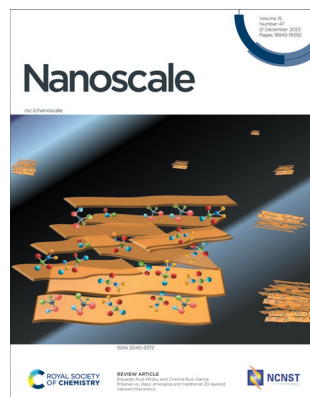


## IN THIS ISSUE

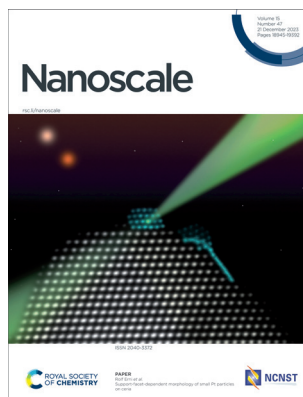
ISSN 2040-3372 CODEN NANOHL 15(47) 18945–19392 (2023)



### Cover

See Eduardo Ruiz-Hitzky and Cristina Ruiz-Garcia, pp. 18959–18979.

Image reproduced by permission of Eduardo Ruiz-Hitzky and Cristina Ruiz-Garcia from *Nanoscale*, 2023, **15**, 18959.



### Inside cover

See Rolf Erni *et al.*, pp. 19091–19098.

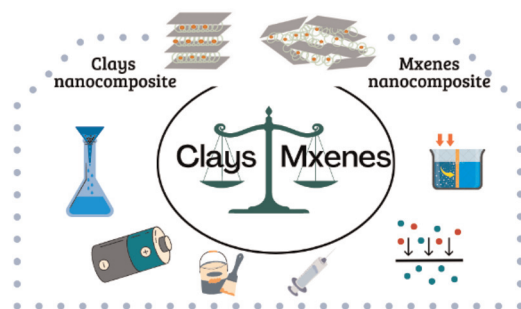
Image reproduced by permission of Henrik Eliasson from *Nanoscale*, 2023, **15**, 19091.

## REVIEWS

18959

### MXenes vs. clays: emerging and traditional 2D layered nanoarchitectonics

Eduardo Ruiz-Hitzky\* and Cristina Ruiz-Garcia

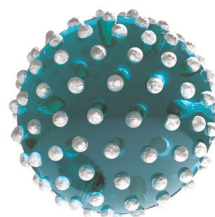


18980

### Liquid marbles: review of recent progress in physical properties, formation techniques, and lab-in-a-marble applications in microreactors and biosensors

Mizuki Tenjimbayashi,\* Timothée Mouterde,\* Pritam Kumar Roy and Koichiro Uto

#### Liquid Marble: Comprehensive Review of Recent Progress



- ✓ Physical Properties
  - Droplet vs Liquid marble
  - Mechanical stability
  - Adhesion and friction
  - Shape evolution
  - Evaporation-induced effects
- ✓ Formation techniques
  - Formation processes
  - Conceptual variations
  - Liquid marble-templated material design
- ✓ Lab-in-a-Marble Applications
  - Microreactors
  - Biosensors



**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 Karmik, 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 Center 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 Dufrene, 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

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, McMaster University / Seoul National University, Canada / 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

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

Xiaoqun 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

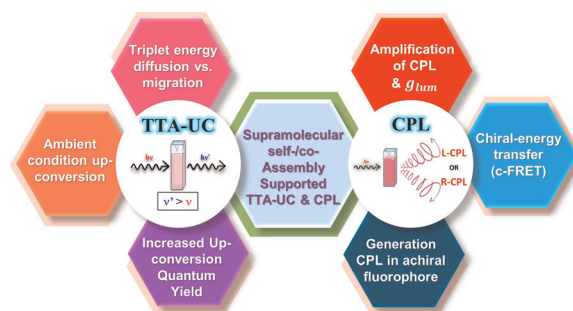


## REVIEWS

18999

### A supramolecular assembly-based strategy towards the generation and amplification of photon up-conversion and circularly polarized luminescence

