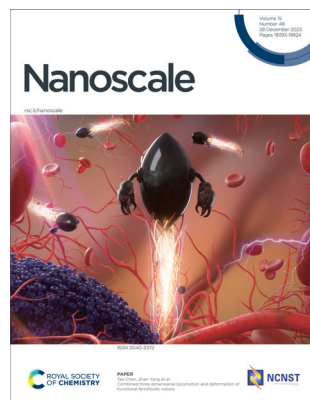


IN THIS ISSUE

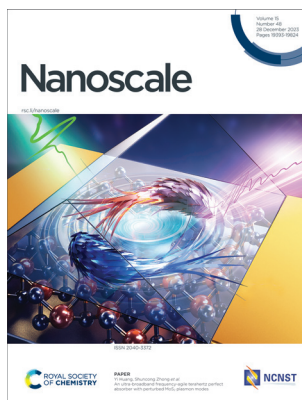
ISSN 2040-3372 CODEN NANOHL 15(48) 19393–19824 (2023)



Cover

See Tao Chen, Zhan Yang *et al.*, pp. 19499–19513.

Image reproduced by permission of Zhan Yang from *Nanoscale*, 2023, **15**, 19499.



Inside cover

See Yi Huang, Shuncong Zhong *et al.*, pp. 19514–19521.

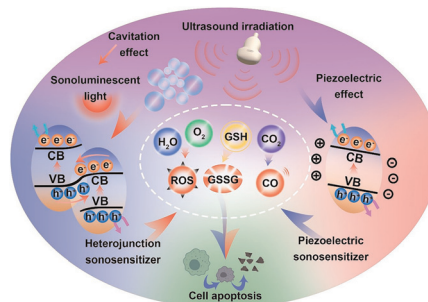
Image reproduced by permission of Yujie Zhong from *Nanoscale*, 2023, **15**, 19514.

REVIEWS

19407

Sonocatalytic cancer therapy: theories, advanced catalysts and system design

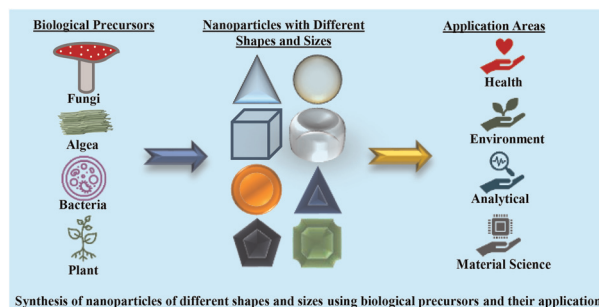
Ruiyan Li, Xuan Wang, Jiacheng Shi, Yong Kang* and Xiaoyuan Ji*



19423

Biogenic synthesis of novel nanomaterials and their applications

Dotse Selali Chormey, Buse Tuğba Zaman, Tülay Borahan Kustanto, Sezin Erarpat Bodur, Süleyman Bodur, Zeynep Tekin, Omid Nejati and Sezgin Bakırdere*



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

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 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

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 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 Cunierti, TU Dresden

(Technische Universität Dresden), Germany

Qing Dai, National Center for Nanoscience

and Technology of China, China

Yves Dufrène, 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, 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

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

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

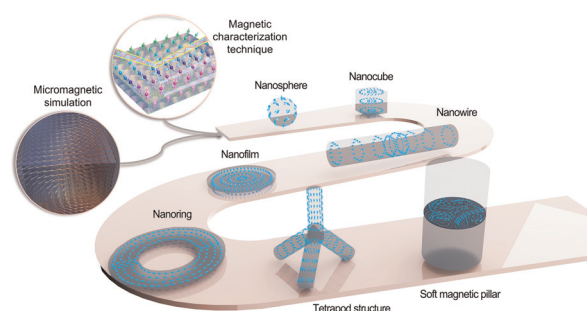


MINIREVIEW

19448

Magnetic characterization techniques and micromagnetic simulations of magnetic nanostructures: from zero to three dimensions

Xin Li, Zhaolian Wang, Zhongyun Lei, Wei Ding, Xiao Shi, Jujian Yan and Jiangang Ku*

