-induced generation of enthalpic traps inside the permeation pathway

Loredana Mereuta, Alina Asandei, Ioan Andricioaei, Jonggwan Park, Yoonkyung Park\* and Tudor Luchian\*

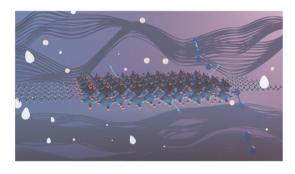


# **PAPERS**

#### 14764

# Surface and optical properties of phase-pure silver iodobismuthate nanocrystals

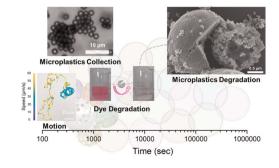
Anastasia Matuhina, G. Krishnamurthy Grandhi, Ashanti Bergonzoni, Laurent Pedesseau, Roberto Grisorio, Shambhavee Annurakshita, Harri Ali-Löytty, Riya Varghese, Kimmo Lahtonen, George Volonakis, Vincenzo Pecunia, Godofredo Bautista, Jacky Even and Paola Vivo\*



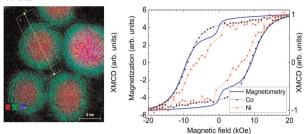
#### 14774

Combining photocatalytic collection and degradation of microplastics using self-asymmetric Pac-Man TiO<sub>2</sub>

Purnesh Chattopadhyay, Maria Camila Ariza-Tarazona, Erika Iveth Cedillo-González, Cristina Siligardi and Juliane Simmchen\*

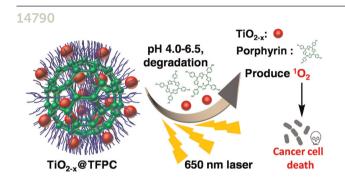


#### 14782



# Probing strongly exchange coupled magnetic behaviors in soft/hard Ni/CoFe<sub>2</sub>O<sub>4</sub> core/shell nanoparticles

J. K. Han, \* A. A. Baker, J. R. I. Lee and S. K. McCall

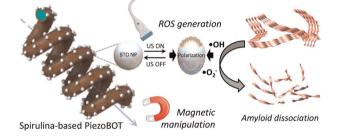


# Anatase $TiO_{2-x}$ and zwitterionic porphyrin polymer-based nanocomposite for enhanced cancer photodynamic therapy

Jiaxu Li, Dengshuai Wei\* and Qinrui Fu\*

#### 14800

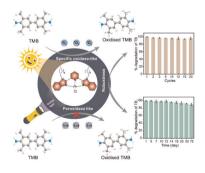
# Non-invasive amyloid dissociation therapy



# Magnetic PiezoBOTs: a microrobotic approach for targeted amyloid protein dissociation

Shen Ning, Roger Sanchis-Gual, Carlos Franco,\* Pedro D. Wendel-Garcia, Hao Ye, Andrea Veciana, Qiao Tang, Semih Sevim, Lukas Hertle, Joaquin Llacer-Wintle, Xiao-Hua Qin, Caihong Zhu, Jun Cai, Xiangzhong Chen, Bradley J. Nelson, Josep Puigmartí-Luis\* and Salvador Pané\*

#### 14809



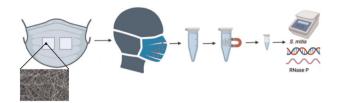
# Light-gated specific oxidase-like activity of a self-assembled Pt(II) nanozyme for environmental remediation

Rohit Kapila, Bhaskar Sen, Alisha Kamra, Shana Chandran and Subinoy Rana\*

#### 14822

A safer framework to evaluate characterization technologies of exhaled biologic materials using electrospun nanofibers

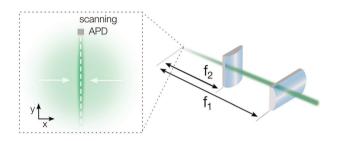
David T. Evans, Dalton J. Nelson, Megan E. Pask and Frederick R. Haselton\*