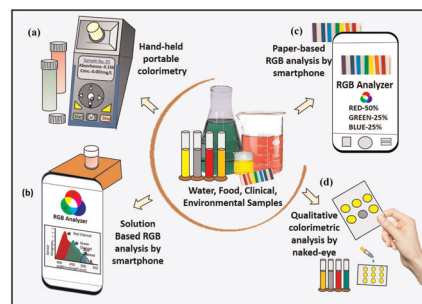
Alisha Sengupta, Gargee Roy, Aakash Ravikant Likhar and Deepak Asthana\*



19016

### Progress in the design of portable colorimetric chemical sensing devices

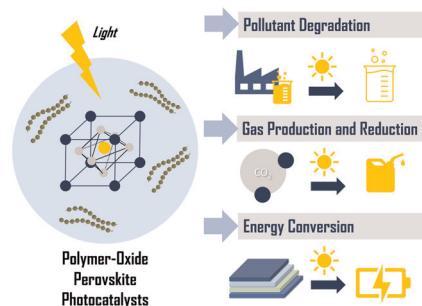
Tushar Kant,\* Kamlesh Shrivastava,\* Ankita Tejwani, Khushali Tandey, Anuradha Sharma and Shashi Gupta



19039

### Polymer-enhanced perovskite oxide-based photocatalysts: a review

Gregory Soon How Thien, Kah-Yoong Chan,\* Ab Rahman Marlinda and Boon Kar Yap

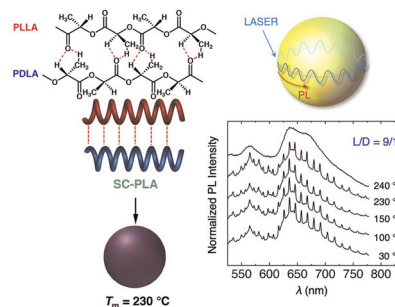


## COMMUNICATIONS

19062

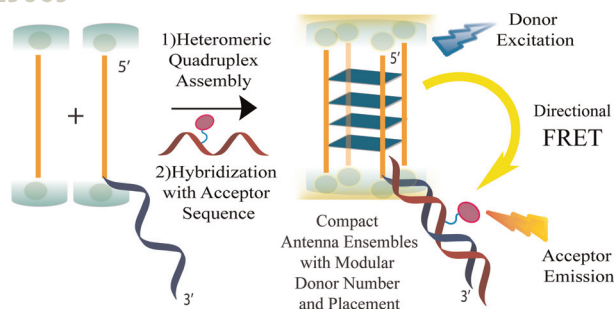
### Poly(lactic acid) stereocomplex microspheres as thermally tolerant optical resonators

Suhaman, Wey Yih Heah, Hiroshi Yamagishi and Yohei Yamamoto\*



## COMMUNICATIONS

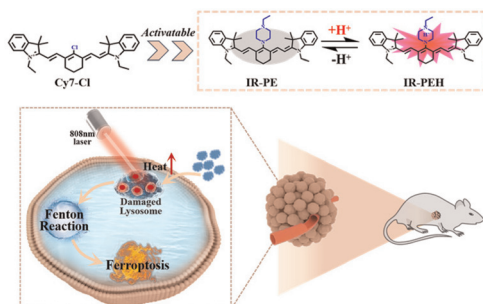
19069



### Heteromeric guanosine (G)-quadruplex derived antenna modules with directional energy transfer

Mohammad Amin Zarandi, Pravin Pathak, Noah Beltrami, Jada N. Walker, Fengqi Zhang, Jennifer S. Brodbelt, Russell Schmehl and Janarthanan Jayawickramarajah\*

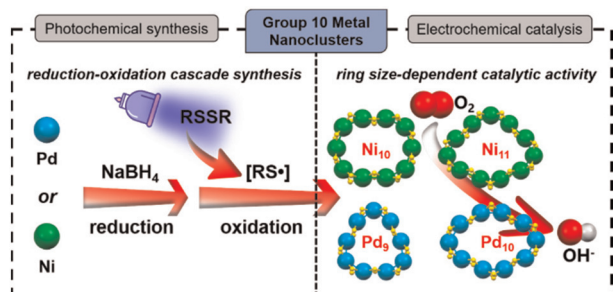
19074



### Inducing tumor ferroptosis via a pH-responsive NIR-II photothermal agent initiating lysosomal dysfunction

Zhiwei Zhang, Jingjing Xiang, Lijiao Guan, Pu Chen, Changzhong Li, Chunlei Guo, Yan Hu,\* Saipeng Huang,\* Lintao Cai\* and Ping Gong\*