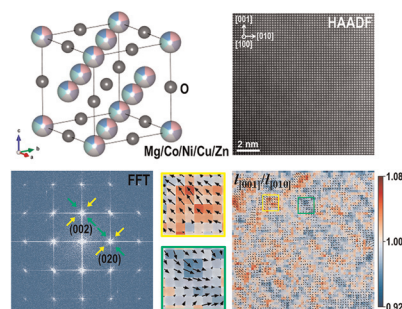


COMMUNICATIONS

19469

Sub-Ångstrom-scale structural variations in high-entropy oxides

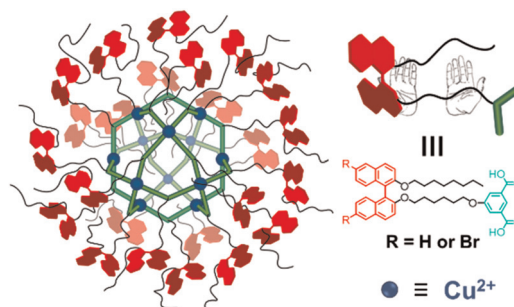
Hanbin Gao, Ning Guo, Yue Gong, Lu Bai, Dongwei Wang and Qiang Zheng*



19475

Chiral metal–organic cages decorated with binaphthalene moieties

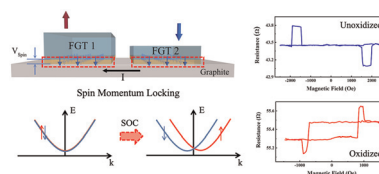
Cheng Huang, Jiajia Li, Xinyuan Zhu and Youfu Wang*



19480

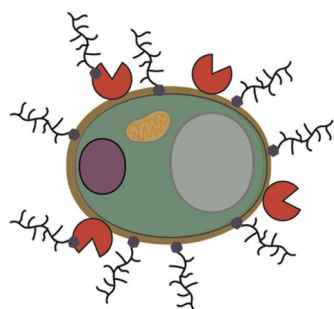
Tunable asymmetric magnetoresistance in an Fe₃GeTe₂/graphite/Fe₃GeTe₂ lateral spin valve

Xiangyu Zeng, Ge Ye, Fazhi Yang, Qikai Ye, Liang Zhang, Boyang Ma, Yulu Liu, Mengwei Xie, Yan Liu,* Xiaozhi Wang,* Yue Hao and Genquan Han



COMMUNICATIONS

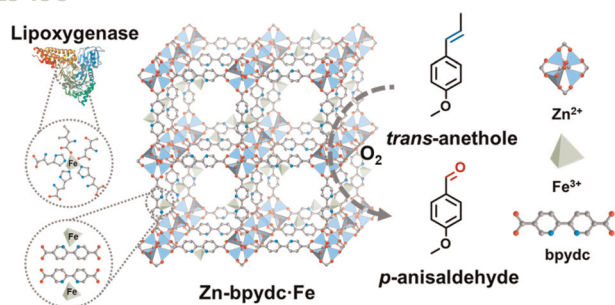
19486



Self-decorating cells via surface-initiated enzymatic controlled radical polymerization

Andrea Belluati,* Dominic Happel, Malte Erbe, Nicole Kirchner, Anna Szelwicka, Adrian Bloch, Valeria Berner, Andreas Christmann, Brigitte Hertel, Raheleh Pardehkhorrarn, Amin Reyhani, Harald Kolmar and Nico Bruns*

19493

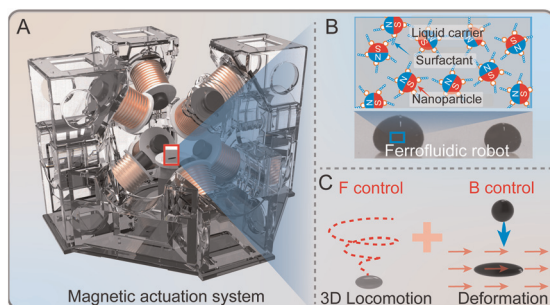


Iron-incorporated metal–organic frameworks for oxidative cleavage of *trans*-anethole to *p*-anisaldehyde

