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# Nano Research

A prospective future towards bio/medical technology and bioelectronics based on 2D vdWs heterostructures

Graphitic carbon nitride with different dimensionalities for energy and environmental applications

Cell vibron polariton resonantly self-confined in the myelin sheath of nerve



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# Contents

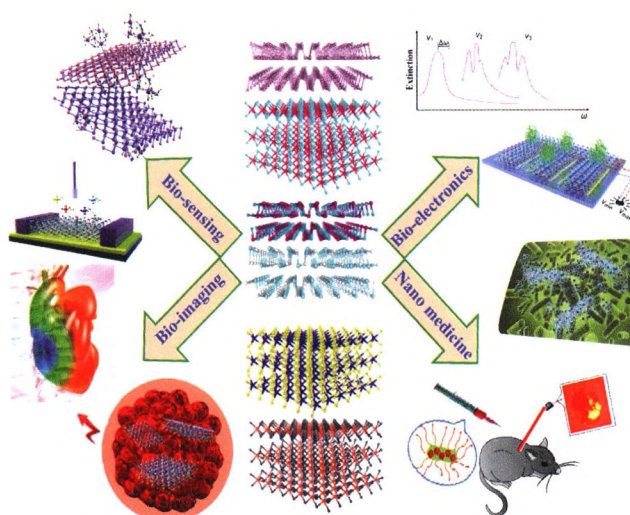
## Review Articles

### A prospective future towards bio/medical technology and bioelectronics based on 2D vdWs heterostructures

Guru Prakash Neupane<sup>1,\*</sup>, Linglong Zhang<sup>1</sup>, Tanju Yildirim<sup>1</sup>, Kai Zhou<sup>2</sup>, Bowen Wang<sup>1</sup>, Yilin Tang<sup>1</sup>, Wendi Ma<sup>1</sup>, Yunzhou Xue<sup>2,\*</sup>, and Yuerui Lu<sup>1,\*</sup>

<sup>1</sup> The Australian National University, Australia

<sup>2</sup> Shenzhen University, China



This article reviews the development of various types of two-dimensional (2D) heterostructures in a variety of nano-biotechnology applications and highlights the future 2D heterostructure scopes in bioimaging, nanomedicine, bio-markers/therapy and bioelectronics.

1–17

### Graphitic carbon nitride with different dimensionalities for energy and environmental applications

Qiang Hao<sup>1</sup>, Guohua Jia<sup>2</sup>, Wei Wei<sup>1</sup>, Ajayan Vinu<sup>3</sup>, Yuan Wang<sup>4</sup>, Hamidreza Arandiyani<sup>5</sup>, and Bing-Jie Ni<sup>1,\*</sup>

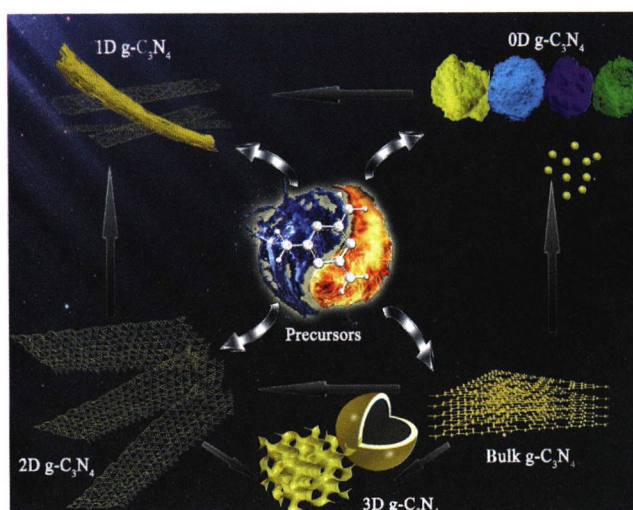
<sup>1</sup> University of Technology Sydney (UTS), Australia

<sup>2</sup> Curtin University, Australia

<sup>3</sup> The University of Newcastle, Australia

<sup>4</sup> The University of New South Wales, Australia

<sup>5</sup> The University of Sydney, Australia

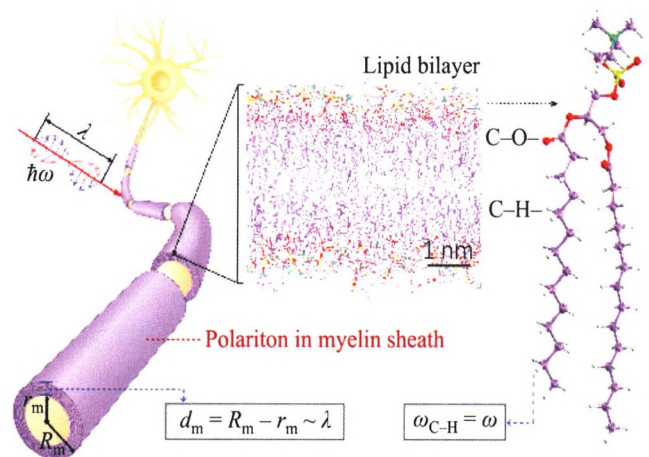


In this work, the authors reviewed the synthesis of graphitic carbon nitride with different micro-nano structures and the applications in various energy and environmental areas.

18–37

## Research Articles

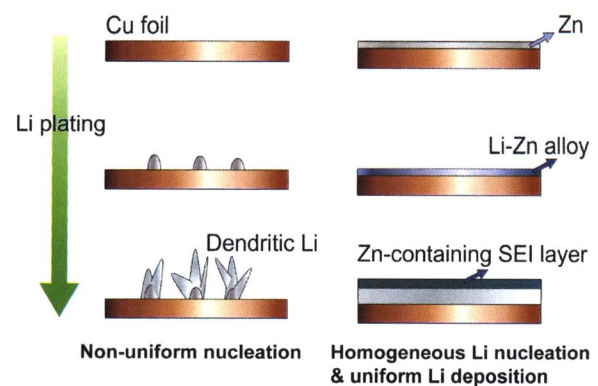
## Cell vibron polariton resonantly self-confined in the myelin sheath of nerve

Bo Song<sup>1,\*</sup> and Yousheng Shu<sup>2</sup><sup>1</sup> University of Shanghai for Science and Technology, China<sup>2</sup> Fudan University, China

A quantum state of cell polariton can form and be self-confined in myelinated neuron due to the specific coupling of myelin sheath and photons.

38–44

## Regulating lithium nucleation and growth by zinc modified current collectors

Na Zhang<sup>1</sup>, Seung-Ho Yu<sup>1,2,\*</sup>, and Héctor D. Abruña<sup>1,\*</sup><sup>1</sup> Cornell University, USA<sup>2</sup> Korea University, Republic of Korea

A Cu current collector modified with a thin layer of Zn can regulate the homogeneous Li nucleation process, leading to the uniform Li growth.

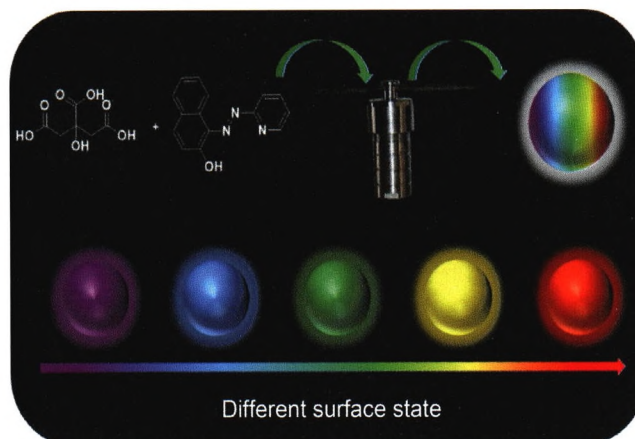
45–51

### Multicolor carbon dots with concentration-tunable fluorescence and solvent-affected aggregation states for white light-emitting diodes

Fanyong Yan<sup>1,\*</sup>, Yingxia Jiang<sup>1</sup>, Xiaodong Sun<sup>1</sup>, Junfu Wei<sup>1,\*</sup>, Liang Chen<sup>2</sup>, and Yuyang Zhang<sup>1</sup>

<sup>1</sup> Tiangong University, China

<sup>2</sup> Hokkaido University, Japan



Multicolor fluorescent CDs (M-CDs) with different surface states were synthesized through one-step solvothermal method and they were successfully used in the preparation of white light-emitting diodes.