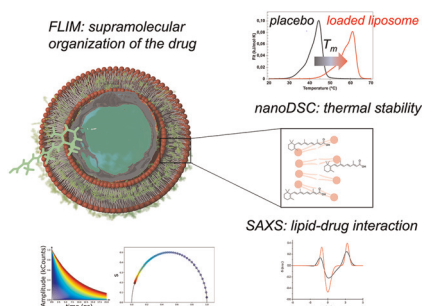
19079



### Photochemical synthesis of group 10 metal nanoclusters for electrocatalysis

Ji-Qiang Fan, Kehui Cen, Hua-Jun Xu, Hai-Yang Wang, Ying Yang, Ze-Min Zhu, Hao Liu, Dengyu Chen, Weigang Fan\* and Man-Bo Li\*

19085



### Phasor-FLIM-guided unraveling of ATRA supramolecular organization in liposomal nanoformulations

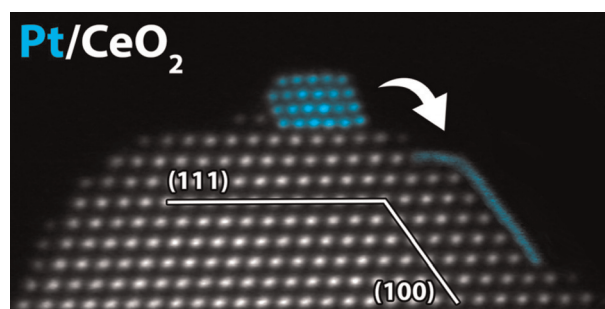
Mario Bernardi, Michael Vernizzi, Laura Baraldi, Sandor Balog, Irene Bassanetti, Elisa Sgarbi, Luca Fornasari, Chiara Arrigoni and Francesco Cardarelli\*



19091

### Support-facet-dependent morphology of small Pt particles on ceria

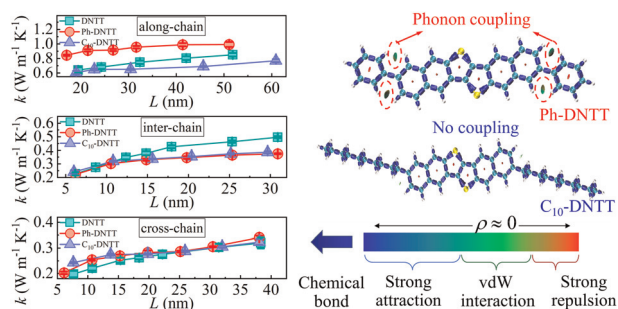
Henrik Eliasson, Yubiao Niu, Richard E. Palmer, Henrik Grönbeck and Rolf Erni\*



19099

### Insight into the effect of side chains on thermal transport of organic semiconductors

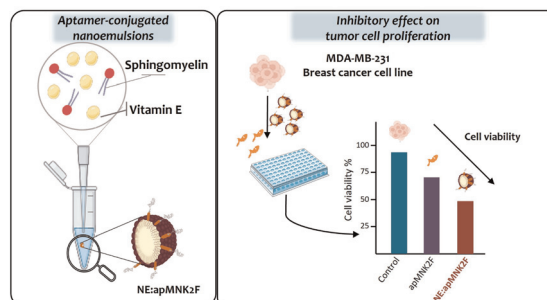
Chao Yang, Weitao Wang, Boyu Peng, Wanxiang Ji and Xinyu Wang\*



19110

### Chemical conjugation of aptamer–sphingomyelin nanosystems and their potential as inhibitors of tumour cell proliferation in breast cancer cells

