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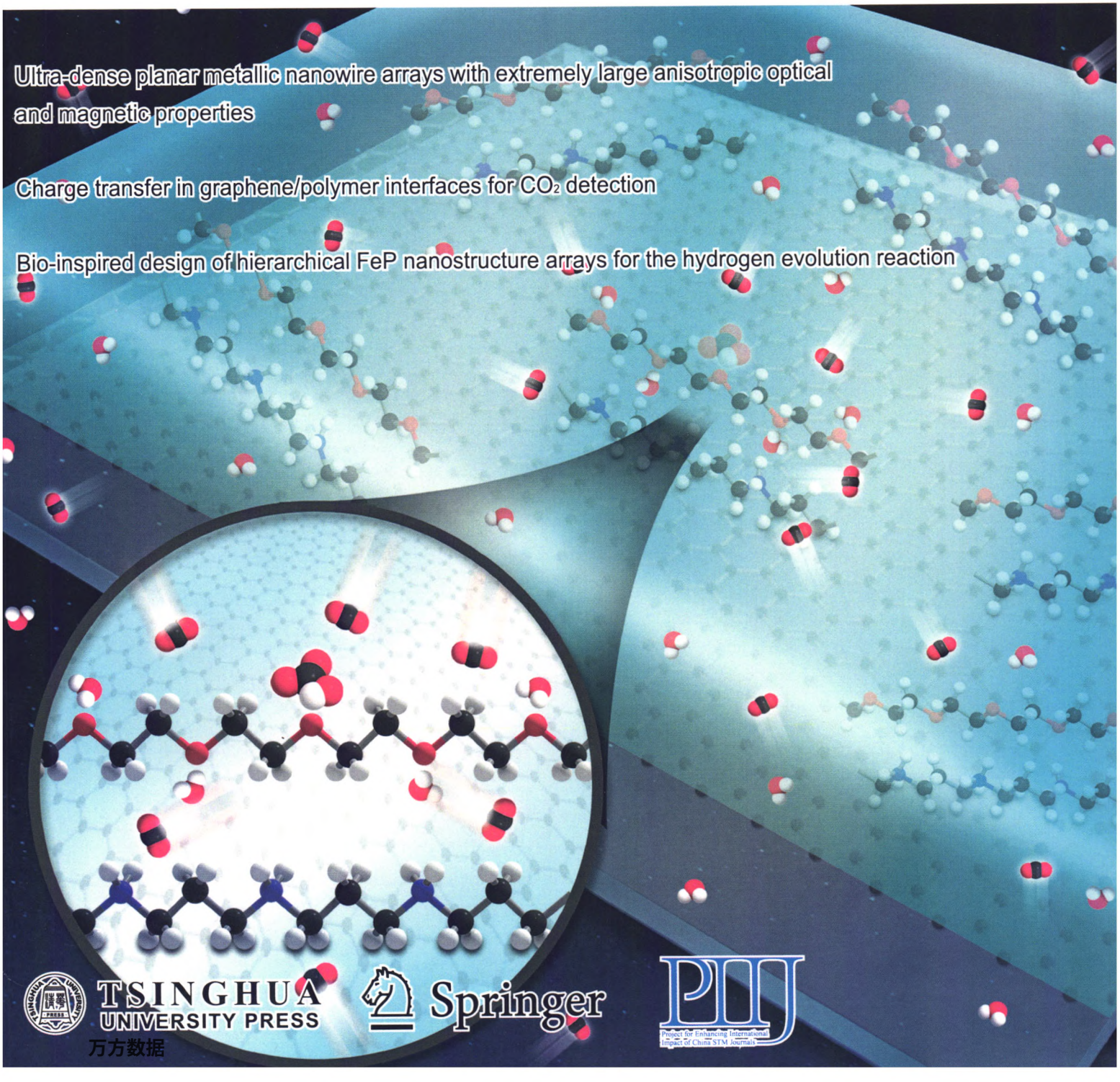