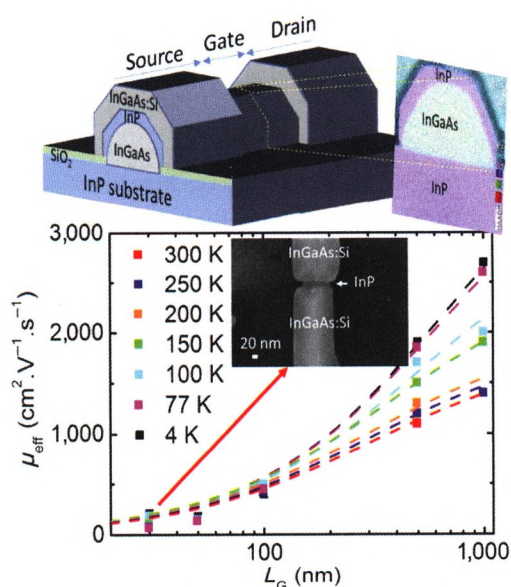
52–60

### Gate length dependent transport properties of in-plane core–shell nanowires with raised contacts

Alexandre Bucamp<sup>1</sup>, Christophe Coinon<sup>1</sup>, David Troadec<sup>1</sup>, Sylvie Lepilliet<sup>1</sup>, Gilles Patriarche<sup>2</sup>, Xavier Wallart<sup>1</sup>, and Ludovic Desplanque<sup>1,\*</sup>

<sup>1</sup> Univ. Polytechnique Hauts-de-France, France

<sup>2</sup> Université Paris-Sud-Université Paris-Saclay, France



The transport properties of in-plane InGaAs/InP core–shell nanowires with raised contacts grown by selective area molecular beam epitaxy are investigated through the characterization of metal oxide semiconductor field effect transistor (MOSFET) devices with gate length down to 30 nm.

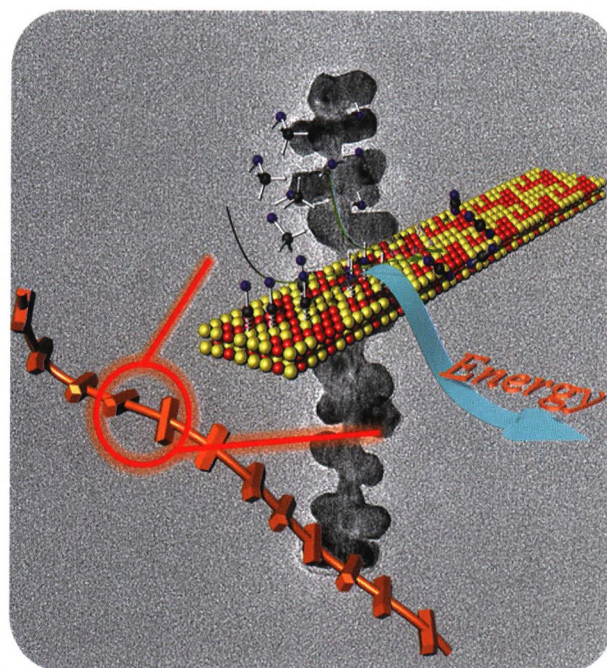
61–66

### Fishbone-like platinum-nickel nanowires as an efficient electrocatalyst for methanol oxidation

Jinquan Chang<sup>1,2</sup>, Luting Song<sup>1</sup>, Yuanqing Xu<sup>1</sup>, Yanhong Ma<sup>1</sup>, Cheng Liang<sup>1</sup>, Wenyu Jiang<sup>1</sup>, and Yong Zhang<sup>1,2,\*</sup>

<sup>1</sup> National Center for Nanoscience and Technology, China

<sup>2</sup> University of Chinese Academy of Sciences, China



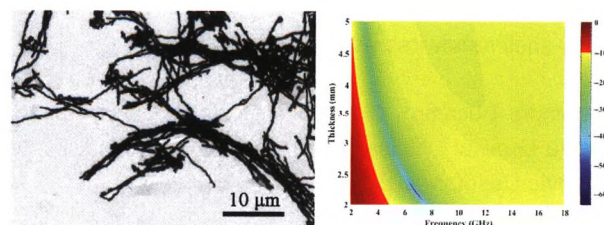
The PtNi<sub>3</sub> fishbone-like nanowires (PtNi<sub>3</sub>-FBNWs) present unique compositional and structural features and therefore demonstrate enhanced electrocatalytic performances compared with commercial 20% Pt/C.

67–71

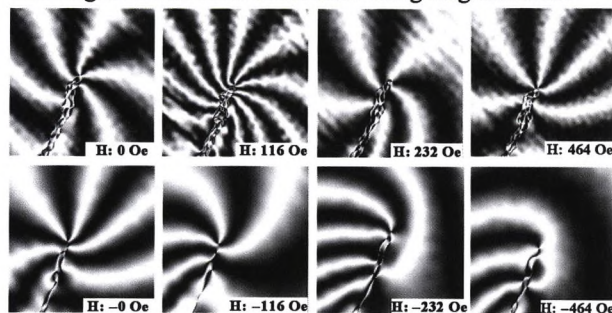
### *In situ* dynamics response mechanism of the tunable length-diameter ratio nanochains for excellent microwave absorber

Wenbin You, Ke Pei, Liting Yang, Xiao Li, Xiaofeng Shi, Xuefeng Yu, Huiqiao Guo, and Renchao Che\*

Fudan University, China



The magnetic flux lines under alternating magnetic field



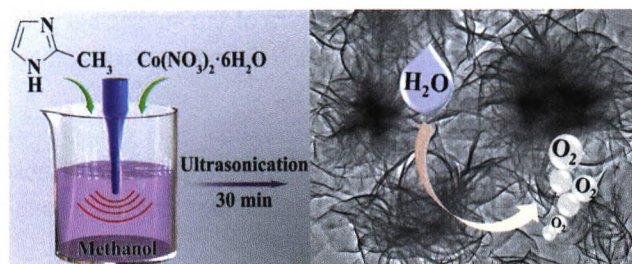
Co nanochains are fabricated via a magnetic field assisted assembly approach and demonstrate the enhancement of magnetic loss in microwave absorption, which exhibits strong chain-length dependences because of the improving magnetic response. Research of microwave absorption mechanism via *in situ* experiment provides visible evidences of magnetic response caused by multiple resonances from the microscopic level.

72–78

## Ultrasonication-assisted and gram-scale synthesis of Co-LDH nanosheet aggregates for oxygen evolution reaction

Tian-Jiao Wang, Xiaoyang Liu, Ying Li, Fumin Li, Ziwei Deng\*, and Yu Chen\*

Shaanxi Normal University, China



Gram-scale flower-like Co-based layered double hydroxides nanosheet aggregates were synthesized by a facile and fast ultrasonic approach, which reveal preeminent stability, a small Tafel slope of  $110 \text{ mV} \cdot \text{dec}^{-1}$ , and a low overpotential of  $300 \text{ mV}$  at  $10 \text{ mA} \cdot \text{cm}^{-2}$  for oxygen evolution reaction in alkaline media.