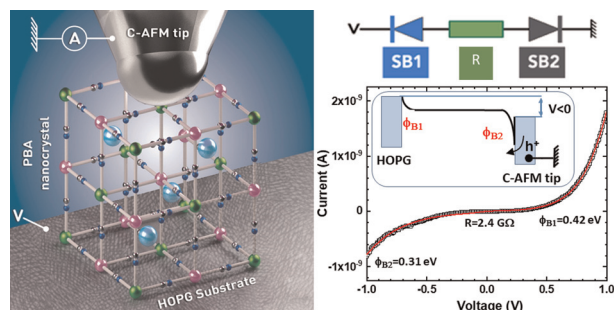
Jenifer García-Fernández, Laura Rivadulla Costa, Celia Pinto-Díez, M. Elena Martín, Víctor M. González and María de la Fuente Freire\*



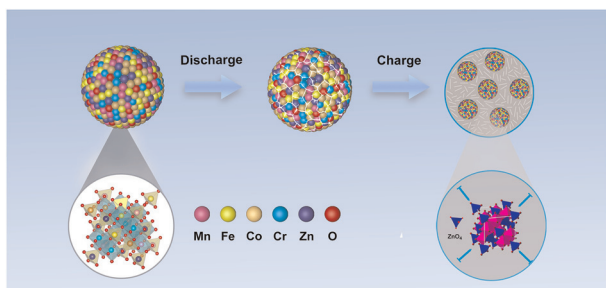
19128

### Electronic properties of single Prussian Blue Analog nanocrystals determined by conductive-AFM

Hugo Therssen, Laure Catala, Sandra Mazérat, Talal Mallah, Dominique Vuillaume, Thierry Mélin and Stéphane Lenfant\*



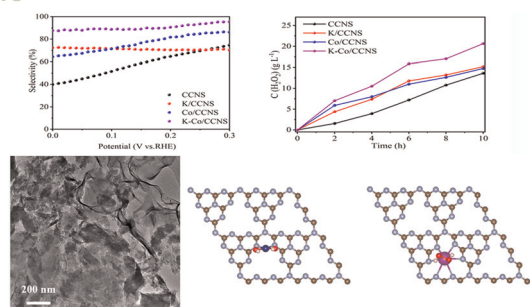
19139



### The elemental pegging effect in locally ordered nanocrystallites of high-entropy oxide enables superior lithium storage

Huitao Leng, Panpan Zhang, Jiansheng Wu, Taiding Xu, Hong Deng, Pan Yang, Shouyue Wang, Jingxia Qiu,\* Zhenzhen Wu\* and Sheng Li\*

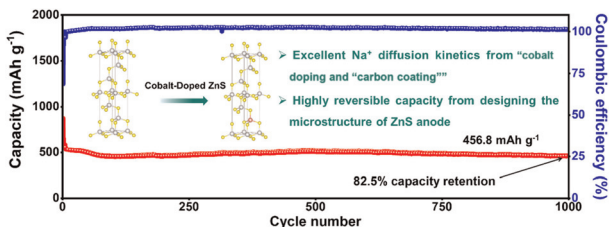
19148



### Electrochemical production of hydrogen peroxide by non-noble metal-doped g-C<sub>3</sub>N<sub>4</sub> under a neutral electrolyte

Ying Wang, Hongcen Yang, Niandi Lu, Di Wang, Kun Zhu, Zhixia Wang, Lianshan Mou, Yan Zhang, Yawei Zhao, Kun Tao, Fei Ma\* and Shanglong Peng\*

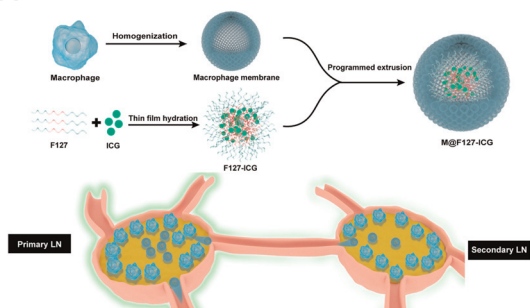
19159



### A cobalt-doped hollow ZnS polyhedra@porous carbon shell composite anode for high-rate sodium-ion batteries

Miaoxin Di, Zhenqi Song, Suhua Chen\* and Ying Bai\*

19168



### Biomimetic nanoplatfom with selectively positioned indocyanine green for accurate sentinel lymph node imaging

Wenjing Cheng, Xiangbai Wu, Shi Yu, Chengwei Zhang, Yinhong Song, Xinzhi Li and Xiang Yu\*