Jun Xiong, Xin Yuan, Min-Hua Zong, Xiaoling Wu* and Wen-Yong Lou*

PAPERS

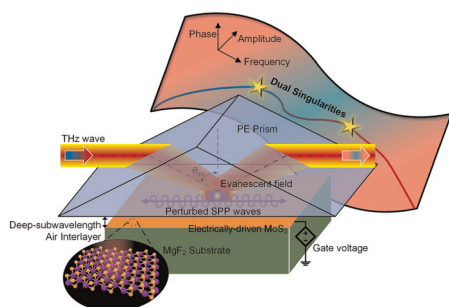
19499



Combined three dimensional locomotion and deformation of functional ferrofluidic robots

Xinjian Fan, Yunfei Zhang, Zhengnan Wu, Hui Xie, Lining Sun, Tao Chen* and Zhan Yang*

19514



An ultra-broadband frequency-agile terahertz perfect absorber with perturbed MoS₂ plasmon modes

Yujie Zhong, Yi Huang,* Shuncong Zhong,* Tingting Shi, Fuwei Sun, Tingling Lin, Qiuming Zeng, Ligang Yao and Xuefeng Chen

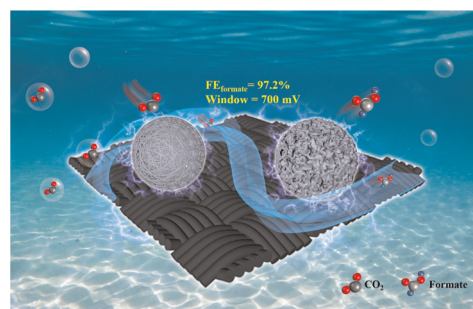


PAPERS

19522

Active-site stabilized Bi metal–organic framework-based catalyst for highly active and selective electroreduction of CO₂ to formate over a wide potential window

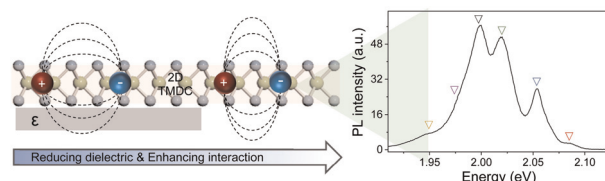
Leliang Cao, Jie Huang, Xueying Wu, Ben Ma, Qingqing Xu, Yuanhong Zhong,* Ying Wu,* Ming Sun and Lin Yu*



19533

Enhanced interactions of excitonic complexes in free-standing WS₂

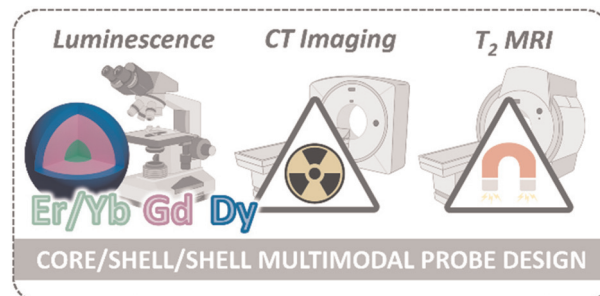
Xueqian Sun, Zhuoyuan Lu and Yuerui Lu*



19546

Core–multi-shell design: unlocking multimodal capabilities in lanthanide-based nanoparticles as upconverting, T₂-weighted MRI and CT probes

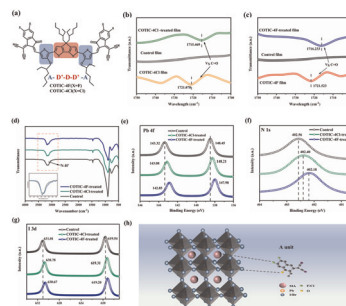
Nan Liu, Christian Homann, Samuel Morfin, Meghana S. Kesanakurti, Nicholas D. Calvert, Adam J. Shuhendler, Tom Al and Eva Hemmer*



19557

Stable and efficient perovskite solar cells via hydrogen bonding and coordination