79–85

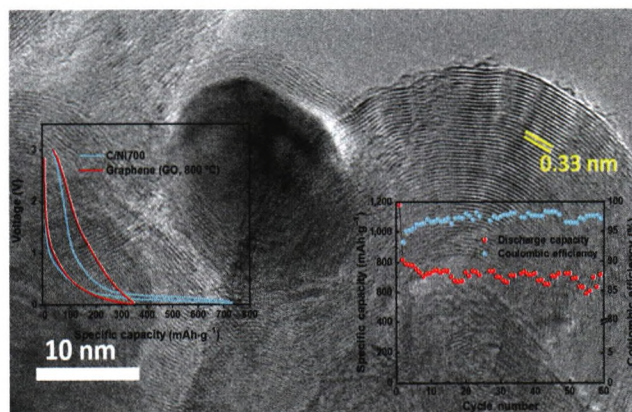
## Highly graphitized carbon nanosheets with embedded Ni nanocrystals as anode for Li-ion batteries

Francisco Javier Soler-Piña<sup>1</sup>, Celia Hernández-Rentero<sup>1</sup>, Alvaro Caballero<sup>1,\*</sup>, Julián Morales<sup>1,\*</sup>, Enrique Rodríguez-Castellón<sup>2</sup>, and Jesús Canales-Vázquez<sup>3</sup>

<sup>1</sup> Universidad de Córdoba, Spain

<sup>2</sup> Universidad de Málaga, Spain

<sup>3</sup> Universidad de Castilla-La Mancha, Spain



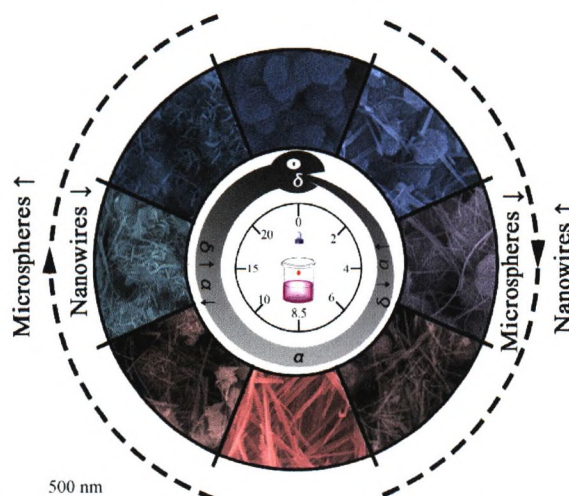
A graphitized carbon@Ni nanocrystals composite obtained at moderate temperatures possesses the ability of doubling the capacity of graphite with a similar polarization between the charge and discharge curves, much lower than that of disordered graphene.

86–94

## Transformation between nanosheets and nanowires structure in MnO<sub>2</sub> upon providing Co<sup>2+</sup> ions and applications for microwave absorption

Lulu Song, Yuping Duan\*, Jia Liu, and Huifang Pang\*

Dalian University of Technology, China



The evolution of morphologies and phases of MnO<sub>2</sub> was studied when the Co doping increased from 0 to 20 mmol (the clockwise direction), the morphologies changed from nanosheets to nanowires and then back to nanosheets, along with the phase from  $\delta$ -MnO<sub>2</sub> to  $\alpha$ -MnO<sub>2</sub> then to  $\delta$ -MnO<sub>2</sub>.

95–104

## Solid-solution alloy nanoclusters of the immiscible gold-rhodium system achieved by a solid ligand-assisted approach for highly efficient catalysis

Xinchun Yang<sup>1,2</sup>, Zhangpeng Li<sup>1</sup>, Mitsunori Kitta<sup>1</sup>, Nobuko Tsumori<sup>3</sup>, Wenhan Guo<sup>4</sup>, Zitao Zhang<sup>4</sup>, Jianbo Zhang<sup>5</sup>, Ruqiang Zou<sup>4,\*</sup>, and Qiang Xu<sup>1,2,6,\*</sup>

<sup>1</sup> National Institute of Advanced Industrial Science and Technology (AIST), Japan

<sup>2</sup> Kobe University, Japan

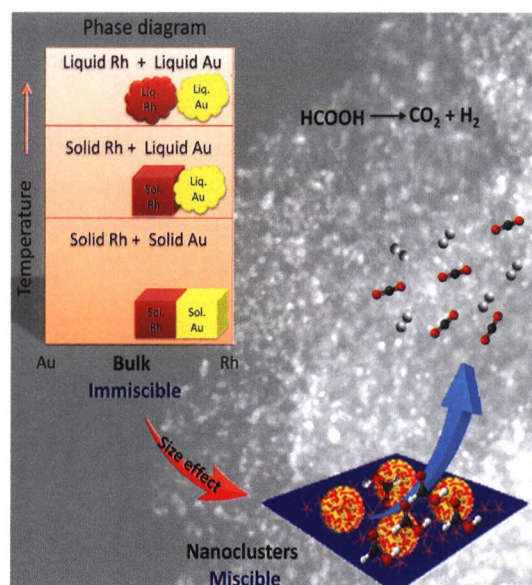
<sup>3</sup> Toyama National College of Technology, Japan

<sup>4</sup> Peking University, China

<sup>5</sup> Centre for High-Pressure Science and Technology Advanced Research, China

<sup>6</sup> AIST-Kyoto University Chemical Energy Materials Open Innovation Laboratory, Japan

105–111



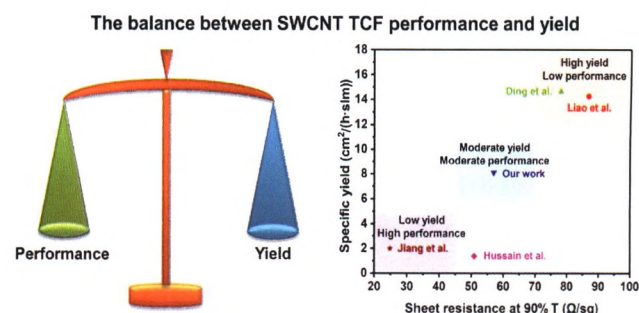
The solid-solution alloying of the immiscible Au and Rh system has been achieved in plenty of clean, ultrafine and highly dispersed metal nanoclusters by using a solid-ligand-assisted approach, which exhibit significantly enhanced catalytic activity toward the dehydrogenation of formic acid.

## High-performance transparent conducting films of long singlewalled carbon nanotubes synthesized from toluene alone

Er-Xiong Ding, Aqeel Hussain, Saeed Ahmad, Qiang Zhang\*, Yongping Liao, Hua Jiang, and Esko I. Kauppinen\*

Aalto University, Finland

112–120



We have for the first time systematically investigated the parameters to synthesize single-walled carbon nanotubes using toluene alone as the carbon source for the fabrication of transparent conducting films with a considerably low sheet resistance of 57 Ω/sq at 90% transmittance and high yield simultaneously.

## Engineering defects and adjusting electronic structure on S doped MoO<sub>2</sub> nanosheets toward highly active hydrogen evolution reaction

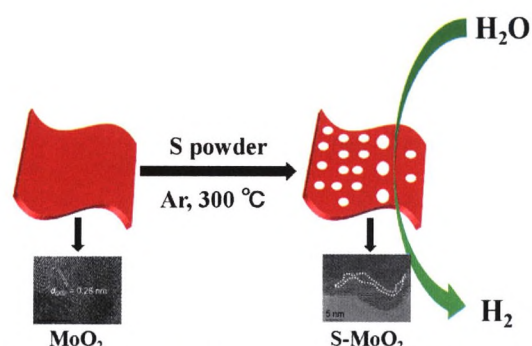
Shuo Geng<sup>1,2</sup>, Yequn Liu<sup>3</sup>, Yong Sheng Yu<sup>1,2,\*</sup>, Weiwei Yang<sup>2,\*</sup>, and Haibo Li<sup>1</sup>

<sup>1</sup> Jilin Normal University, China

<sup>2</sup> Harbin Institute of Technology, China

<sup>3</sup> Institute of Coal Chemistry, Chinese Academy of Sciences, China

121–126



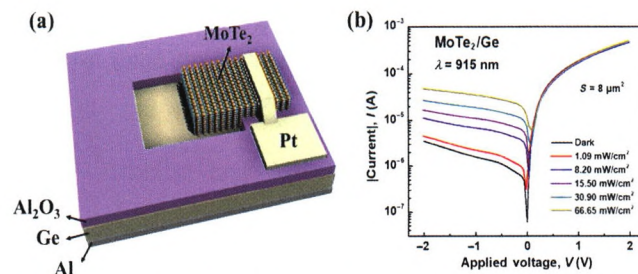
Owing to the electron structure adjusting, lattice defect engineering, and oxygen vacancies increasing, the S doped MoO<sub>2</sub> shows excellent hydrogen evolution reaction (HER) performance.