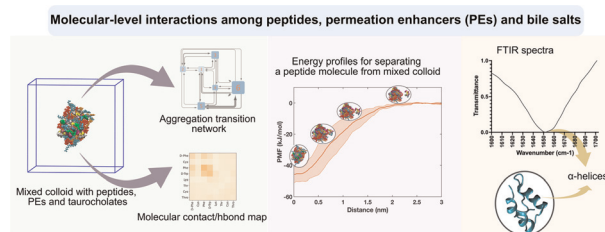


## PAPERS

19180

## Revealing the interaction between peptide drugs and permeation enhancers in the presence of intestinal bile salts

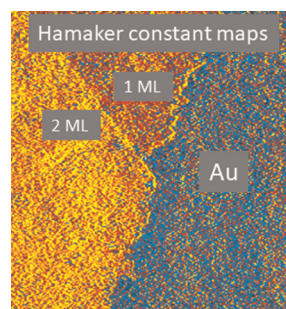
Shakhawath Hossain, Rosita Kneiszl and Per Larsson\*



19196

## Fast and high-resolution mapping of van der Waals forces of 2D materials interfaces with bimodal AFM

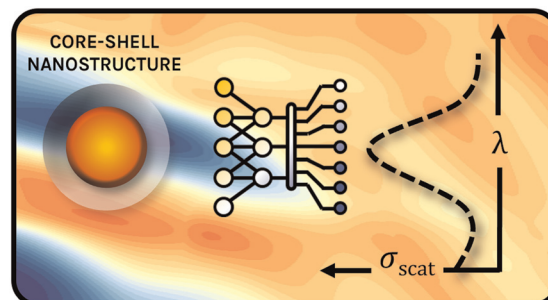
Victor G. Gisbert and Ricardo Garcia\*



19203

## Machine learning of all-dielectric core-shell nanostructures: the critical role of the objective function in inverse design

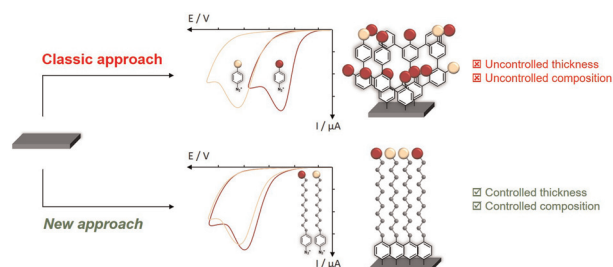
David J. Hoxie,\* Purushotham V. Bangalore and Kannatassen Appavoo



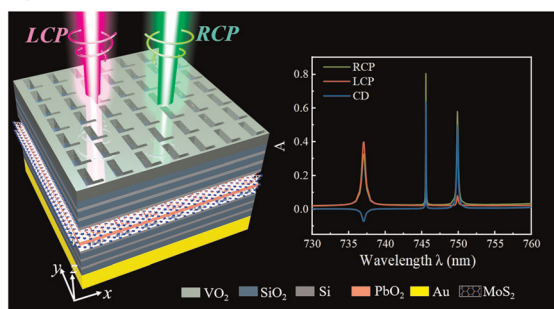
19213

## An innovative method for controlled synthesis of bicomponent monolayer films obtained by reduction of diazonium

Julien Billon, Anna Omelchuk, Viacheslav Shkirskiy, Sylvie Dabos-Seignon, Olivier Alévêque, Eric Levillain, Tony Breton and Christelle Gautier\*



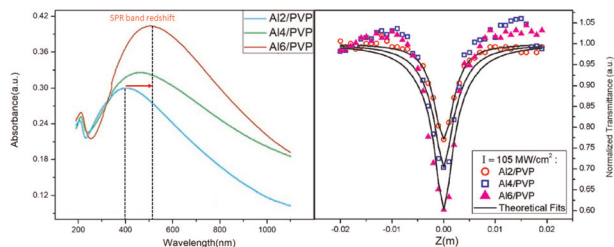
19219



### Enhancement and sensing applications of ultra-narrow band circular dichroism of the chiral nanopore films based on Bragg reflector

