

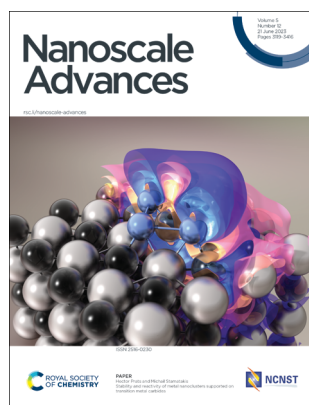
# Nanoscale Advances

An open access journal publishing across the breadth of nanoscience and nanotechnology  
[rsc.li/nanoscale-advances](https://rsc.li/nanoscale-advances)

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 2516-0230 CODEN NAADAI 5(12) 3119–3416 (2023)



### Cover

See Hector Prats and Michail Stamatakis, pp. 3214–3224.  
Image reproduced by permission of Michail Stamatakis from *Nanoscale Adv.*, 2023, 5, 3214.

## EDITORIAL

3129

### Introduction to Epitaxial growth of nanostructures and their properties

Jin Zou

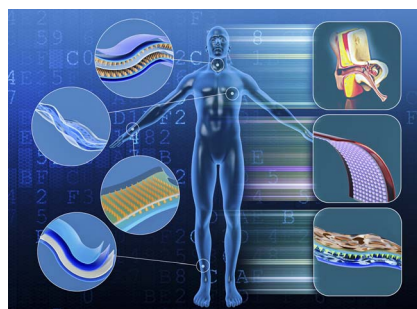


## REVIEWS

3131

### Recent progress in flexible micro-pressure sensors for wearable health monitoring

Jianguo Hu, Guanhua Dun, Xiangshun Geng, Jing Chen, Xiaoming Wu and Tian-Ling Ren\*



## Editorial Staff

### Executive Editor

Jeremy Allen

### Deputy Editor

Hannah Kerr

### Editorial Assistant

Rosie Hague

### Editorial Production Manager

Christopher Goodall

### Assistant Editors

Zita Zachariah and Serra Arslanlan Sengelen

### Publisher

Neil Hammond

For queries about submitted papers, please contact Christopher Goodall, Editorial Production Manager in the first instance. E-mail: [nanoscaleadvances@rsc.org](mailto:nanoscaleadvances@rsc.org)

For pre-submission queries please contact Jeremy Allen, Executive Editor. E-mail: [nanoscaleadvances-rsc@rsc.org](mailto:nanoscaleadvances-rsc@rsc.org)

Nanoscale Advances (electronic: ISSN 2516-0230) is published 24 times a year by the Royal Society of Chemistry, Thomas Graham House, Science Park, Milton Road, Cambridge, UK CB4 0WE.

Nanoscale Advances is a Gold Open Access journal and all articles are free to read. Please email [orders@rsc.org](mailto:orders@rsc.org) to register your interest or contact 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)

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 Advances

[rsc.li/nanoscale-advances](http://rsc.li/nanoscale-advances)

*Nanoscale Advances* 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

### Editors-in-chief

Chunli Bai, National Centre for Nanoscience and Nanotechnology, China

Dirk Guldi, Friedrich-Alexander-Universität Erlangen-Nürnberg, Germany

### Associate Editors

Cinzia Casiraghi, University of Manchester, UK

Gianurelio (Giovanni) Cuniberti, TU 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, Korea

Christian Klinker, 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

Jonathan Veinot, University of Alberta, Canada

Umesh Waghmare, JNCASR, India

Jinlan Wang, Southeast University, China

Manzhou Zhu, Anhui University, China

Jin Zou, University of Queensland, Australia

## Advisory Board

Suryasarathi Bose, Indian Institute of Science Bangalore, India

Stephanie Brock, Wayne State University, USA

Raffaella Buonsanti, EPFL, Switzerland

Chunying Chen, National Centre for Nanoscience and Technology of China, China

Jingyi Chen, University of Arkansas, USA

Xiaodong Chen, Nanyang Technological University, Singapore

Wenlong Cheng, Monash University, Australia

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 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