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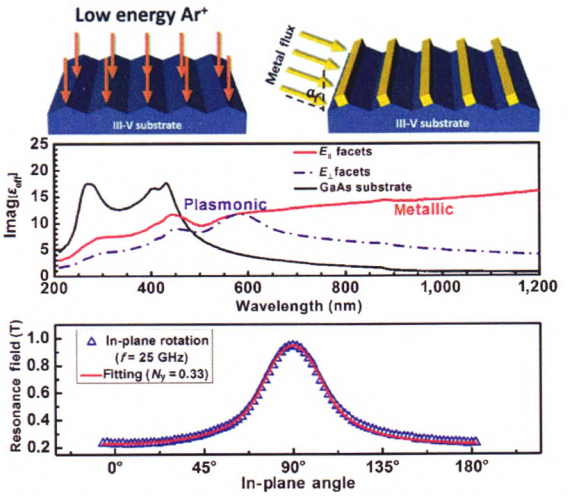
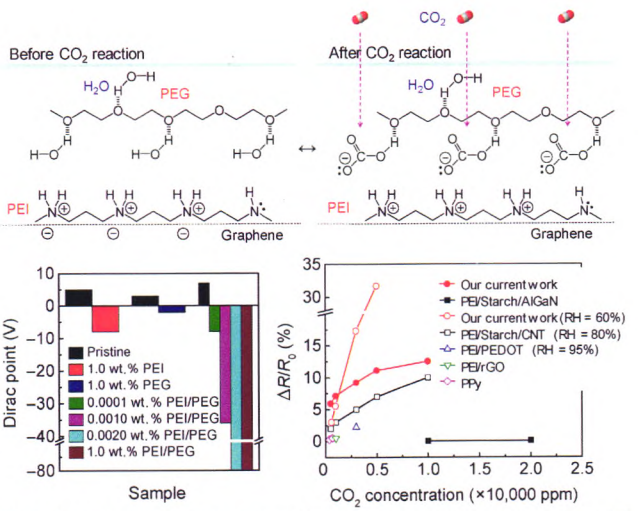
Contents

Research Articles



An efficient self-assembly method to fabricate large-area and ultra-dense planar metallic nanowire arrays on faceted surfaces is presented. The surfaces of crystalline III-V semiconductors are faceted by reverse epitaxy, and the deposited Au and Fe nanowire arrays with periodicities down to 45 nm exhibit extremely large anisotropic optical and magnetic properties.



The charge transfer processes between graphene and amine-rich polyethyleneimine (PEI) upon CO_2 exposure were significantly improved by the introduction of hygroscopic polyethylene glycol (PEG) in humid air, prompting the development of highly sensitive portable graphene-based chemiresistive sensors able to operate at room temperature and low power.

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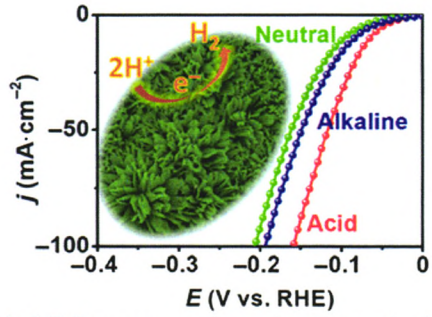
Bio-inspired design of hierarchical FeP nanostructure arrays for the hydrogen evolution reaction

Ya Yan[1,5], Xue Rong Shi[3,4], Mao Miao[2], Ting He[2], Ze Hua Dong[2], Ke Zhan[1], Jun He Yang[1], Bin Zhao[1,5,*], and Bao Yu Xia[2,6,*]

[1] University of Shanghai for Science and Technology, China
[2] Huazhong University of Science and Technology (HUST), China
[3] Shanghai University of Engineering Science, China
[4] University of Innsbruck, Austria
[5] Shanghai Innovation Institute for Materials, China
[6] Shenzhen Institute of Huazhong University of Science and Technology, China

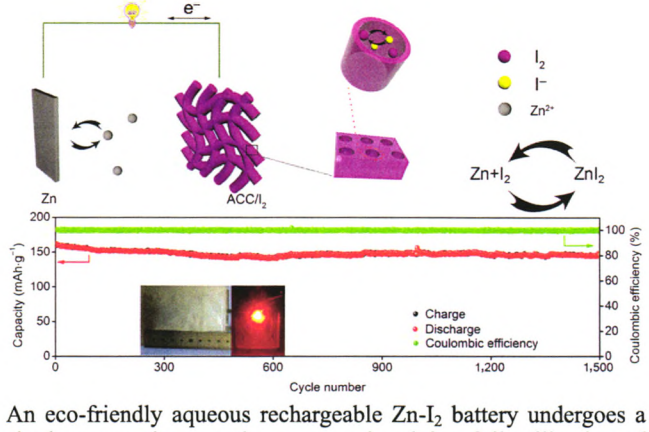


A hierarchical FeP nanoarray electrode composed of FeP nanopetals is successfully fabricated for hydrogen evolution reaction. Theoretical calculations reveal that the mixed P/Fe termination of the FeP surface is responsible for the high catalytic activity of the FeP electrode.