Yongkai Wang,\* Jialin Sun, Zhiduo Li, Qingyan Han, Wei Gao, Lipeng Zhu, Jun Dong and Zhongyue Zhang\*

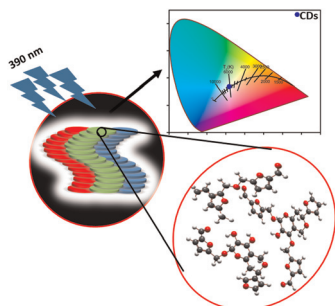
19229



### Controlled plasmon-induced nonlinear absorption and optical limiting in Al/PVP composite nanofibers

Bekir Asilcan Ünlü, Serife Akkoyun,\* Ahmet Karatay,\* Aytunc Ates and Ayhan Elmali

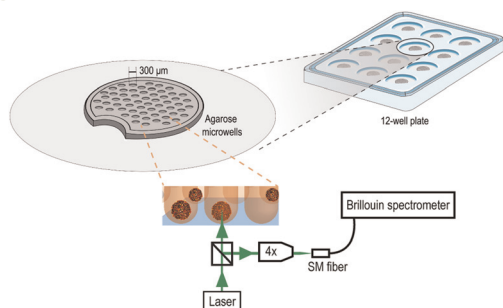
19238



### White light emission from helically stacked humin-mimic based H-aggregates in heteroatom free carbon dots

Md. Abdus Salam Shaik, Dipanjan Samanta, Ankit Kumar Sharma, Manisha Shaw, Sayan Prodhan, Rajarshi Basu, Imran Mondal, Shailab Singh, Prasanta Kumar Dutta and Amita Pathak\*

19255



### Predicting nanocarriers' efficacy in 3D models with Brillouin microscopy

Giulia Guerriero, Alexis Viel, Veronica Feltri, Alice Balboni, Guqi Yan, Sylvain Monnier, Giovanna Lollo\* and Thomas Dehoux\*



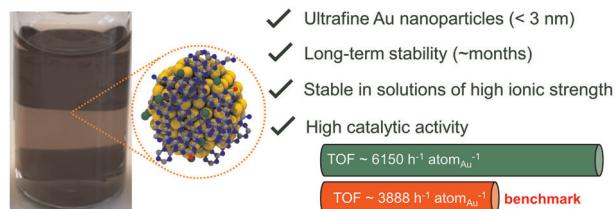


## PAPERS

19268

### Water-soluble ionic carbon nitride as unconventional stabilizer for highly catalytically active ultrafine gold nanoparticles

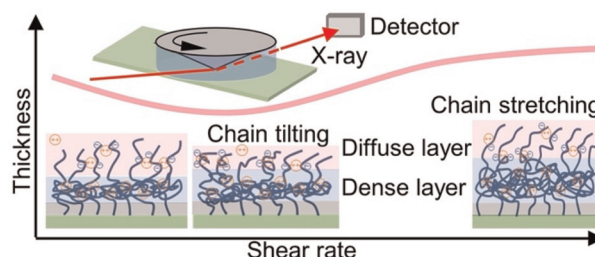
Mohamed M. Elnagar, Johannes Liessem, Changbin Im, Dariusz Mitoraj, Ludwig A. Kibler, Christof Neumann, Andrey Turchanin, Robert Leiter, Ute Kaiser, Timo Jacob,\* Igor Krittsov\* and Radim Beranek\*