## Ultrahigh sensitive near-infrared photodetectors based on MoTe<sub>2</sub>/germanium heterostructure

Wenjie Chen<sup>1</sup>, Renrong Liang<sup>1,\*</sup>, Shuqin Zhang<sup>1</sup>, Yu Liu<sup>1</sup>, Weijun Cheng<sup>1</sup>, Chuanchuan Sun<sup>2</sup>, and Jun Xu<sup>1,\*</sup>

<sup>1</sup> Tsinghua University, China

<sup>2</sup> Beijing Institute of Control Engineering, China



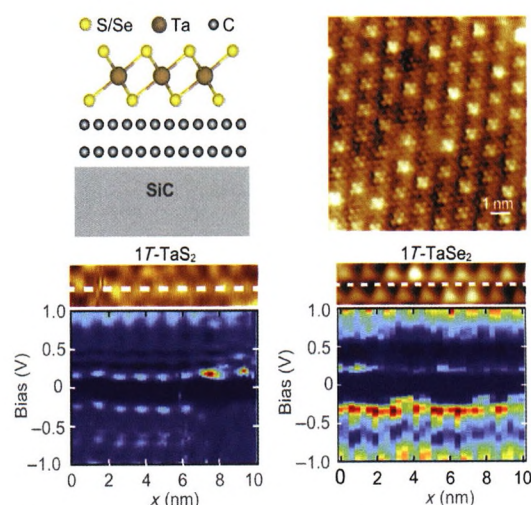
The efficient near-infrared light detection of the MoTe<sub>2</sub>/germanium (Ge) heterojunction has been demonstrated. The photoresponsivity and specific detectivity can reach to 12,460 A/W and  $3.3 \times 10^{12}$  Jones, respectively. And the photoresponse time is 5 ms. These properties suggest that MoTe<sub>2</sub>/Ge heterostructure is one of the promising structures for the development of high performance near-infrared photodetectors.

127–132

## Scanning tunneling spectroscopic study of monolayer 1T-TaS<sub>2</sub> and 1T-TaSe<sub>2</sub>

Haicheng Lin, Wantong Huang, Kun Zhao, Shuang Qiao, Zheng Liu, Jian Wu, Xi Chen\*, and Shuai-Hua Ji\*

Tsinghua University, China



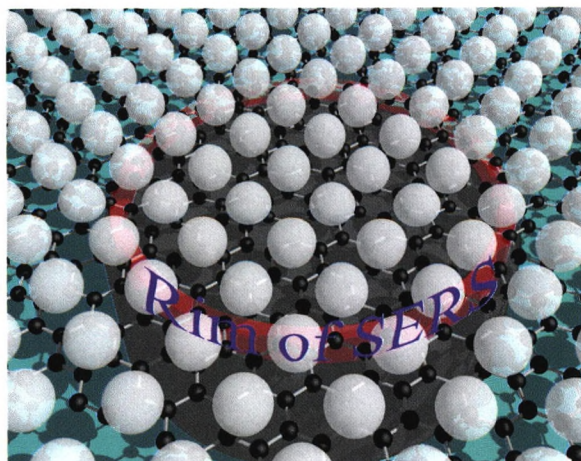
The isostructural and isoelectronic transition-metal-dichalcogenides 1T-TaS<sub>2</sub> and 1T-TaSe<sub>2</sub> monolayers show commensurate charge wave phase at low temperature. 1T-TaS<sub>2</sub> monolayer is proved to be a Mott insulator while 1T-TaSe<sub>2</sub> monolayer is a regular band insulator.

133–137

## Spatial Raman mapping investigation of SERS performance related to localized surface plasmons

Yansheng Liu and Feng Luo\*

Ciudad Universitaria de Cantoblanco, Spain



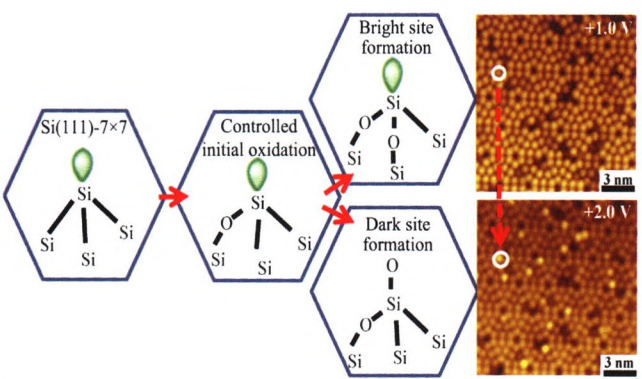
The Ag NPs/SLG/Ag NDs exhibited extremely high surface-enhanced Raman scattering (SERS) performance. The spatial Raman mapping illustrated the larger SERS signal existed in the rim of the Ag NDs.

138–144

Combining scanning tunneling microscope (STM) imaging and local manipulation to probe the high dose oxidation structure of the Si(111)-7×7 surface

Dogan Kaya<sup>1,2</sup>, Richard J. Cobley<sup>3,\*</sup>, and Richard E. Palmer<sup>3</sup>

<sup>1</sup> Cukurova University, Turkey  
<sup>2</sup> University of Birmingham, UK  
<sup>3</sup> Swansea University, UK



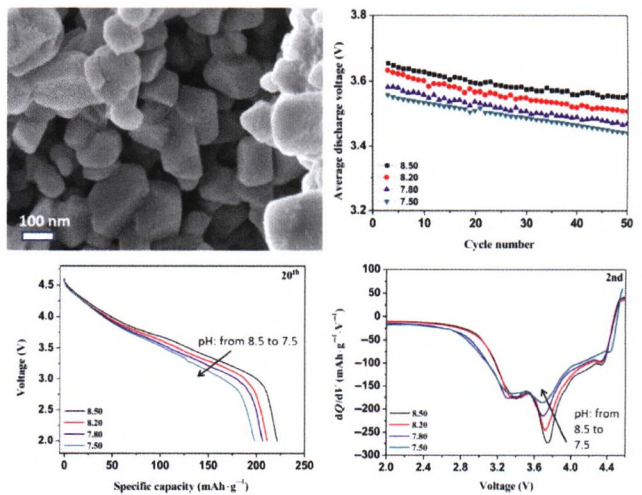
Combining scanning tunneling microscope (STM) imaging with local atomic manipulation elucidates the oxidation behavior of the Si(111)-7×7 surface, yielding the primary oxidation pathway.

145–150

Mitigation of voltage decay in Li-rich layered oxides as cathode materials for lithium-ion batteries

Wenhui Hu<sup>1</sup>, Youxiang Zhang<sup>1,2,\*</sup>, Ling Zan<sup>1</sup>, and Hengjiang Cong<sup>1,\*</sup>

<sup>1</sup> Wuhan University, China  
<sup>2</sup> Shenzhen Research Institute of Wuhan University, China



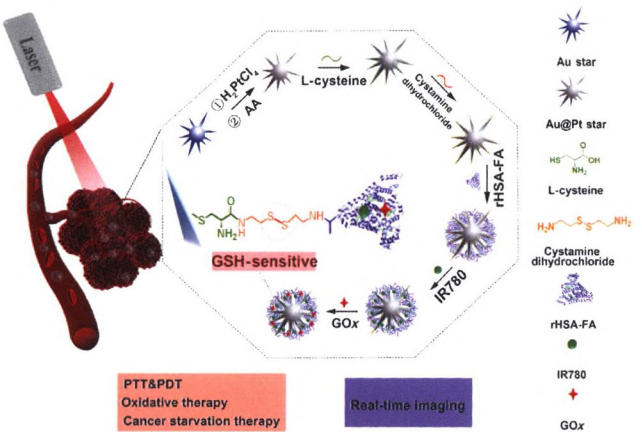
A lithium-rich layered oxide with composition of  $\text{Li}_{1.16}\text{Mn}_{0.50}\text{Ni}_{0.25}\text{Co}_{0.09}\text{O}_2$  was synthesized by carbonate co-precipitation method which showed impressively increased initial Coulombic efficiency, cycling stability and average discharge voltages as cathode material for lithium ion batteries.