Katharina Landfester, Max Planck Institute for Polymer Research, Germany

Dattatray Late, CSIR - National Chemical Laboratory, India

Pooi See Lee, Nanyang Technological University, Singapore

Changming Li, Southwest University, China

Jie Liu, Duke University, USA

Laura Na Liu, Max Planck Institute for Intelligent Systems, Germany

Liberato Manna, Istituto Italiano di Tecnologia, Italy

Anna Fontcuberta i Morral, EPFL, Switzerland

Catherine Murphy, University of Illinois at Urbana-Champaign, USA

Kostya Ostrikov, Queensland University of Technology, Australia

So-Jung Park, Ewha Womens University, Korea

Lakshmi Polavarapu, University of Vigo, Spain

Thalappil Pradeep, Indian Institute of Technology Madras, India

Narayan Pradhan, Indian Association for the Cultivation of Science, India

Dong Qin, Georgia Tech University, USA

Michael Sailor, University of California, San Diego, USA

Hyeon Suk Shin, Ulsan National Institute of Science and Technology, South Korea

Zhigang Shuai, Tsinghua University, China

Sara Skrabalak, Indiana University, USA

Francesco Stellacci, EPFL, Switzerland

Hong-Bo Sun, Jilin 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 Nanotec, 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, Chinese Academy of Sciences, China

Jinhua Ye, National Institute for Materials Science, Japan

Xiao Cheng Zeng, University of Nebraska-Lincoln, USA

Gang Zhang, Institute of High Performance Computing, Singapore

Hua Zhang, City University of Hong Kong, China

Miqin Zhang, University of Washington, USA

## Information for Authors

Full details on how to submit material for publication in Nanoscale Advances 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-advances](http://rsc.li/nanoscale-advances)

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

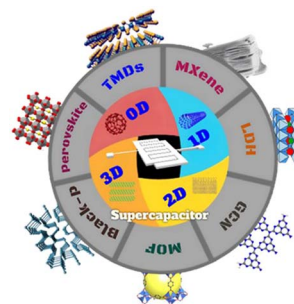


## REVIEWS

3146

### Recent advancements in zero- to three-dimensional carbon networks with a two-dimensional electrode material for high-performance supercapacitors

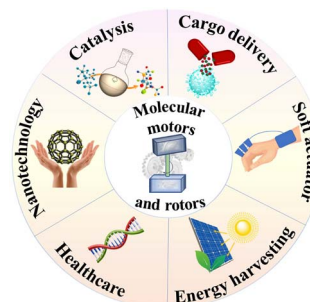
Niraj Kumar, Sudip Ghosh, Dinbandhu Thakur, Chuan-Pei Lee\* and Prasanta Kumar Sahoo\*



3177

### Accounts of applied molecular rotors and rotary motors: recent advances

Anup Singhania, Sudeshna Kalita, Prerna Chettri and Subrata Ghosh\*

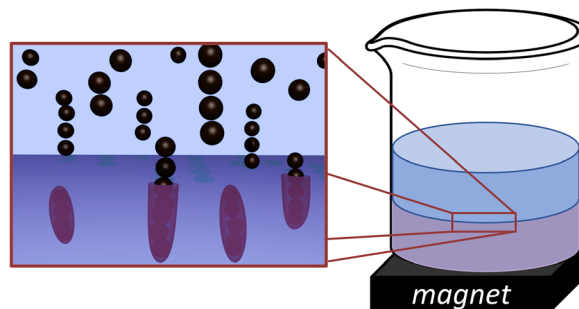


## COMMUNICATION

3209

### Magnetically driven preparation of 1-D nano-necklaces capable of MRI relaxation enhancement

Aaron M. King, Teresa Insinna, Connor J. R. Wells, Isabel A. Raby, Yurii K. Gun'ko and Gemma-Louise Davies\*



## PAPERS

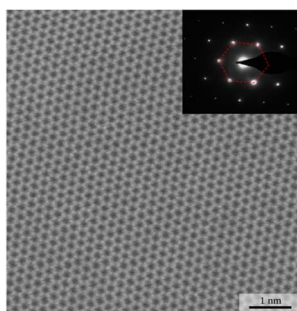
3214

### Stability and reactivity of metal nanoclusters supported on transition metal carbides

Hector Prats\* and Michail Stamatakis



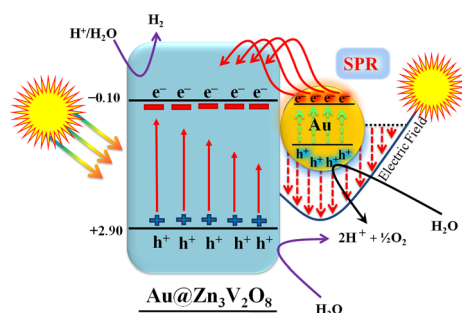
3225



### High p doped and robust band structure in Mg-doped hexagonal boron nitride

Lama Khalil, Cyrine Ernandes, José Avila, Adrien Rousseau, Pavel Dudin, Nikolai D. Zhigadlo, Guillaume Cassabois, Bernard Gil, Fabrice Oehler, Julien Chaste and Abdelkarim Ouerghi\*