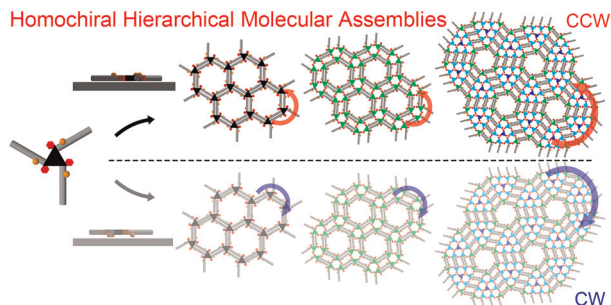
Tianrui Li, Tao Zhu,* Xiyao Zhang, Haorui Tang, Kai Zhang, Xing Zhu, Shaoyuan Li, Wenhui Ma and Jie Yu*



PAPERS

19569

Homochiral Hierarchical Molecular Assemblies



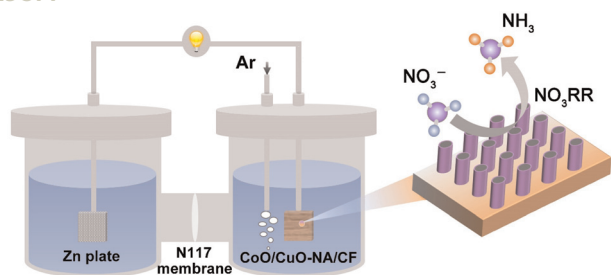
Homochiral hierarchical molecular assemblies through dynamic combination of conformational states of a single chiral building block at the liquid/solid interface

Matsuhiro Maeda, Kazuya Sato, Steven De Feyter and Kazukuni Tahara*

19577

Electrocatalytic nitrate-to-ammonia conversion on CoO/CuO nanoarrays using Zn–nitrate batteries

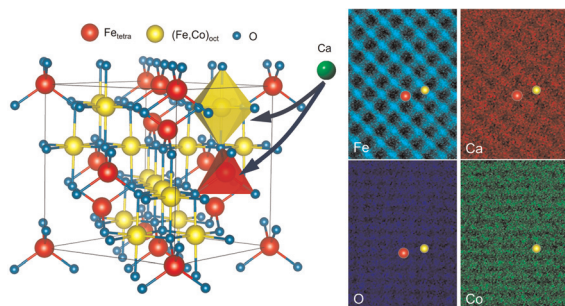
Shanshan Chen, Gaocan Qi,* Ruilian Yin, Qian Liu, Ligang Feng, Xincan Feng, Guangzhi Hu, Jun Luo, Xijun Liu* and Wenxian Liu*



19586

Atomic-scale observation of calcium occupation in spinel cobalt ferrite towards the regulation of intrinsic magnetic properties

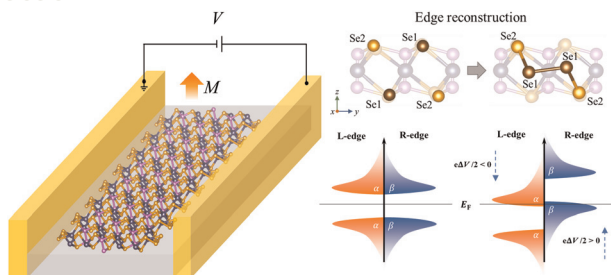
Guohua Bai, Weijia Zhong, Zhenhua Zhang,* Sateesh Bandaru, Xiuyuan Fan, Xiaolian Liu and Xuefeng Zhang*



19598

Electrically induced net magnetization in FePSe₃ nanoribbons: the role of edge reconstructions

Wenqi Zhang, Weifeng Xie, Bin Shao* and Xu Zuo*

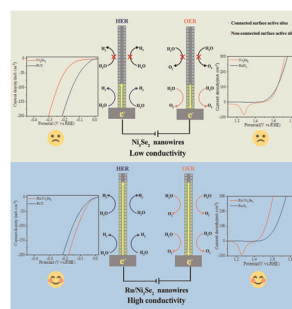


PAPERS

19604

Exceptional green hydrogen production performance of a ruthenium-modulated nickel selenide