A sustainable aqueous Zn-I_2 battery

Chong Bai[1], Fengshi Cai[2], Lingchang Wang[2], Shengqi Guo[2], Xizheng Liu[2,*], and Zhihao Yuan[1,2,*]

[1] Tianjin University, China
[2] Tianjin University of Technology, China

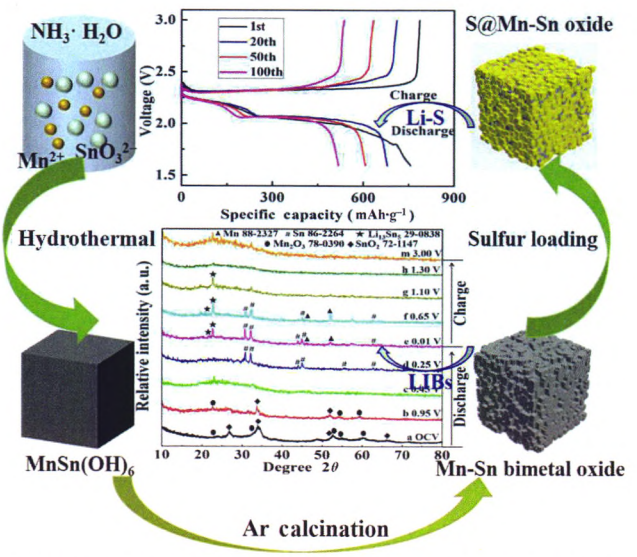


An eco-friendly aqueous rechargeable Zn-I_2 battery undergoes a single conversion reaction process involving full utilization of iodine atoms, thus showing high performance.

Mesoporous Mn-Sn bimetallic oxide nanocubes as long cycle life anodes for Li-ion half/full cells and sulfur hosts for Li-S batteries

Yanyan He[1], Liqiang Xu[1,*], Chuanchuan Li[1], Xiaoxia Chen[1], Gang Xu[1], and Xiaoyun Jiao[2]

[1] Shandong University, China
[2] Shandong Normal University, China

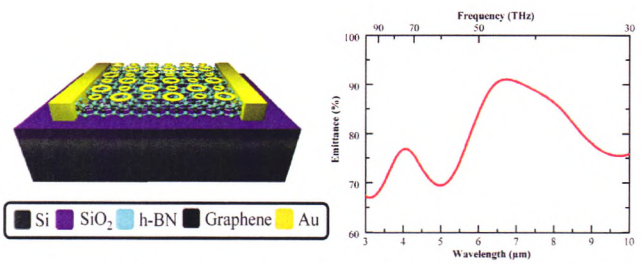


Mesoporous Mn-Sn bimetallic oxide nanocubes, fabricated via a facile hydrothermal method, show long cycle life in Li-ion half and full cells. The application of these materials as sulfur hosts for Li-S batteries is also investigated.

Metamaterial-based graphene thermal emitter

Cheng Shi, Nathan H. Mahlmeister, Isaac J. Luxmoore, and Geoffrey R. Nash*

University of Exeter, UK

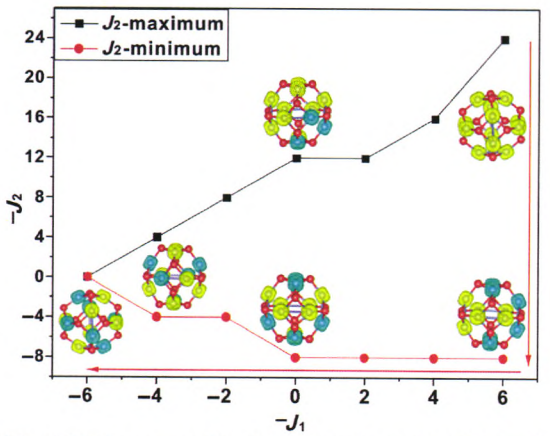


A metamaterial-based graphene thermal emitter was designed, fabricated, and characterized. The results demonstrate the feasibility of a new generation of thermal emitters.

Stability of the $Fe_{12}O_{12}$ cluster

Xiaohu Yu[1,2,3,*], Xuemei Zhang[1], and Xun-Wang Yan[3]

[1] Shaanxi University of Technology, China
[2] Moscow Institute of Physics and Technology, Russia
[3] Anyang Normal University, China

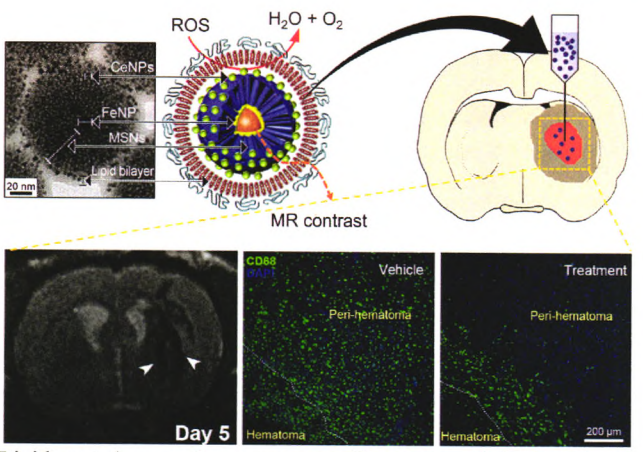


A highly stable bare cage $Fe_{12}O_{12}$ cluster is predicted by using an evolutionary algorithm and DFT+U calculations. Using Heisenberg's model, we trace the origin of the unexpected stability and exotic geometry of the bare $Fe_{12}O_{12}$ cluster to magnetic competition between the exchange constants J_1 and J_2, induced by superexchange interactions.