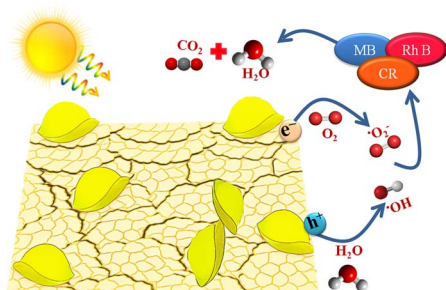
3233



### Facile transfer of surface plasmon electrons of Au-NPs to $Zn_3V_2O_8$ surfaces: a case study of sunlight driven $H_2$ generation from water splitting

Muhammad Jalil, Khezina Rafiq,\* Muhammad Zeeshan Abid, Abdul Rauf, Shuxin Wang, Shahid Iqbal and Ejaz Hussain\*

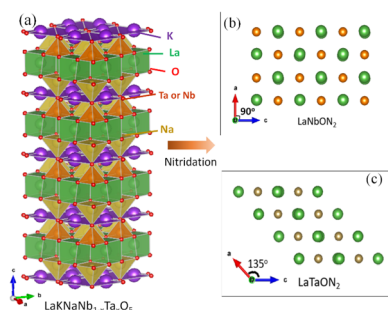
3247



### Synergism of Co/Na in $BiVO_4$ microstructures for visible-light driven degradation of toxic dyes in water

Muhammad Zeeshan Abid, Khezina Rafiq, Abdul Rauf, Syed Shoaib Ahmad Shah, Rongchao Jin\* and Ejaz Hussain\*

3260



### Defect engineering of two-dimensional Nb-based oxynitrides for visible-light-driven water splitting to produce $H_2$ and $O_2$

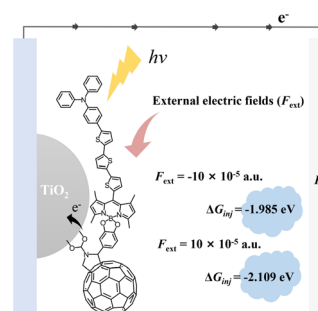
Chang Xu, Yan Wang,\* Quansheng Guo and Xin Wang\*



3267

### Control and regulation of the performance of fullerene-based dye-sensitized solar cells with a D–D–A structure by external electric fields

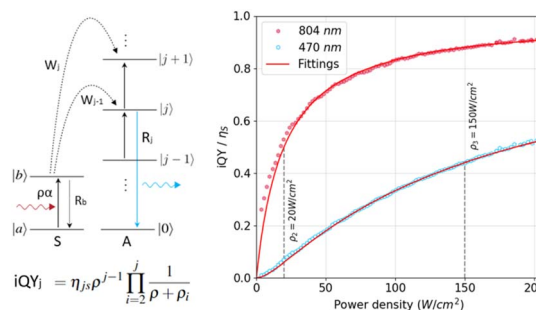
Xinyue Wang, Cong Shen, Jingping Li, Meixia Zhang\* and Peng Song\*



3279

### Generalised analytical model of the transition power densities of the upconversion luminescence and quantum yield

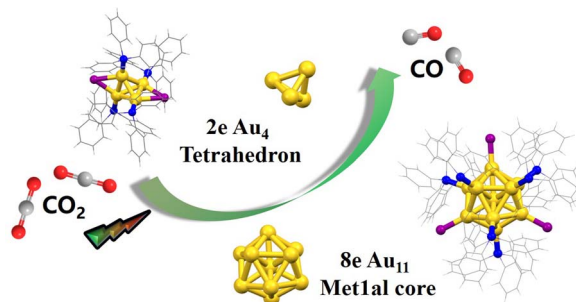
J. S. Matias,\* K. Komolibus, K. W. Kho, S. Konugolu-Venkata-Sekar and S. Andersson-Engels



3287

### The smallest superatom $\text{Au}_4(\text{PPh}_3)_4\text{I}_2$ with two free electrons: synthesis, structure analysis, and electrocatalytic conversion of $\text{CO}_2$ to $\text{CO}$

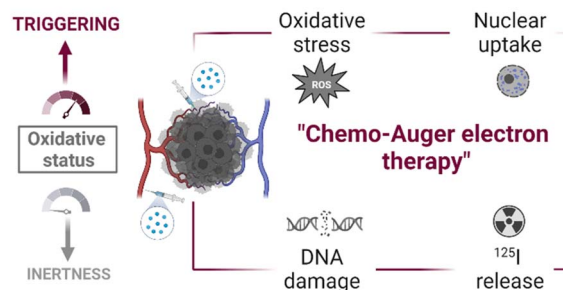
Cheng Zhang, Mei Ding, Yonggang Ren, Along Ma, Zhengmao Yin,\* Xiaoshuang Ma\* and Shuxin Wang\*