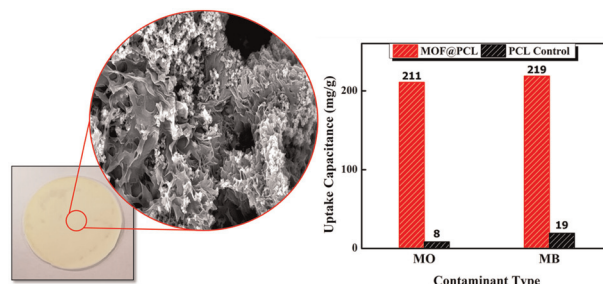
Rong Li, Lanli Chen, Huaming Zhang,*
Muhammad Humayun, Junhong Duan, Xuefei Xu,
Yanjun Fu, Mohamed Bououdina and Chundong Wang*



19617

Durable and recyclable MOF@polycaprolactone mixed-matrix membranes with hierarchical porosity for wastewater treatment

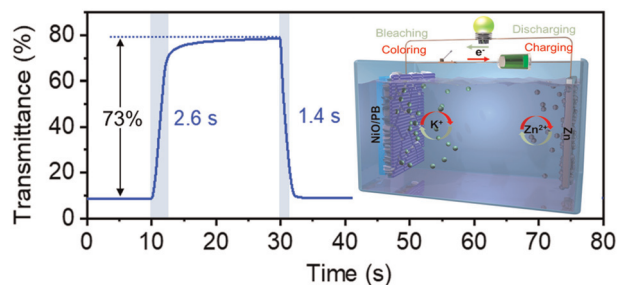
Amal Hani, Rana R. Haikal,* Worood A. El-Mehalmey,
Youssef Safwat and Mohamed H. Alkordi



19629

Transparent metal oxide interlayer enabling durable and fast-switching zinc anode-based electrochromic devices

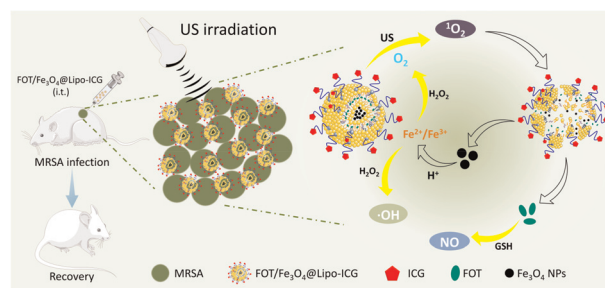
Bing Xu, Jingwei Chen,* Ping Li, Yujia Ouyang, Yu Ma,
Huanlei Wang* and Haizeng Li*



19638

An ultrasound-controllable ROS-responsive nanoplatform for O₂ and NO generation to enhance sonodynamic therapy against multidrug-resistant bacterial infections

Jingyi Zhang, Lin Zhang, Yuhang Zhang, Rong Ju and
Guoqing Wei*



PAPERS

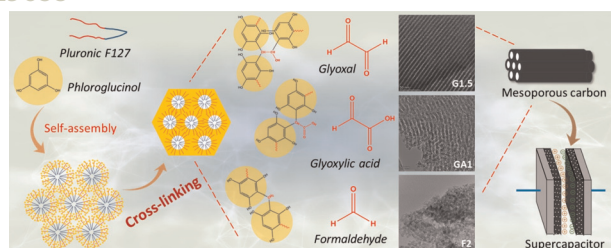
19650



Nano-infrared analysis of amyloid β_{1-42} fibrils formed in the presence of lipids with unsaturated fatty acids

Kirył Zhaliaska and Dmitry Kurouski*

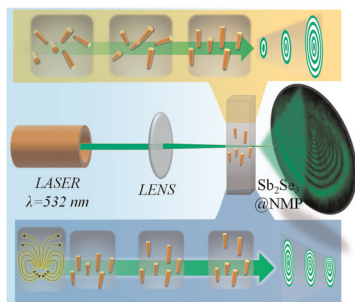
19658



Advancing mesoporous carbon synthesis for supercapacitors: a systematic investigation of cross-linking agent effects on pore structure and functionality