151–159

GSH-triggered sequential catalysis for tumor imaging and eradication based on star-like Au/Pt enzyme carrier system

Amin Zhang<sup>1</sup>, Qian Zhang<sup>1</sup>, Gabriel Alfranca<sup>1,2</sup>, Shaojun Pan<sup>1</sup>, Zhicheng Huang<sup>1</sup>, Jin Cheng<sup>1</sup>, Qiang Ma<sup>3</sup>, Jie Song<sup>1</sup>, Yunxiang Pan<sup>1</sup>, Jian Ni<sup>1</sup>, Lijun Ma<sup>4,\*</sup>, and Daxiang Cui<sup>1,\*</sup>

<sup>1</sup> Shanghai Jiao Tong University, China  
<sup>2</sup> CSIC/Universidad de Zaragoza, Spain  
<sup>3</sup> Xintai People's Hospital, China  
<sup>4</sup> Shanghai Jiao Tong University School of Medicine, China



In this work, we have successfully prepared a sequential catalytic platform based on Au/Pt star for tumor theragnostic by using unique tumor microenvironment. Here we demonstrated that our probes simultaneously possessed a GSH-sensitive release, real-time imaging ability, and synergetic cancer starving-like therapy/nanozyme oxidative therapy/photo-thermal therapy (PTT)/photodynamic therapy (PDT) features, which provides a potential strategy for effective tumor theragnostic.

160–172

## Molecular imaging of advanced atherosclerotic plaques with folate receptor-targeted 2D nanoprobe

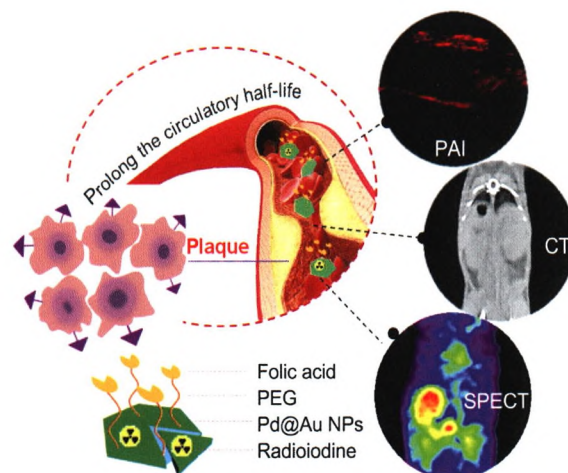
Zhide Guo<sup>1</sup>, Liu Yang<sup>2</sup>, Mei Chen<sup>1,3</sup>, Xuejun Wen<sup>1</sup>, Huanhuan Liu<sup>1</sup>, Jingchao Li<sup>1</sup>, Duo Xu<sup>1</sup>, Yuanyuan An<sup>2</sup>, Changrong Shi<sup>1</sup>, Jindian Li<sup>1</sup>, Xinhui Su<sup>4</sup>, Zijing Li<sup>1</sup>, Ting Liu<sup>1</sup>, Rongqiang Zhuang<sup>1</sup>, Nanfeng Zheng<sup>1,\*</sup>, Haibo Zhu<sup>2,\*</sup>, and Xianzhong Zhang<sup>1,\*</sup>

<sup>1</sup> Xiamen University, China

<sup>2</sup> Institute of Materia Medica, Chinese Academy of Medical Sciences & Peking Union Medical College, China

<sup>3</sup> Hunan University, China

<sup>4</sup> Zhongshan Hospital Affiliated to Xiamen University, China



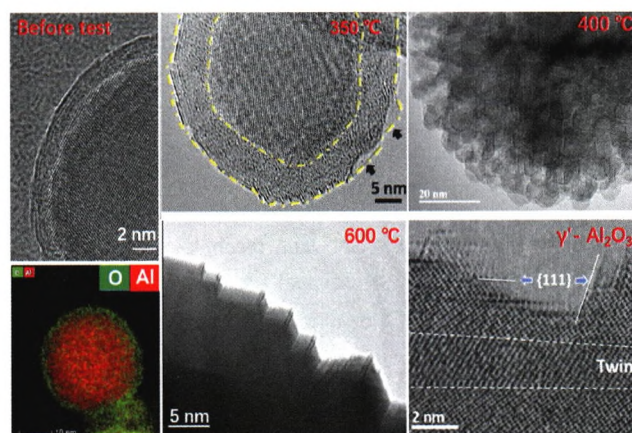
The macrophage-targeted Pd@Au-PEG-FA offers a versatile nanoplatform for sensitive and specific detection of folate receptor (FR)-positive atherosclerotic plaques through multimodal imaging.

## 173–182

## *In situ* observation of temperature-dependent atomistic and mesoscale oxidation mechanisms of aluminum nanoparticles

Jing Gao, Jingyuan Yan, Beikai Zhao, Ze Zhang, and Qian Yu\*

Zhejiang University, China



*In situ* environmental transmission electron microscopy testing was applied to investigate the temperature-dependent oxidation process of aluminum nanoparticles from ambient to 600 °C. The oxidation mechanisms were found to be changed with temperature.

## 183–187

## Highly dispersed Co-Mo sulfide nanoparticles on reduced graphene oxide for lithium and sodium ion storage

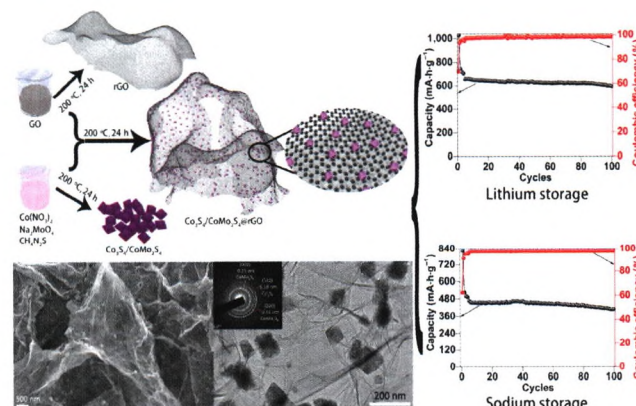
Yuqing Liao<sup>1</sup>, Chun Wu<sup>2</sup>, Yaotang Zhong<sup>1</sup>, Min Chen<sup>1</sup>, Luyang Cai<sup>1</sup>, Huirong Wang<sup>1</sup>, Xiang Liu<sup>1,3,\*</sup>, Guozhong Cao<sup>4,\*</sup>, and Weishan Li<sup>1,\*</sup>

<sup>1</sup> South China Normal University, China

<sup>2</sup> Changsha University of Science and Technology, China

<sup>3</sup> Nanjing Tech University, China

<sup>4</sup> University of Washington, USA



Co<sub>3</sub>S<sub>4</sub>/CoMo<sub>2</sub>S<sub>4</sub> nanoparticles highly dispersed on reduced graphene oxide (rGO) exhibit excellent lithium and sodium ion storage performances.