#### 14831

# Boosting the efficiency of transient photoluminescence microscopy using cylindrical lenses

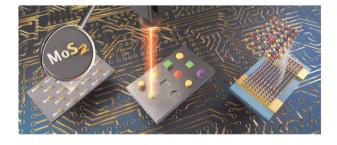
Alvaro J. Magdaleno, Mercy M. Cutler, Jesse J. Suurmond, Marc Meléndez, Rafael Delgado-Buscalioni, Michael Seitz and Ferry Prins\*



#### 14837

# Three-dimensional patterning of MoS<sub>2</sub> with ultrafast laser

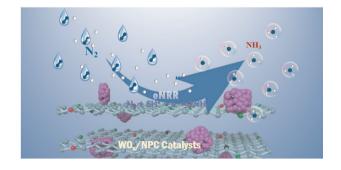
Dezhi Zhu, Ming Qiao, Jianfeng Yan,\* Jiawang Xie, Heng Guo, Shengfa Deng, Guangzhi He, Yuzhi Zhao and Ma Luo



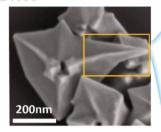
#### 14847

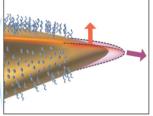
# WO<sub>x</sub> nanoparticles coupled with nitrogen-doped porous carbon toward electrocatalytic N<sub>2</sub> reduction

Zhaobing Lu, Hui Wang, Yinghao Tao, Sheng Zhu,\* Weiju Hao, Xinjuan Liu,\* Yulin Min and Jinchen Fan\*



#### 14858

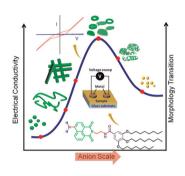




# Gold nanohexagrams *via* active surface growth under sole CTAB control

An Su, Qian Wang, Liping Huang, Yonglong Zheng, Yawen Wang and Hongyu Chen\*

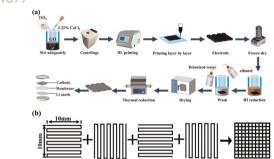
#### 14866



Anion-assisted supramolecular polymerization of luminescent organic  $\pi$ -conjugated chromophores in a moderately polar solvent: tunable nanostructures and their corresponding effects on electronic properties

Sk Mursed Ali, Sujauddin Sk, Ankita Sengupta, Subrata Santra, Souvik Barman, Nayim Sepay and Mijanur Rahaman Molla\*

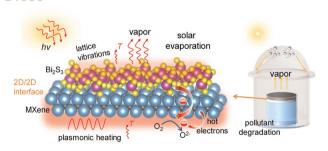
# 14877



# A 3D-printed freestanding graphene aerogel composite photocathode for high-capacity and long-life photo-assisted $Li-O_2$ batteries

Zhichao Xue, Yingyi Ru, Zhizhe Wang, Qiang Li, Mingfu Yu, Jie Li and Hong Sun\*

#### 14886



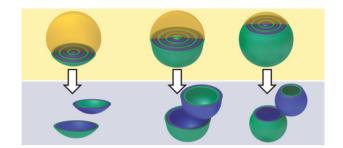
# Synergistic photothermal conversion and photocatalysis in 2D/2D MXene/Bi<sub>2</sub>S<sub>3</sub> hybrids for efficient solar-driven water purification

Yang Liu, Shu-Zhou Qu, Ze-Run Zhou, Xiang-Ping Song, Liang Ma,\* Si-Jing Ding and Qu-Quan Wang\*

#### 14896

Janus nanoplates, -bowls, and -cups: controlling size and curvature via terpolymer/homopolymer blending in 3D confinement

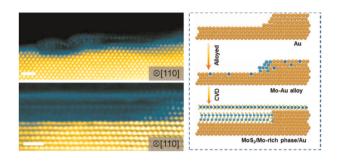
Suna Azhdari, Yorick Post, Manuel Trömer, Deniz Coban, Giada Quintieri and André H. Gröschel\*