Customized lipid-coated magnetic mesoporous silica nanoparticle doped with ceria nanoparticles for theragnosis of intracerebral hemorrhage

Bong Geun Cha[1], Han-Gil Jeong[2], Dong-Wan Kang[2], Myong-Joo Nam[1], Chi Kyung Kim[2,3], Do Yeon Kim[2], In-Young Choi[2], Seul Ki Ki[2], Song I Kim[2], Ju hee Han[2], Jaeyun Kim[1,*], and Seung-Hoon Lee[2,*]

[1] Sungkyunkwan University, Republic of Korea
[2] Seoul National University Hospital 101 Daehak-ro, Republic of Korea
[3] Korea University Guro Hospital and Korea University College of Medicine, Republic of Korea

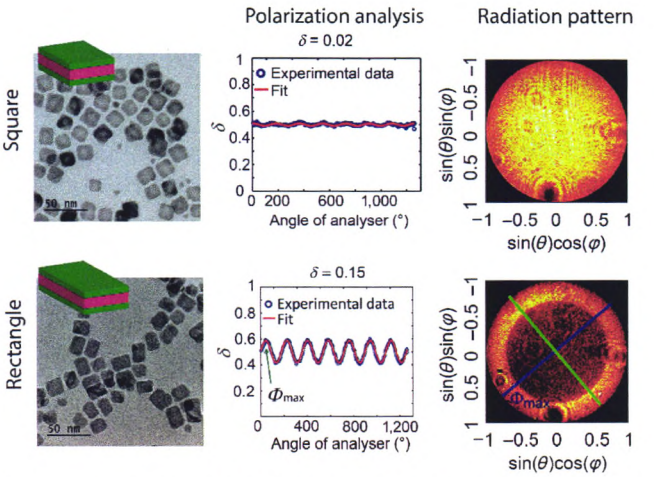


Lipid-coated magnetic mesoporous silica nanoparticles doped with ceria nanoparticles (LMCs) successfully reduced inflammation and brain edema, and they were visualized by magnetic resonance imaging.

Consequence of shape elongation on emission asymmetry for colloidal CdSe/CdS nanoplatelets

Fu Feng[1], Loan Thu Nguyen[1,2], Michel Nasilowski[1], Brice Nadal[1], Benoît Dubertret[1], Laurent Coolen[1], and Agnès Maître[1,*]

[1] UPMC Univ Paris 6, France
[2] Vietnam Academy of Science and Technology, Vietnam

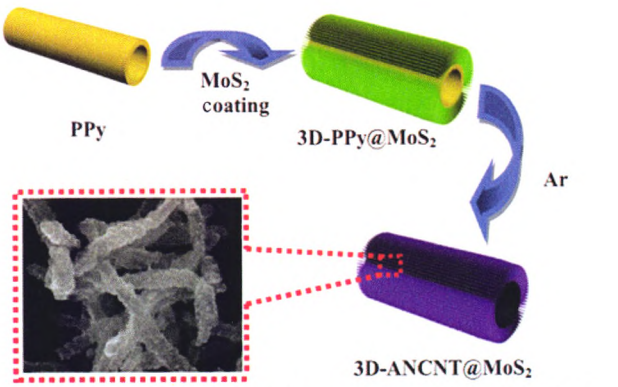


Individual square nanoplatelets are shown to emit unpolarized photoluminescence, with isotropic radiation patterns. In contrast, rectangular nanoplatelets exhibit polarized anisotropic emission, which can be appropriately described by the dielectric antenna effect caused by the elongated shape of the nanoplatelet.

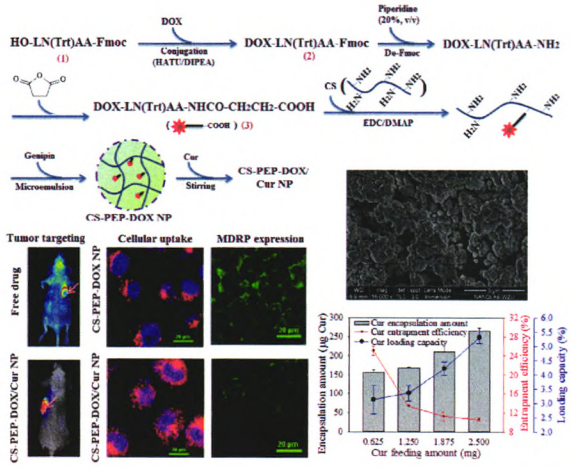
Ultrathin MoS_2 with expanded interlayers supported on hierarchical polypyrrole-derived amorphous N-doped carbon tubular structures for high-performance Li/Na-ion batteries