19282

### Stretching of immersed polyelectrolyte brushes in shear flow

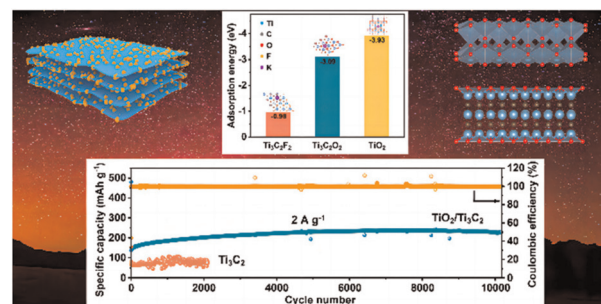
Yijun Qiao, Qiming He, Hsin-Hsiang Huang, Dean Mastropietro, Zhang Jiang, Hua Zhou, Yuhong Liu,\* Matthew V. Tirrell\* and Wei Chen\*



19292

### In situ construction of a hierarchical TiO<sub>2</sub>/Ti<sub>3</sub>C<sub>2</sub> hybrid via water steam etching for high-performance potassium-ion batteries

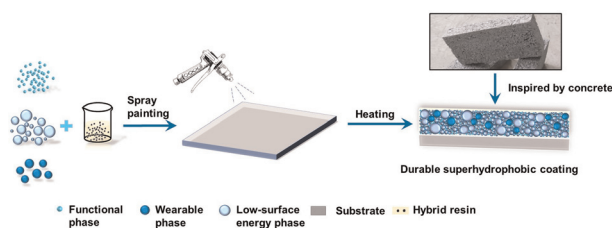
Tengfei Li, Lu Wang,\* Junwen Duan, Zifeng Liu, Dan Zhou, Chang Xue\* and Zhubing Xiao\*



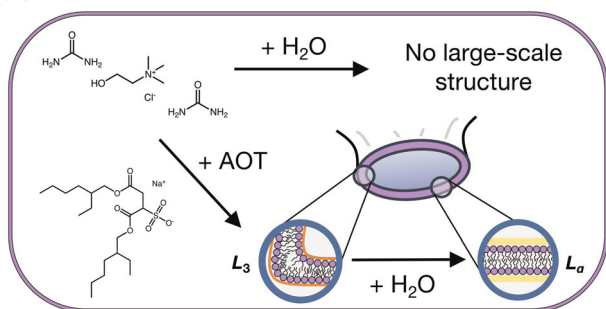
19304

### A highly robust, concrete-inspired superhydrophobic nanocomposite coating

Wu Binrui, Qin Qiong, Jiao Xuan, Xu Dong, Ke li, Sheng Liping,\* Cui Xin, Zhao Qizhi, Fu Feiyan\* and Yi Xian\*



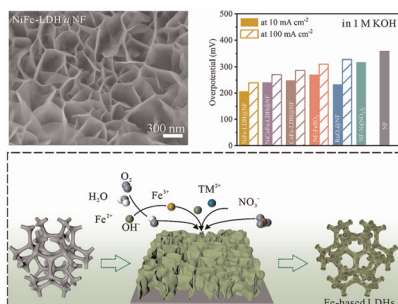
19314



### Evidence for an $L_3$ phase in ternary deep eutectics: composition-induced $L_3$ -to- $L_\alpha$ transition of AOT

Oliver S. Hammond,\* Naomi S. Elstone, James Douch, Peixun Li and Karen J. Edler

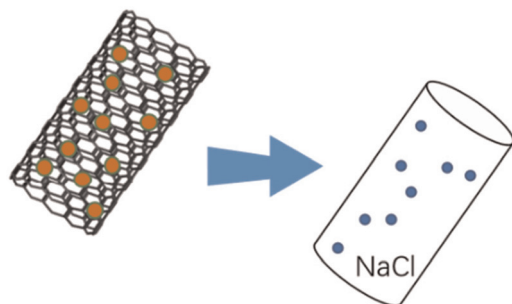
19322



### A moderate method for *in situ* growing Fe-based LDHs on Ni foam for catalyzing the oxygen evolution reaction

Yanqi Liu, Chenghao Zhang, Qingsong Cai, Jianmin Zhang\* and Zongmin Zheng\*

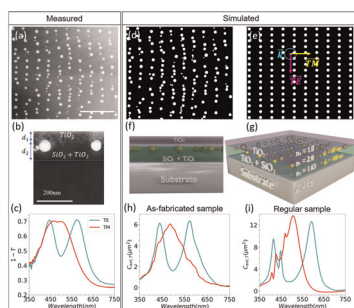
19330



### Switchable NaCl cages via a MWCNTs/Ni[Fe(CN)<sub>6</sub>]<sub>2</sub> nanocomposite for high performance desalination