Yaoguang Song, Xiaolei Zhang,* Peter A. A. Klusener and Peter Nockemann*

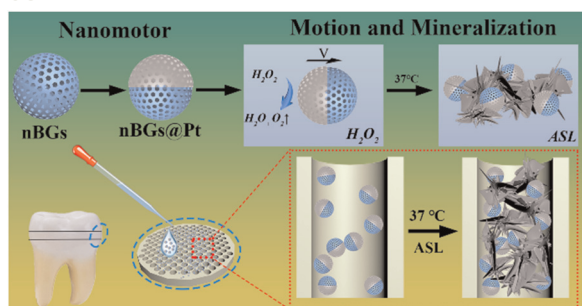
19671



Strong non-linear optical response of Sb₂Se₃ nanorods in a liquid suspension based on spatial self-phase modulation and their all-optical photonic device applications

Nabanita Sen, Nabamita Chakraborty, Biswajit Das and Kalyan Kumar Chattopadhyay*

19681



Self-propelled bioglass janus nanomotors for dentin hypersensitivity treatment

Wei Wu, Hang Chi, Qianyang Zhang, Ce Zheng, Narisu Hu,* Yingjie Wu* and Jiaxin Liu*

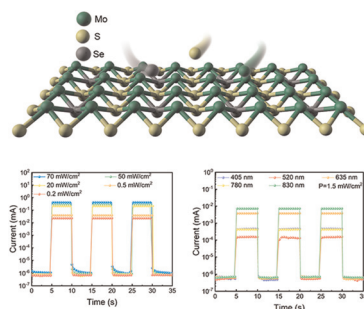


PAPERS

19691

An ultrafast and self-powered $\text{MoS}_x\text{Se}_{2-x}/\text{Si}$ photodetector with high light-trapping structures and a SiO_x interface layer

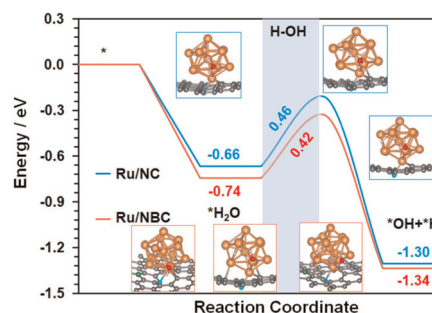
Zhen Yue, Honglie Shen,* Chen Wang, Yajun Xu, Jinjie Zheng, Yufang Li, Jingzhe Zhang, Jianian Chen, Hang Bai, Hechao Li, Jiuchuan Zeng and Long Wang



19703

Ru nanoclusters anchored on boron- and nitrogen-doped carbon for a highly efficient hydrogen evolution reaction in alkaline seawater

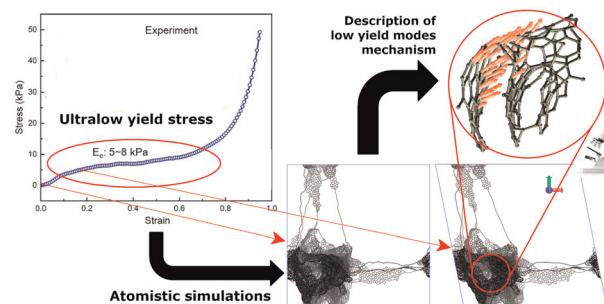
Binbin Jiang, Zhen Wang, Hui Zhao, Xie Wang, Xiaoxia Mao, Aijian Huang,* Xuehua Zhou, Kui Yin,* Kefa Sheng and Junwei Wang*



19709

Atomistic mechanisms underlying plastic flow at ultralow yield stress in ductile carbon aerogels

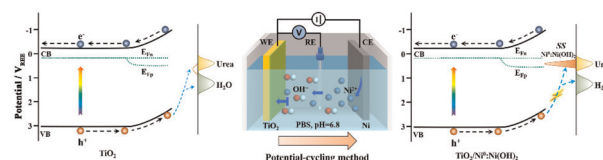
Giorgio Conter, Kailu Xiao, Xianqian Wu, William A. Goddard, III* and Alessandro Fortunelli*