Xiaojun Zhao[1,2], Gang Wang[1], Xiaojie Liu[1,*], Xinliang Zheng[1], and Hui Wang[1,*]

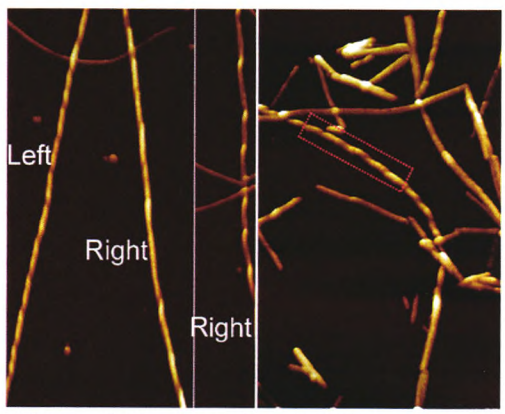
[1] Northwest University, China
[2] Ankang University, China



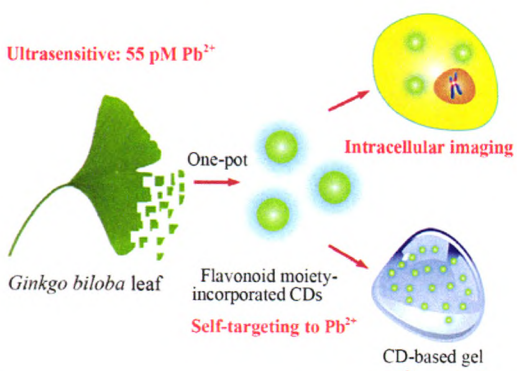
Design of ultrathin MoS_2 nanosheets with expanded interlayers supported on amorphous N-doped carbon nanotube (ANCNT) exhibits the improved electrochemical properties of lithium-ion batteries (LIBs) and sodium-ion batteries (SIBs).



Co-delivery of doxorubicin and curcumin within a legumain-sensitive nanocarrier significantly enhanced multidrug resistance-reversing efficiency and tumor-targeting properties.



Human islet amyloid polypeptides (IAPP) in fibrillar form are polymorphic, ambidextrous, and possess multiple periodicities. Upon interfacing with the small molecule epigallocatechin gallate (EGCG), IAPP fibrils displayed kinks and branching but conserved the twisted morphology.

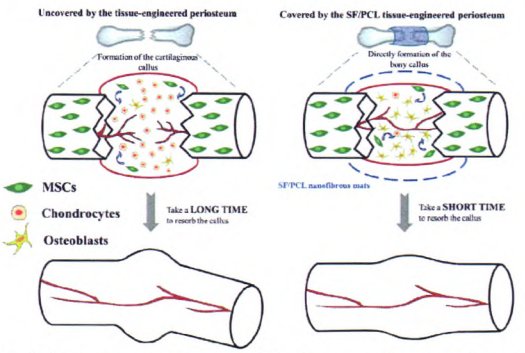


The flavonoid extract of *G. biloba* leaf derived carbon dot is highly fluorescent, biocompatible, and self-targeting to Pb^{2+}. It can be used for ultrasensitive detection and removal of Pb^{2+}.

Promoting osteogenic differentiation in pre-osteoblasts and reducing tibial fracture healing time using functional nanofibers

Gu Cheng[1], Jiajia Chen[1], Qun Wang[2], Xuewen Yang[1], Yuet Cheng[1], Zhi Li[1], Hu Tu[1], Hongbing Deng[1,*], and Zubing Li[1,*]

[1] Wuhan University, China
[2] Iowa State University, USA

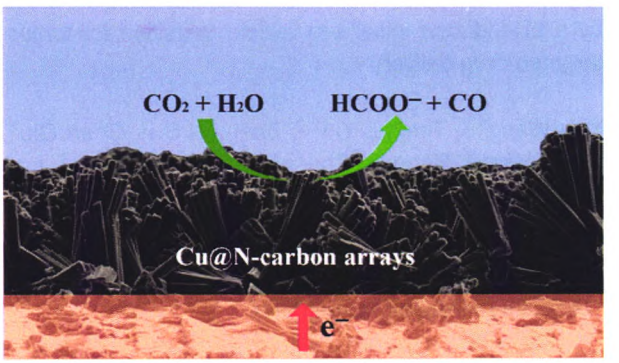


Silk fibroin/polycaprolactone (SF/PCL) composite membranes were used to form a synthetic periosteum that enabled osteoinduction and cellular delivery, and was able to function as a barrier. Following interruption of the tissue-engineered periosteum, mesenchymal stem cells (MSCs) at the fracture sites were induced to form osteoblasts rather than chondrocytes, and bony calluses rather than cartilaginous tissue formed in the fracture gap.