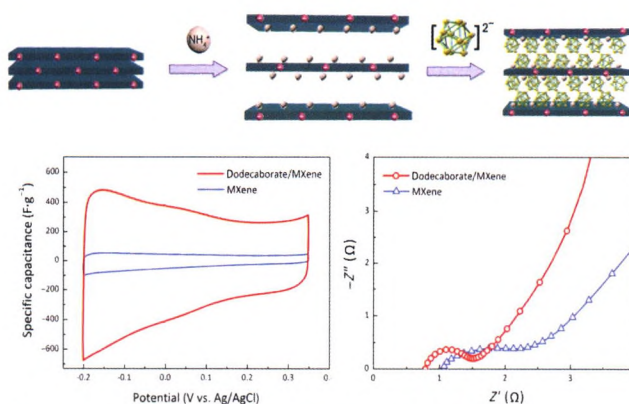
## 188–195

## Highly conductive dodecaborate/MXene composites for high performance supercapacitors

Zhenxing Li<sup>1,\*</sup>, Chang Ma<sup>1</sup>, Yangyang Wen<sup>1</sup>, Zhiting Wei<sup>1</sup>, Xiaofei Xing<sup>1</sup>, Junmei Chu<sup>1</sup>, Chengcheng Yu<sup>1</sup>, Kaili Wang<sup>2</sup>, and Zhao-Kui Wang<sup>2,\*</sup>

<sup>1</sup> China University of Petroleum (Beijing), China

<sup>2</sup> Soochow University, China



The surface of MXene was modified by a simple ultrasonic treatment by adding of ammonium ion, and the dodecaborate ion was inserted into the inner surface of MXene by electrostatic adsorption. The dodecaborate ion can act as a “lubricant” for ion diffusion between the MXene layers, which significantly improves the ion transfer rate of supercapacitors. The dodecaborate/MXene composites can achieve an extremely high capacitance of  $366 \text{ F} \cdot \text{g}^{-1}$  at a scan rate of  $2 \text{ mV} \cdot \text{s}^{-1}$ , which is more than eight times higher than the capacitance of MXene ( $43 \text{ F} \cdot \text{g}^{-1}$ ) at the same scan speed.

196–202

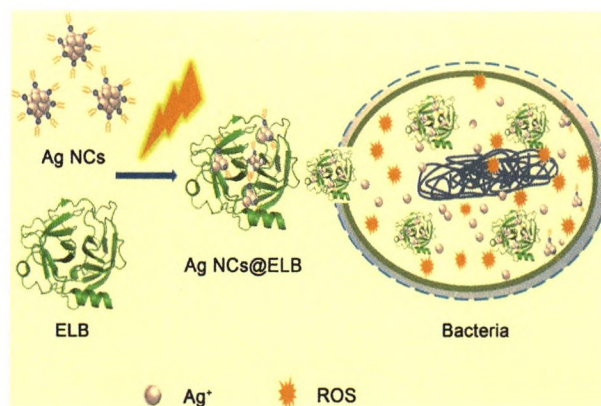
## Embedding ultrasmall Ag nanoclusters in Luria-Bertani extract via light irradiation for enhanced antibacterial activity

Ziping Wang<sup>1,2</sup>, Yushuang Fang<sup>1</sup>, Xianfeng Zhou<sup>1</sup>, Zhibo Li<sup>1</sup>, Haiguang Zhu<sup>1</sup>, Fanglin Du<sup>1</sup>, Xun Yuan<sup>1,\*</sup>, Qiaofeng Yao<sup>3,\*</sup>, and Jianping Xie<sup>3,\*</sup>

<sup>1</sup> Qingdao University of Science and Technology, China

<sup>2</sup> Weifang University of Science and Technology, China

<sup>3</sup> National University of Singapore, Singapore



Encapsulating Ag nanoclusters (NCs) inside a sacrificial nanovehicle (e.g., the extract of Luria-Bertani medium) which is preferably swallowed and digested by the bacteria, can significantly improve the targeting and uptake over the bacteria, boosting the bacterial killing efficacy of Ag NCs.

203–208

## FeOOH quantum dots decorated graphene sheet: An efficient electrocatalyst for ambient $\text{N}_2$ reduction

Xiaojuan Zhu<sup>1,2</sup>, Jinxiu Zhao<sup>1</sup>, Lei Ji<sup>1</sup>, Tongwei Wu<sup>1</sup>, Ting Wang<sup>1</sup>, Shuyan Gao<sup>3</sup>, Abdulmohsen Ali Alshehri<sup>4</sup>, Khalid Ahmed Alzahrani<sup>4</sup>, Yonglan Luo<sup>2</sup>, Yimo Xiang<sup>5</sup>, Baozhan Zheng<sup>6,\*</sup>, and Xuping Sun<sup>1,\*</sup>

<sup>1</sup> University of Electronic Science and Technology of China, China

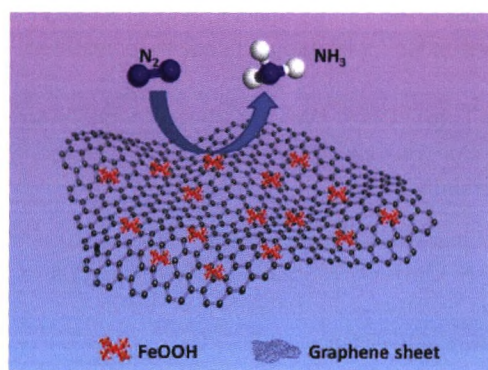
<sup>2</sup> China West Normal University, China

<sup>3</sup> Henan Normal University, China

<sup>4</sup> King Abdulaziz University, Saudi Arabia

<sup>5</sup> No. 12 Middle School, China

<sup>6</sup> Sichuan University, China



FeOOH quantum dots decorated graphene sheet behaves as a high-performance and stable catalyst for ambient electrochemical  $\text{N}_2$ -to- $\text{NH}_3$  fixation. In  $0.1 \text{ M LiClO}_4$ , this hybrid achieves a large  $\text{NH}_3$  yield rate and a high Faradaic efficiency of  $27.3 \mu\text{g} \cdot \text{h}^{-1} \cdot \text{mg}_{\text{cat}}^{-1}$  and 14.6% at  $-0.4 \text{ V}$  vs. reversible hydrogen electrode.

209–214

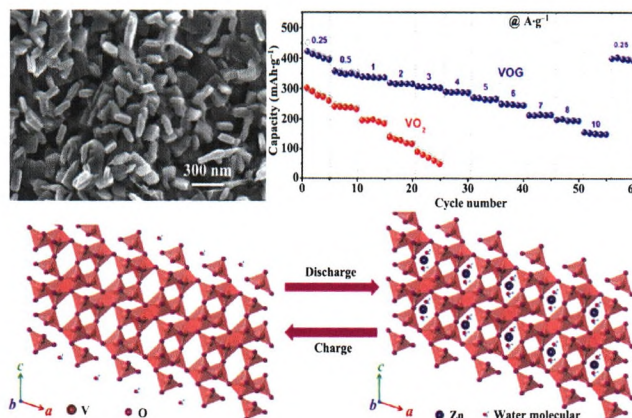
## VO<sub>2</sub>·0.2H<sub>2</sub>O nanocuboids anchored onto graphene sheets as the cathode material for ultrahigh capacity aqueous zinc ion batteries

Dedong Jia<sup>1,\*</sup>, Kun Zheng<sup>1</sup>, Ming Song<sup>2</sup>, Hua Tan<sup>3</sup>, Aitang Zhang<sup>1</sup>, Lihua Wang<sup>1</sup>, Lijun Yue<sup>1</sup>, Da Li<sup>1</sup>, Chenwei Li<sup>1,\*</sup>, and Jingquan Liu<sup>1,\*</sup>