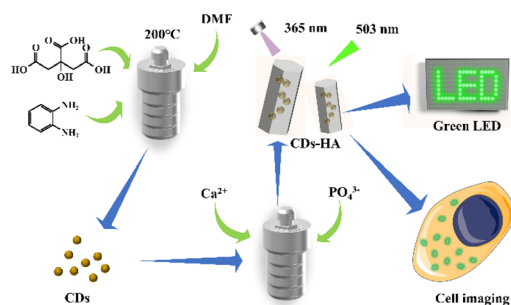
3293

### Platinum nanoparticles labelled with iodine-125 for combined "chemo-Auger electron" therapy of hepatocellular carcinoma

Kamil Wawrowicz,\* Kinga Żelechowska-Matysiak, Agnieszka Majkowska-Pilip, Mateusz Wierzbicki and Aleksander Bilewicz



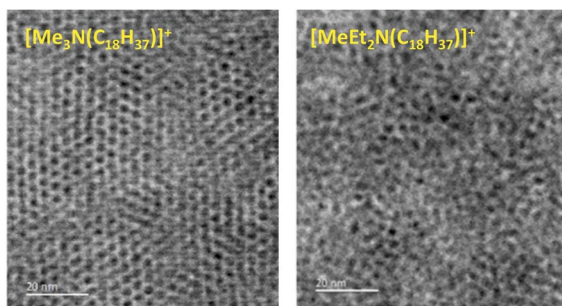
3304



### Single-particle dispersion of carbon dots in the nano-hydroxyapatite lattice achieving solid-state green fluorescence

Lunzhu Wang, Xinru Wang, Shuoshuo Zhou, Jian Ren, Liting Liu, Cairong Xiao and Chunlin Deng\*

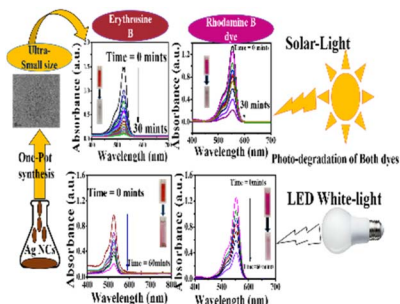
3316



### Effects of surfactant head group modification on vertically oriented mesoporous silica produced by the electrochemically assisted surfactant assembly method

Nabil A. N. Mohamed, Yisong Han, Sarah Harcourt-Vernon, Andrew L. Hector,\* Anthony R. Houghton, Gillian Reid, Daryl R. Williams and Wenjian Zhang

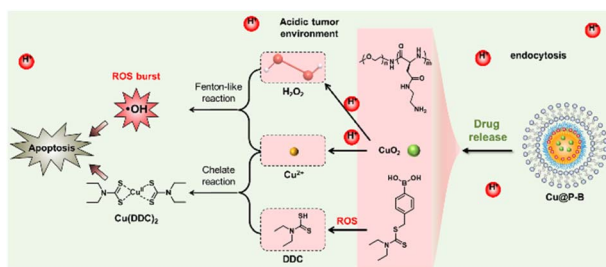
3326



### Facile synthesis of water-soluble silver nanoclusters for the photocatalytic degradation of dyes by multivariate optimization approach

Saif Ullah, Qinzen Li, Rooh Ullah, Sadat Anwar, Muhammad Fazal Hameed and Manzhou Zhu\*

3336



### Co-delivery of a tumor microenvironment-responsive disulfiram prodrug and CuO<sub>2</sub> nanoparticles for efficient cancer treatment

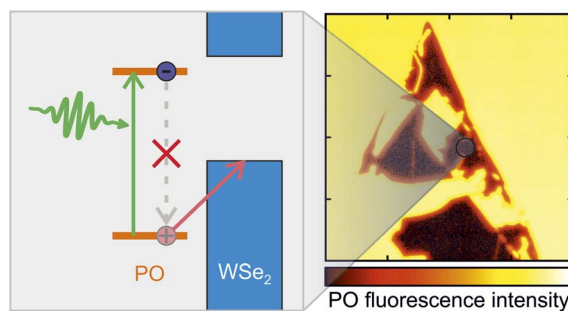
Fen-Ting Cheng, Ya-Di Geng, Yun-Xiao Liu, Xuan Nie, Xin-Ge Zhang, Zhao-Lin Chen, Li-Qin Tang,\* Long-Hai Wang,\* Ye-Zi You and Lei Zhang\*