Ultra-small Cu nanoparticles embedded in N-doped carbon arrays for electrocatalytic CO_2 reduction reaction in dimethylformamide

Xiaolong Zhang[1], Ying Zhang[1], Fengwang Li[1], Christopher D. Easton[2], Alan M. Bond[1], and Jie Zhang[1,*]

[1] Monash University, Australia
[2] CSIRO Manufacturing, Australia

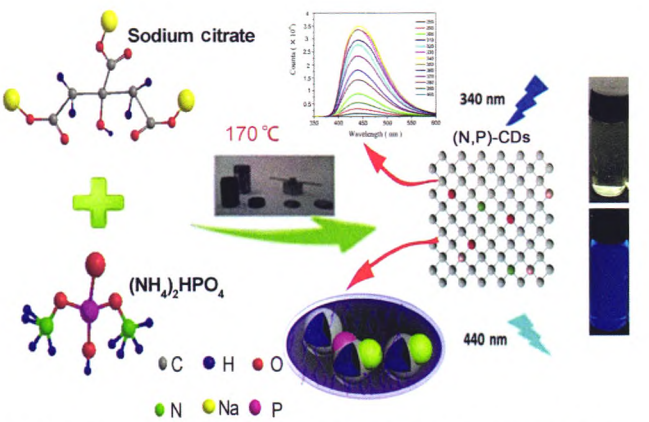


Ultra-small Cu nanoparticles embedded in N-doped carbon arrays exhibit a significantly enhanced catalytic activity for CO_2 reduction in dimethylformamide in comparison with polycrystalline Cu, with an order magnitude larger catalytic current density at a potential of –2.7 V vs. Fc/Fc^+ (Fc = ferrocene).

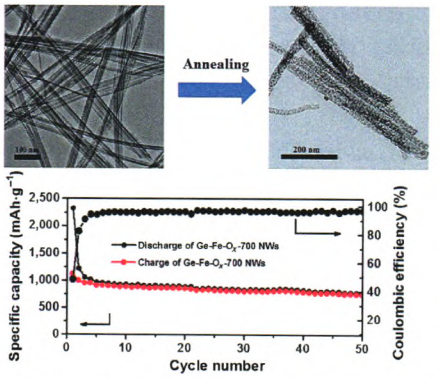
Synthesis, mechanical investigation, and application of nitrogen and phosphorus co-doped carbon dots with a high photoluminescent quantum yield

Quan Xu[1,*], Bofan Li[1], Yingchun Ye[1], Wei Cai[1], Weijun Li[1], Chuanyao Yang[2], Yusheng Chen[3], Meng Xu[4], Neng Li[5,*], Xusheng Zheng[6], Jason Street[7], Yan Luo[8], and Lulu Cai[2,*]

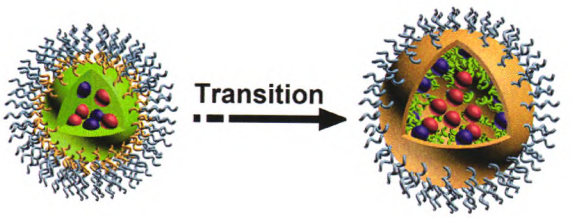
[1] China University of Petroleum (Beijing), China
[2] University of Electronic Science and Technology of China, China
[3] University of Akron, USA
[4] General Hospital of Chinese People's Liberation Army, China
[5] Wuhan University of Technology, China
[6] University of Science and Technology of China, China
[7] Mississippi State University, USA
[8] West Virginia University, USA



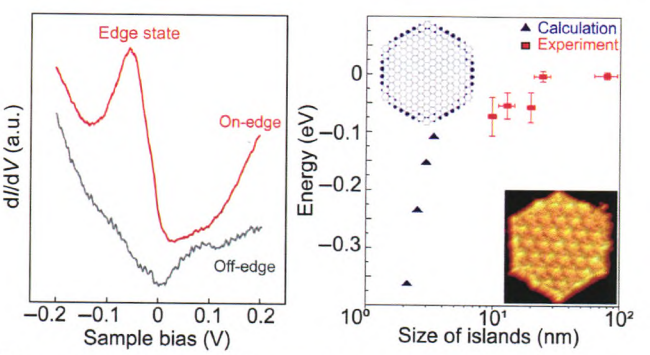
In this study, a single-step, high-efficiency hydrothermal method was applied to synthesize nitrogen and phosphorous-doped carbon dots ((N,P)-CDs) with a quantum yield of up to 53.8% with independent emission behavior.