<sup>1</sup> Qingdao University, China

<sup>2</sup> Xuzhou University of Technology, China

<sup>3</sup> Nanyang Technological University, Singapore



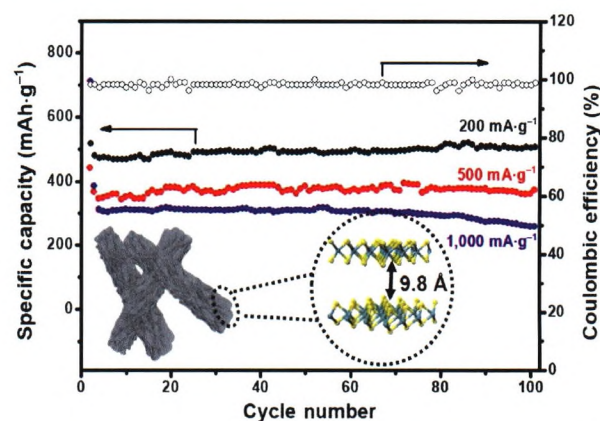
A hybrid structure containing VO<sub>2</sub>·0.2H<sub>2</sub>O nanocuboids anchored on graphene sheets has been synthesized through a facile and efficient microwave-assisted solvothermal method. When used as cathode material for aqueous Zn-ion batteries, it is able to reach 423 mAh·g<sup>-1</sup> in specific capacity, and long cycle stability (87% capacity retention after 1,000 cycles under 8 A·g<sup>-1</sup>) because of the reversible Zn ions de-intercalation and rapid electron transport in the composite.

215–224

## Interlayer-expanded MoS<sub>2</sub> assemblies for enhanced electrochemical storage of potassium ions

Sijia Di, Pan Ding, Yeyun Wang, Yunling Wu, Jun Deng, Lin Jia, and Yanguang Li\*

Soochow University, China



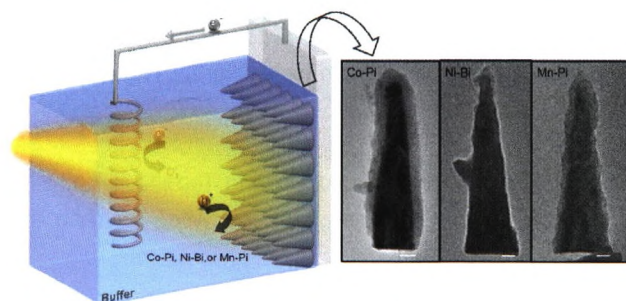
Hierarchical interlayer-expanded MoS<sub>2</sub> assemblies supported on carbon nanotubes are prepared via a straightforward solution method. The interlayer expansion lowers the diffusion energy barrier and improves the diffusion kinetics of ions, thereby affording our product with an excellent electrochemical performance for reversible K<sup>+</sup> ion storage.

225–230

## Room-temperature photodeposition of conformational transition metal based cocatalysts on BiVO<sub>4</sub> for enhanced photoelectrochemical water splitting

Lu Wang, Tao Zhang, Jinzhan Su\*, and Liejin Guo\*

Xi'an Jiaotong University, China



A versatile *in-situ* light-driven two-electrode photodeposition approach is proposed to deposit different transition metal complex on the surface of BiVO<sub>4</sub> highly oriented nanocone-arrays. Conformal Co-Pi, Ni-Bi and Mn-Pi complexes were obtained by this photodeposition strategy, leading to enhanced photoelectrochemical performance of these novel BiVO<sub>4</sub> nanocone array-based photoanodes.

231–237

## Metal-organic frameworks nanoswitch: Toward photo-controllable endo/lysosomal rupture and release for enhanced cancer RNA interference

Gan Lin<sup>1,2</sup>, Yang Zhang<sup>1</sup>, Long Zhang<sup>1</sup>, Junqing Wang<sup>1</sup>, Ye Tian<sup>1</sup>, Wen Cai<sup>1</sup>, Shangui Tang<sup>1</sup>, Chengchao Chu<sup>1</sup>, JiaJing Zhou<sup>3</sup>, Peng Mi<sup>4</sup>, Xiaoyuan Chen<sup>5</sup>, and Gang Liu<sup>1,\*</sup>

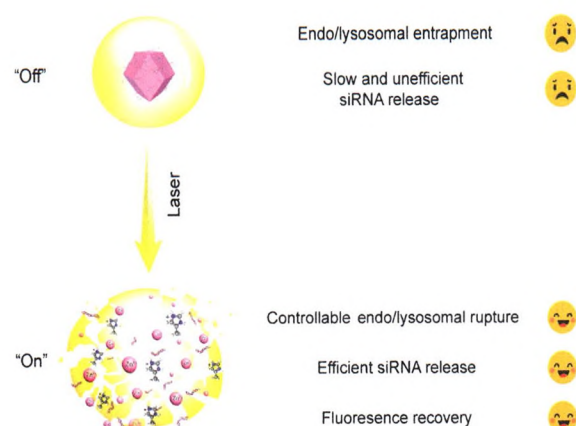
<sup>1</sup> Xiamen University, China

<sup>2</sup> The University of Melbourne, Australia

<sup>3</sup> Nanyang Technological University, Singapore

<sup>4</sup> Sichuan University, China

<sup>5</sup> National Institutes of Health, USA



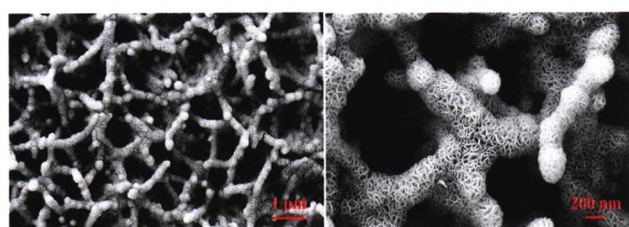
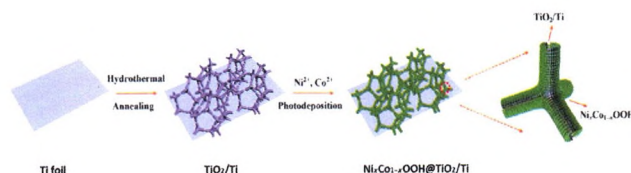
Killing two birds with one stone nanoswitch is presented to simultaneously address endosomal rupture and gene release for enhancing cancer RNA interfering. Upon photoirradiation, the nanoswitch rapidly dissociates into endosomal disrupting agents and gene therapeutics, allowing a spatiotemporal control over gene transfer in targeted sites, along with fluorescence recovery that could be used for real-time monitoring the gene delivery.

238–245

## Photodeposition fabrication of hierarchical layered Co-doped Ni oxyhydroxide ( $\text{Ni}_x\text{Co}_{1-x}\text{OOH}$ ) catalysts with enhanced electrocatalytic performance for oxygen evolution reaction

Liang-ai Huang, Zhishun He, Jianfeng Guo, Shi-en Pei, Haibo Shao, and Jianming Wang\*

Zhejiang University, China



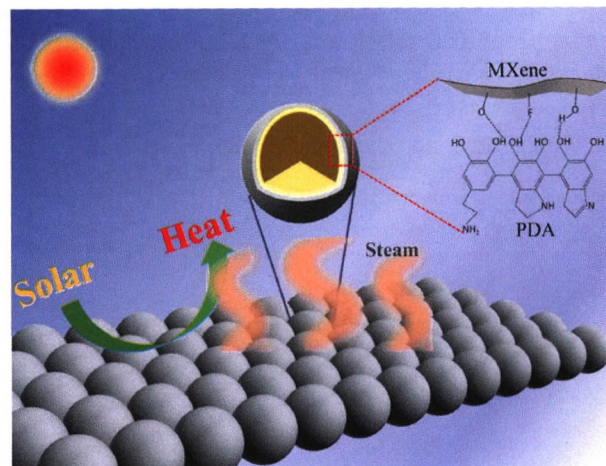
We report an original photodeposition strategy for the fabrication of  $\text{Ni}_x\text{Co}_{1-x}\text{OOH}/\text{TiO}_2$  heterostructure nanosheet arrays with improved electrocatalytic performance for oxygen evolution reaction.