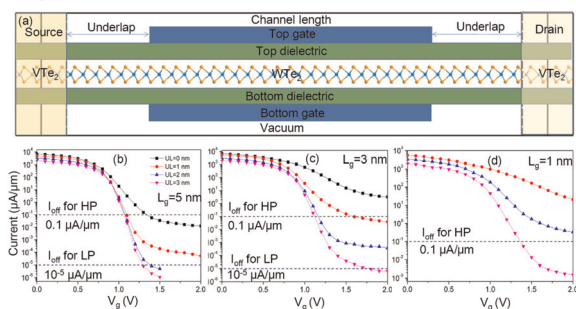
19717

Tailoring the density of states of $\text{Ni}(\text{OH})_2$ with Ni^0 towards solar urea wastewater splitting

Li Zou, Wenyan Tao, Jing Huang, Shuxiang Wang, Yijia Zhang, Keqiang Han, Yi Hu, Haoyan Gao, Pingping Yang and Jiale Xie*



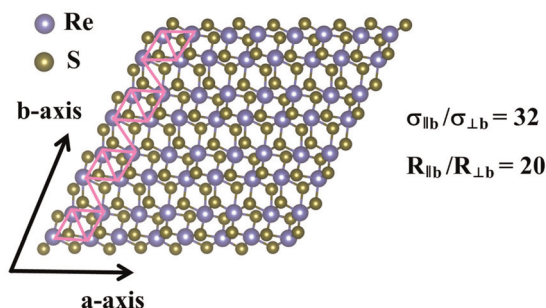
19726



The device performance limit of in-plane monolayer VTe₂/WTe₂ heterojunction-based field-effect transistors

Xingyi Tan, Qiang Li, Dahua Ren and Hua-Hua Fu*

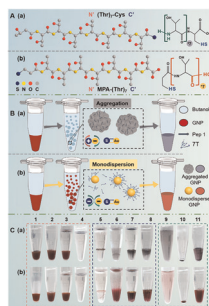
19735



Electrical and optoelectronic anisotropy and surface electron accumulation in ReS₂ nanostructures

Hemant Kumar Bangolla, Muhammad Yusuf Fakhri, Ching-Hsuan Lin, Cheng-Maw Cheng, Yi-Hung Lu, Tsu-Yi Fu, Pushpa Selvarasu, Rajesh Kumar Ulaganathan, Raman Sankar and Ruei-San Chen*

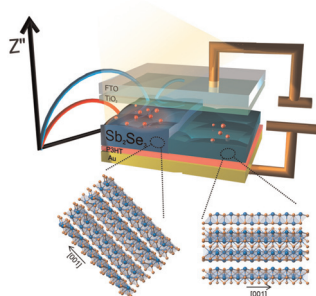
19746



Quantified instant conjugation of peptides on a nanogold surface for tunable ice recrystallization inhibition

Shixuan Yang, Zhongxiang Ding, Leiming Chu, Mengke Su and Honglin Liu*

19757



Impedance spectroscopy of Sb₂Se₃ photovoltaics consisting of (Sb₄Se₆)_n nanoribbons under light illumination

Jaemin Park, Thomas P. Shalvey, Thomas Moehl, Kyoohee Woo, Jonathan D. Major, S. David Tilley and Wooseok Yang*

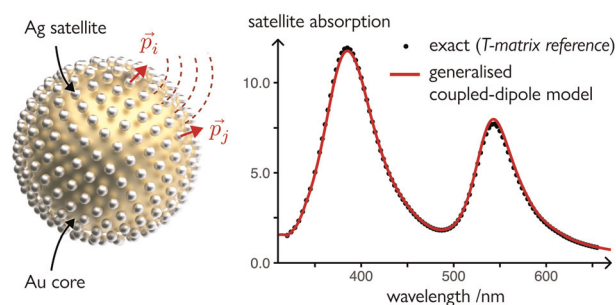


PAPERS

19767

Generalised coupled-dipole model for core-satellite nanostructures

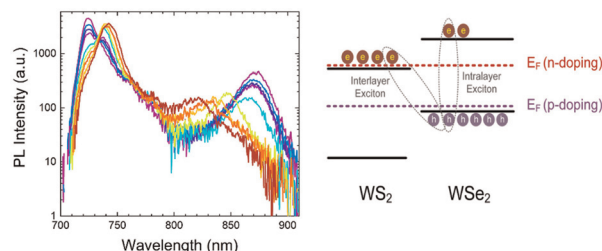
Stefania Glukhova, Eric C. Le Ru and Baptiste Auguie*