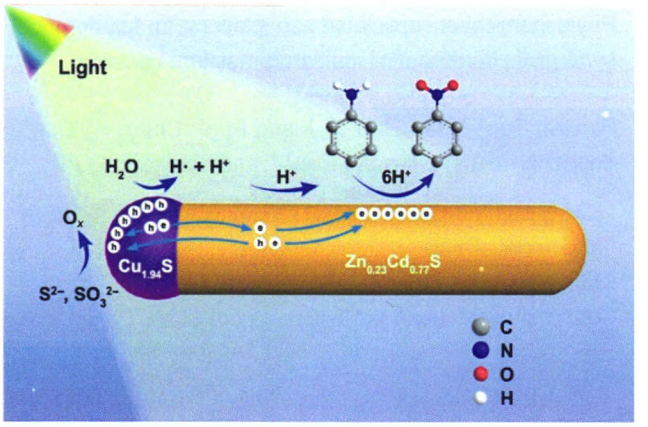
We designed porous Ge-Fe bimetal oxide nanowires (Ge-Fe-O_x-700 NWs) by a large-scale and facile solvothermal reaction. When used as the anode material for lithium-ion batteries, these Ge-Fe-O_x-700 NWs exhibited superior electrochemical performance and good cycling performance.



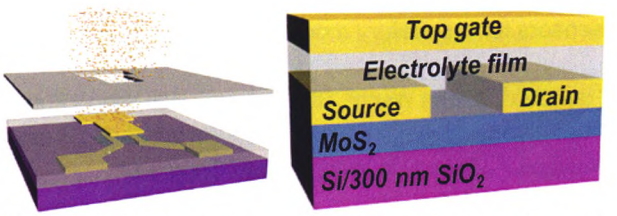
Nanospheres with ultrasound sensitivity and a uniform size distribution for effective drug delivery to solid tumors are described here; the nanospheres were prepared by a pH-induced micelle-to-vesicle transition, which allowed the encapsulation of a hydrophobic phase-transitional imaging agent into the vesicular lumen. A tumor site-specific release and tissue-penetrating delivery of an anticancer drug was achieved *in vivo*.



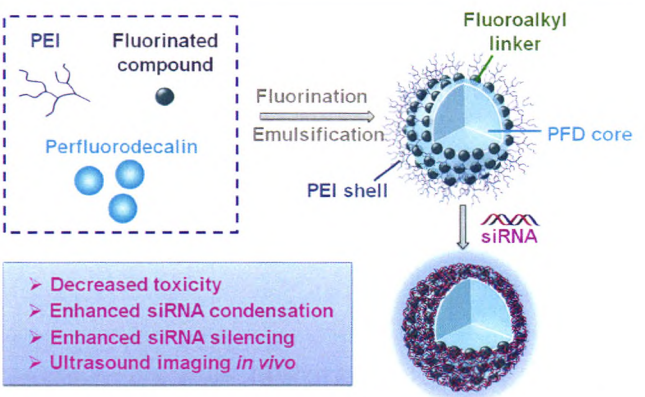
Edge states of free-standing graphene nanoislands suppressed by Ir substrates can be recovered by intercalating a layer of Si atoms between the graphene and the Ir substrate. The edge states gradually shift to the Fermi level with increasing island size.



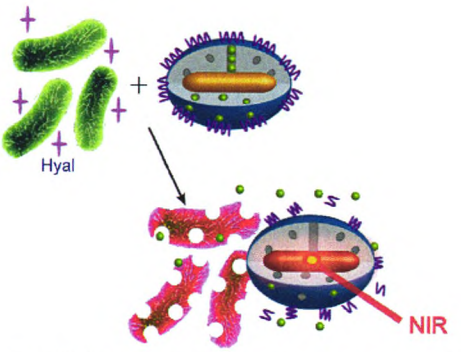
Active hydrogen species and photo-generated electrons can be directly applied to the hydrogenation process with $Cu_{1.94}S$-$Zn_{0.23}Cd_{0.77}S$ semiconductor heterojunction nanorods.



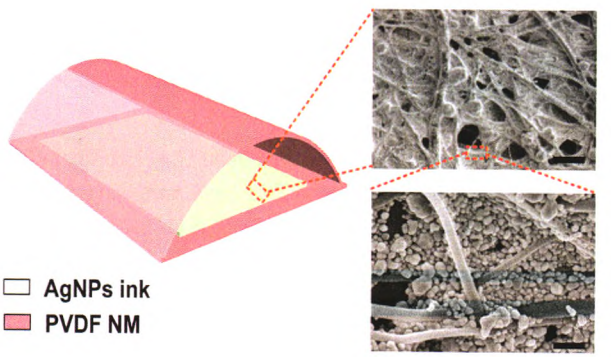
This work demonstrates a top-gated MoS_2 transistor with a spin-coated electrolyte layer as the dielectric. The superior carrier tuning capability together with a small film thickness of the electrolyte layer enables good performance at a relatively high operating frequency.