#### 14906

An unexpected interfacial Mo-rich phase in 2D molybdenum disulfide and 3D gold heterojunctions

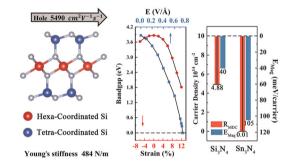
Mengjia Wang, Ruichun Luo, Yuxin Liu, Xiaoran Zhao, Xiaodong Zhuang, Wen Wu Xu,\* Mingwei Chen\* and Pan Liu\*



#### 14912

Two-dimensional superhard silicon nitrides with widely tunable bandgap, high carrier mobility and hole-doping-induced robust magnetism

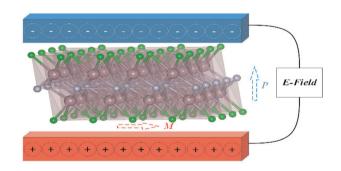
Shenggian Ma, Jiaxin Jiang, Lanlan Zou, Jiagi Lin, Ning Lu, Zhiwen Zhuo,\* Xiaojun Wu and Qunxiang Li\*



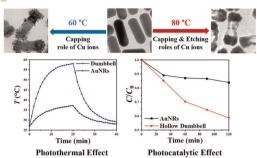
#### 14923

Charge disproportionation-induced multiferroics and electric field control of magnetism in a 2D MXene - Mo<sub>2</sub>NCl<sub>2</sub>

Chao Xin,\* Bingqian Song, Yaohui Yin, Ai Wang, Zhixin Sun, Guangyong Jin, Yongli Song and Feng Pan\*



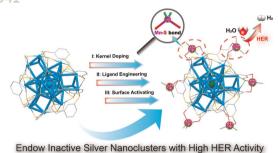
#### 14931



Capping and etching roles of copper ions in controlled synthesis of Au-PtCu trimetallic nanorods with improved photothermal and photocatalytic activities

Xiang Long, Yang Yang, Zhen-Long Dou, Qu-Quan Wang\* and Li Zhou\*

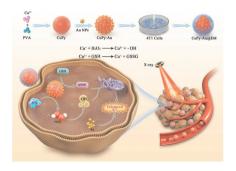
#### 14941



# Stepwise construction of Ag<sub>29</sub> nanocluster-based hydrogen evolution electrocatalysts

Honglei Shen, Qingtao Zhu, Jiawei Xu, Kun Ni,\* Xiao Wei, Yuanxin Du,\* Shan Gao,\* Xi Kang\* and Manzhou Zhu

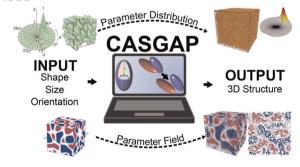
#### 14949



# A tumor cell exosome-mimicking multifunctional nanozyme for targeted breast cancer radiotherapy

Gaili Chen, Dazhen Jiang, Shuaijie Ding, Chunyu Huang, Daoming Zhu and Huangang Jiang\*

#### 14958



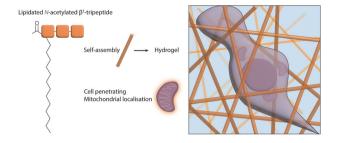
# Computational approach for structure generation of anisotropic particles (CASGAP) with targeted distributions of particle design and orientational order

Nitant Gupta and Arthi Jayaraman\*

#### 14971

# Elucidating the cell penetrating properties of self-assembling $\beta$ -peptides

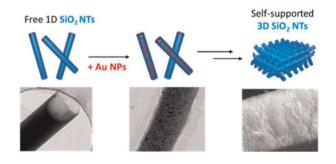
Meg L. McFetridge, Ketav Kulkarni, Tzong-Hsien Lee, Mark P. Del Borgo, Marie-Isabel Aguilar\* and Sharon D. Ricardo\*