246–254

## Self-assembled core-shell polydopamine@MXene with synergistic solar absorption capability for highly efficient solar-to-vapor generation

Xing Zhao, Xiang-Jun Zha, Li-Sheng Tang, Jun-Hong Pu, Kai Ke, Rui-Ying Bao, Zheng-ying Liu, Ming-Bo Yang, and Wei Yang\*

Sichuan University, China



The core-shell polydopamine (PDA)@MXene photothermal microspheres with synergistic and stable solar absorption capability as well as adequate water supply are constructed through a simple self-assembly strategy.

255–264

### Porous Pt nanoframes decorated with Bi(OH)<sub>3</sub> as highly efficient and stable electrocatalyst for ethanol oxidation reaction

Xiaolei Yuan<sup>1</sup>, Bei Jiang<sup>5</sup>, Muhan Cao<sup>2</sup>, Congyang Zhang<sup>2</sup>, Xiaozhi Liu<sup>3,4</sup>, Qinghua Zhang<sup>3</sup>, Fenglei Lyu<sup>2</sup>, Lin Gu<sup>3,4,\*</sup>, and Qiao Zhang<sup>2,\*</sup>

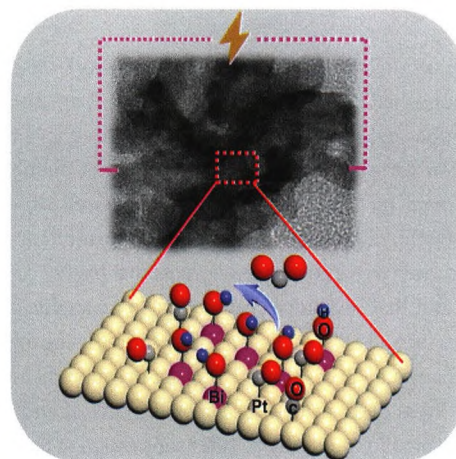
<sup>1</sup> Nantong University, China

<sup>2</sup> Soochow University, China

<sup>3</sup> Institute of Physics, Chinese Academy of Sciences, China

<sup>4</sup> University of Chinese Academy of Sciences, China

<sup>5</sup> Sichuan University, China



Porous Pt-Bi(OH)<sub>3</sub> nanoframes prepared through a two-step approach show superior catalytic activity and operation durability for ethanol oxidation reaction to commercial Pt/C catalysts in both alkaline and acidic conditions.

265–272

### PCN-Fe(III)-PTX nanoparticles for MRI guided high efficiency chemo-photodynamic therapy in pancreatic cancer through alleviating tumor hypoxia

Tao Zhang<sup>1</sup>, Zhenqi Jiang<sup>2,3</sup>, Libin Chen<sup>4</sup>, Chunshu Pan<sup>2</sup>, Shan Sun<sup>2</sup>, Chuang Liu<sup>2</sup>, Zihou Li<sup>2</sup>, Wenzhi Ren<sup>2,5,\*</sup>, Aiguo Wu<sup>2,\*</sup>, and Pintong Huang<sup>1,\*</sup>

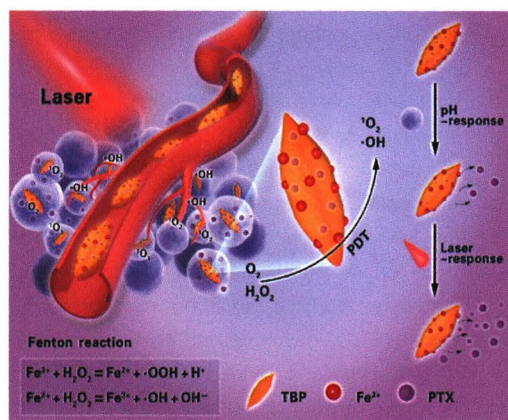
<sup>1</sup> The Second Affiliated Hospital of Zhejiang University School of Medicine, China

<sup>2</sup> Ningbo Institute of Materials Technology and Engineering, Chinese Academy of Sciences, China

<sup>3</sup> University of Chinese Academy of Sciences, China

<sup>4</sup> Ningbo First Hospital, China

<sup>5</sup> Key Laboratory of Diagnosis and Treatment of Digestive System Tumors of Zhejiang Province, China



Porous coordination network-Fe(III)-paclitaxel (PCN-Fe(III)-PTX) nanoparticles (NPs) used as PTX carrier and photosensitizer could effectively regulate tumor hypoxia by continuous decomposition of the endogenous H<sub>2</sub>O<sub>2</sub> and remarkably augment the therapeutic efficiency of chemo-photodynamic combined therapy. Also, these NPs represent an ideal agent for MRI image and can release drug in response to both laser irradiation and pH changes to promote drug accumulation within tumors.

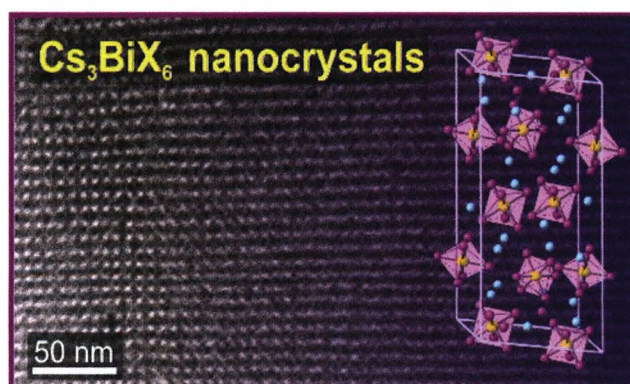
273–281

### Synthesis and transformation of zero-dimensional Cs<sub>3</sub>BiX<sub>6</sub> (X = Cl, Br) perovskite-analogue nanocrystals

Hanjun Yang<sup>1</sup>, Tong Cai<sup>1</sup>, Exian Liu<sup>2</sup>, Katie Hills-Kimball<sup>1</sup>, Jianbo Gao<sup>2</sup>, and Ou Chen<sup>1,\*</sup>

<sup>1</sup> Brown University, USA

<sup>2</sup> Clemson University, USA



The synthesis of Cs<sub>3</sub>BiX<sub>6</sub> (X = Cl, Br) nanocrystals opens up opportunities to understanding optical properties and post-synthetic transformations of zero-dimensional lead-free perovskite analogue materials.

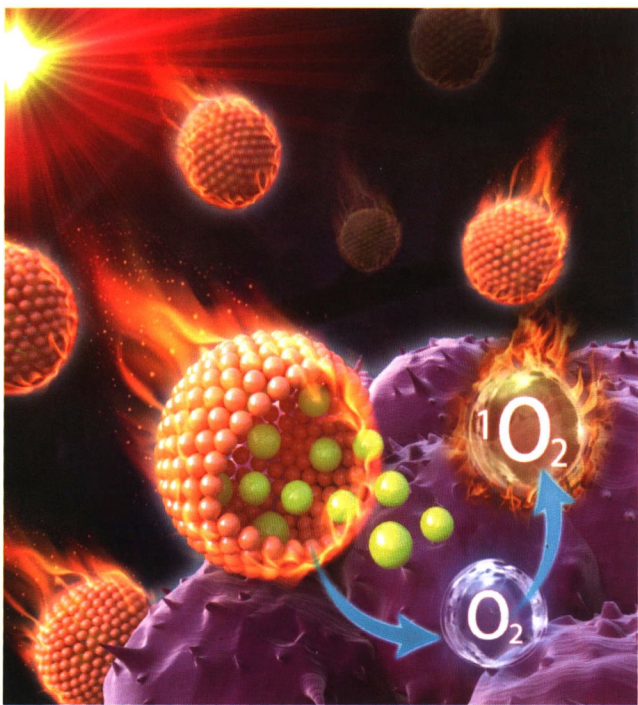
282–291

Erratum to: Effects of redox-active interlayer anions on the oxygen evolution reactivity of NiFe-layered double hydroxide nanosheets (<https://doi.org/10.1007/s12274-017-1750-9>)

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