19777

Probing the interlayer excitation dynamics in WS₂/WSe₂ heterostructures with broadly tunable pump and probe energies

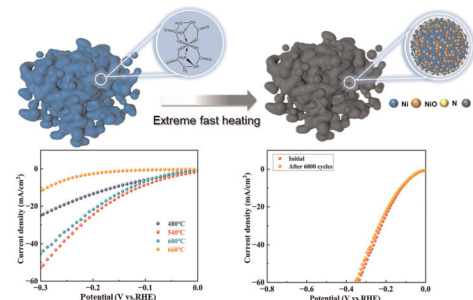
Anran Wang, Wendian Yao, Zidi Yang, Dingqi Zheng, Songlin Li, Yi Shi, Dehui Li and Fengqiu Wang*



19784

Ni/NiO@NC as a highly efficient and durable HER electrocatalyst derived from nickel(II) complexes: importance of polydentate amino-acid ligands

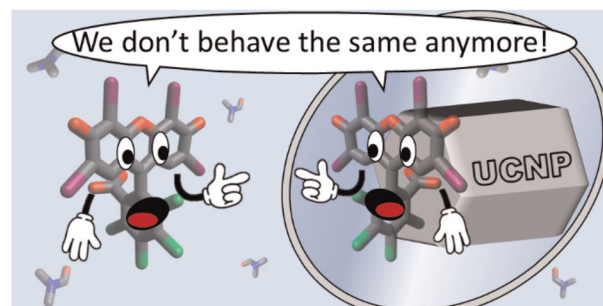
Xu Yang, Mengxue Liu, Fang Cui,* Qinghai Ma and Tieyu Cui*



19792

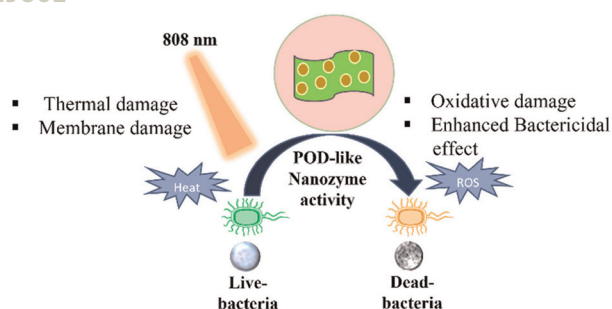
Synergistic or antagonistic effect of lanthanides on Rose Bengal photophysics in upconversion nanohybrids?

Juan Ferrera-González, María González-Béjar* and Julia Pérez-Prieto*



PAPERS

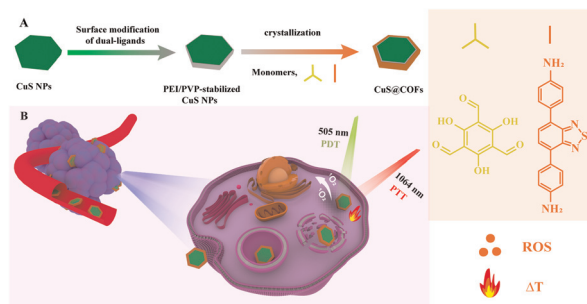
19801



2D-MoS₂-supported copper peroxide nanodots with enhanced nanozyme activity: application in antibacterial activity

Archana Kumari, Jagabandhu Sahoo and Mrinmoy De*

19815



Dual-wavelength responsive CuS@COF nanosheets for high-performance photothermal/photodynamic combination treatments

Qian An, Shengze Su, Wei Hu, Yanying Wang, Tao Liang,* Xianghong Li* and Chunya Li*

CORRECTIONS

19820

Correction: Pursuing colloidal diamonds

Łukasz Baran,* Dariusz Tarasewicz, Daniel M. Kamiński and Wojciech Rżysko

19821

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

Eduardo Ruiz-Hitzky* and Cristina Ruiz-Garcia