Ze-Qin Yang, Wei-Bin Zhang,\* Kang Yang, Bi Chen, Yi Yin, Jia-Jun Li, Jing-Lei Yang, Yue Gao and Xue-Jing Ma\*

19339



### Hybridization between plasmonic and photonic modes in laser-induced self-organized quasi-random plasmonic metasurfaces

Van Doan Le, Yaya Lefkir and Nathalie Destouches\*

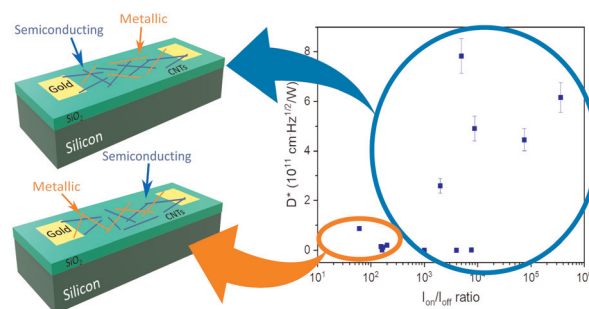


## PAPERS

19351

### Photogating interfacial effects in carbon nanotube-based transistors on a Si/SiO<sub>2</sub> substrate toward highly sensitive photodetection

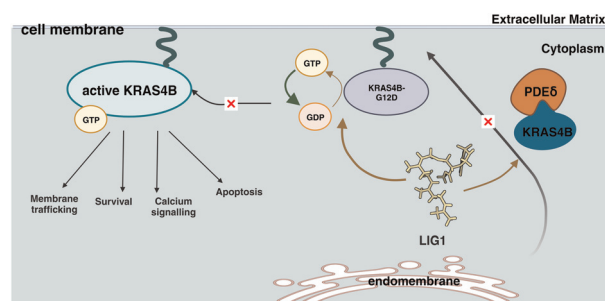
Svetlana I. Serebrennikova, Daria S. Kopylova, Yuriy G. Gladush, Dmitry V. Krasnikov, Sakellaris Mailis and Albert G. Nasibulin\*



19359

### In silico design of a lipid-like compound targeting KRAS4B-G12D through non-covalent bonds

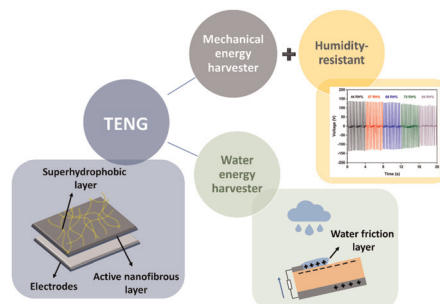
Huixia Lu,\* Zheyao Hu, Jordi Faraudo and Jordi Martí\*



19369

### Flexible, humidity- and contamination-resistant superhydrophobic MXene-based electrospun triboelectric nanogenerators for distributed energy harvesting applications

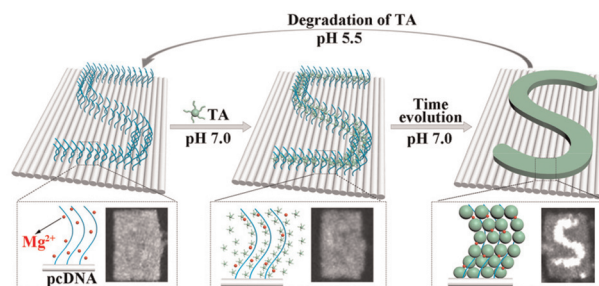
Sagar Sardana, Vaishali Sharma, Kevin Gurbani Beepat, Davinder Pal Sharma, Amit Kumar Chawla and Aman Mahajan\*



19381

### The controllable patterning of tannic acid on DNA origami

Yanyuan Luo, Liqiong Niu, Pengyan Hao, Xiaoya Sun, Yongxi Zhao and Na Wu\*



## CORRECTION

19389

**Correction: 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\*