3348

### Strong quenching of dye fluorescence in monomeric perylene orange/TMDC hybrid structures

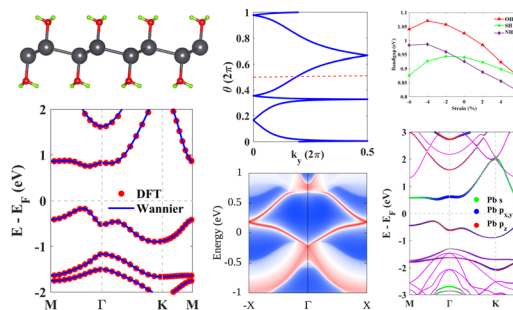
Tim Völzer, Alina Schubert, Erik von der Oelsnitz, Julian Schröer, Ingo Barke, Rico Schwartz, Kenji Watanabe, Takashi Taniguchi, Sylvia Speller, Tobias Korn and Stefan Lochbrunner\*



3357

### Large band gap quantum spin Hall insulators in plumbene monolayer decorated with amidogen, hydroxyl and thiol functional groups

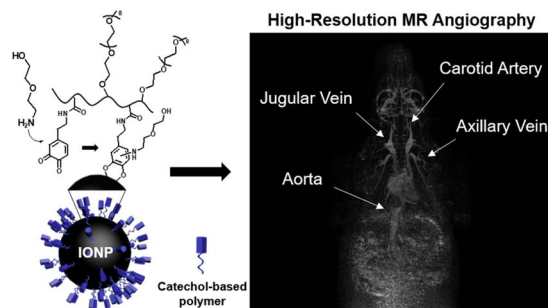
Sumaiya Jahan Tabassum, Tanshia Tahreen Tanisha, Nishat Tasnim Hiramony and Samia Subrina\*



3368

### Amine-assisted catechol-based nanocoating on ultrasmall iron oxide nanoparticles for high-resolution $T_1$ angiography

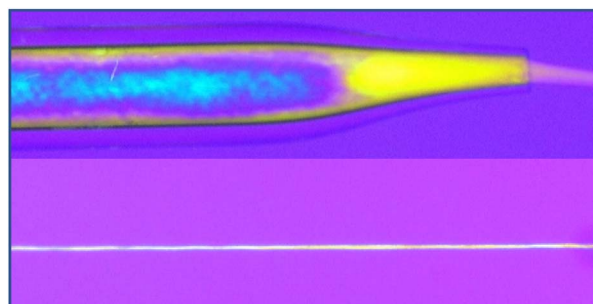
Hyunhong Kim, Sunyoung Woo, Hoesu Jung, Hyo-Suk Ahn, Ning Chen, HyungJoon Cho\* and Jongnam Park\*



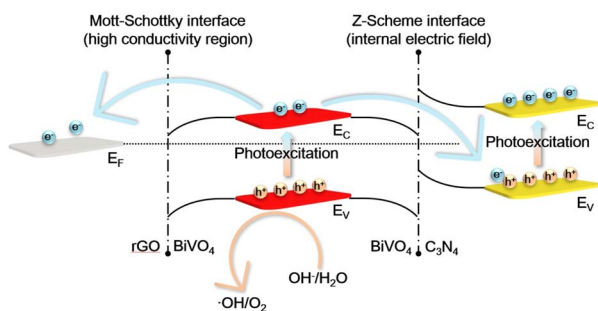
3376

### Wet spinning imogolite nanotube fibres: an *in situ* process study

Joseph F. Moore, Erwan Paineau, Pascale Launois\* and Milo S. P. Shaffer\*



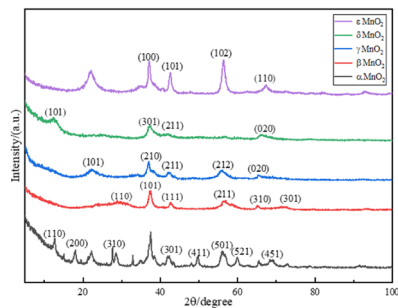
3386



### Nanoarchitectonics on Z-scheme and Mott–Schottky heterostructure for photocatalytic water oxidation *via* dual-cascade charge-transfer pathways

Yao Li, Siyuan Liu, Runlu Liu, Jian Pan, Xin Li, Jianyu Zhang, Xiaoxiao Zhang, Yixin Zhao, Dawei Wang, Hengdao Quan and Shenmin Zhu\*

3396



### Physicochemical properties of different crystal forms of manganese dioxide prepared by a liquid phase method and their quantitative evaluation in capacitor and battery materials

Yang Pan, Wang Jiawei, Wang Haifeng,\* Wang Song, Yang Chunyuan and He Yue