#### 14981

# Tuning Au/SiO<sub>2</sub> nanostructures from 1D to 3D interconnected nanotube networks using polycarbonate porous templates

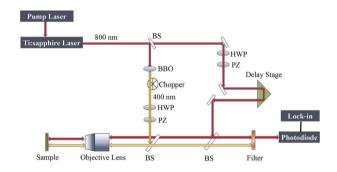
Fabien Drault, Etienne Ferain, Milena Chagas Lisboa, Sophie Hermans\* and Sophie Demoustier-Champagne\*



#### 14994

# Ultrafast transient absorption measurements of photocarrier dynamics in PdSe<sub>2</sub>

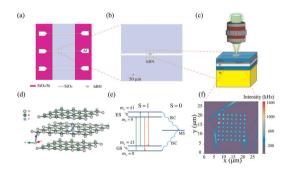
Guili Li, Xiaoxian Zhang, Yongsheng Wang, Zhiying Bai, Hui Zhao, Jiaqi He\* and Dawei He\*



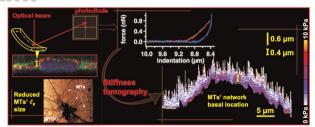
#### 15000

# Reflective dielectric cavity enhanced emission from hexagonal boron nitride spin defect arrays

Xiao-Dong Zeng, Yuan-Ze Yang, Nai-Jie Guo, Zhi-Peng Li, Zhao-An Wang, Lin-Ke Xie, Shang Yu, Yu Meng, Qiang Li, Jin-Shi Xu, Wei Liu,\* Yi-Tao Wang,\* Jian-Shun Tang,\* Chuan-Feng Li\* and Guang-Can Guo

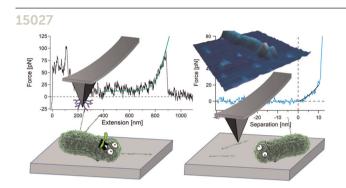


#### 15008



# The cyto-linker and scaffolding protein "plectin" mis-localization leads to softening of cancer cells

Anahid Amiri,\* Christian Dietz, Alexander Rapp, M. Cristina Cardoso and Robert W. Stark



# A single filament biomechanical study of the enteropathogenic Escherichia coli Type III secretion system reveals a high elastic aspect ratio

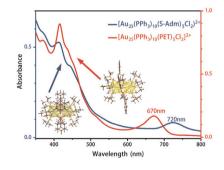
Moran Elias-Mordechai, Nofar David, Sonia Oren, Maya Georgia Pelah, Jürgen Jopp, Boris Fichtman, Amnon Harel, Ronen Berkovich\* and Neta Sal-Man\*



# Highly efficient degradation of polyesters and polyethers by decatungstate photocatalysis

Chifeng Li, Chen Gu, Kazuya Yamaguchi and Kosuke Suzuki\*





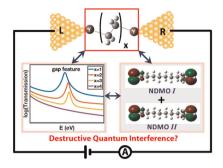
# Influence of ligands on the optical properties of rod-shaped Au<sub>25</sub> nanoclusters

Zewen Zuo, Kuo-Juei Hu,\* Siqi Lu, Shengyong Hu, Sichen Tang, Yongxin Zhang, Zixiang Zhao, Dong Zheng\* and Fengqi Song\*

#### 15050

Do quantum interference effects manifest in acyclic aliphatic molecules with anchoring groups?

Ravinder Kumar, Charu Seth,\* Ravindra Venkatramani\* and Veerabhadrarao Kaliginedi\*



#### **EXPRESSION OF CONCERN**

#### 15059

Expression of concern: Bacterial self-defense antibiotics release from organic-inorganic hybrid multilayer films for long-term anti-adhesion and biofilm inhibition properties

Qingwen Xu, Xi Li, Yingying Jin, Lin Sun, Xiaoxu Ding, Lin Liang, Lei Wang, Kaihui Nan,\* Jian Ji, Hao Chen\* and Bailiang Wang\*