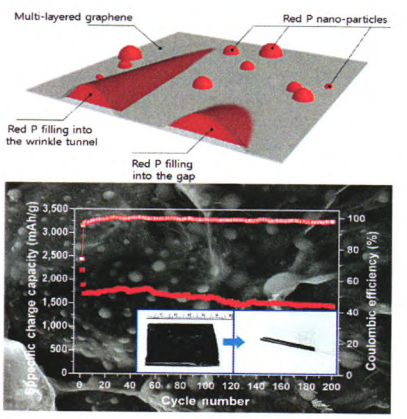
This study introduces fluorinated emulsion polyplexes as a safe and efficient method for s small interfering RNA (siRNA) delivery.



An "on-demand" delivery system was developed to enhance the bioavailability and selectivity of phytochemicals. The antimicrobial effect against multidrug-resistant strains was improved by the combination of chemo-photothermal therapy.



A self-powered and nanofiber-based triboelectric sensor (SNTS) is fabricated by batch-scale fabrication technologies using electrospinning and screen-printing for health monitoring via respiratory monitoring.

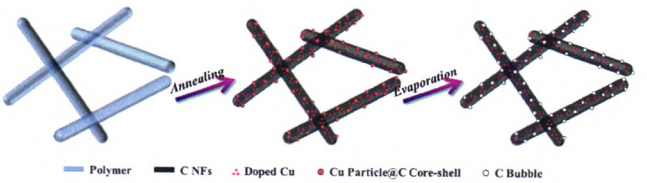


Nanosized red phosphorus (RP) was deposited on the surface of reduced graphene oxide (rGO) and in the void spaces between rGO layers through a single-step flash-heat treatment coupled with simultaneous reduction of graphene oxide. The resulting RP/rGO flexible film exhibited excellent electrochemical performance toward sodium-ion storage, as well as superior flame retardancy, associated with the RP component.

Osiers-sprout-like heteroatom-doped carbon nanofibers as ultrastable anodes for lithium/sodium ion storage

Hang Zhang[1], Guanhua Zhang[1,*], Zhiqin Li[1], Ke Qu[2], Huimin Shi[1], Qingfeng Zhang[1], Huigao Duan[1], and Jianhui Jiang[1,*]

[1] Hunan University, China
[2] Massachusetts Institute of Technology, USA

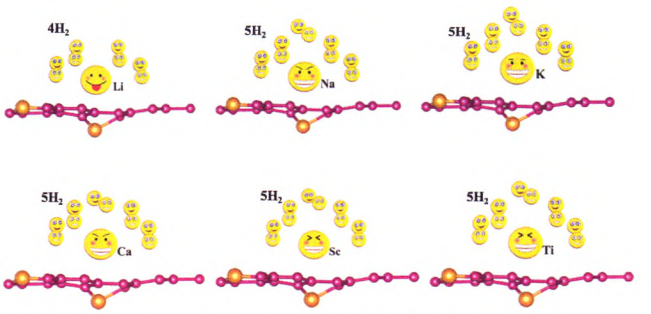


We report an *in situ* carbothermic reduction process for preparing osiers-sprout-like heteroatom-doped carbon nanofibers as anode materials with ultrastable Li^+/Na^+ storage.

Metallized siligraphene nanosheets (SiC_7) as high capacity hydrogen storage materials

Syeda R. Naqvi[1], Tanveer Hussain[3,*], Wei Luo[1], and Rajeev Ahuja[1,2]

[1] Uppsala University, Sweden
[2] Royal Institute of Technology (KTH), Sweden
[3] The University of Queensland, Australia

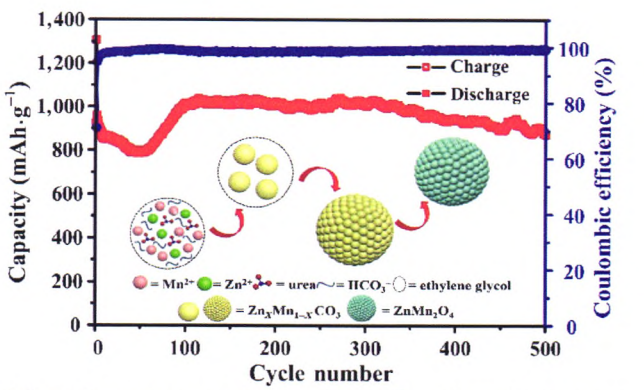


Metal adatoms strongly bind to SiC_7 sheets and obtain partial positive charges upon adsorption. These positively charged species induce an electric field, which is responsible for the polarization and subsequent adsorption of H_2 molecules in the vicinity of the adatoms.

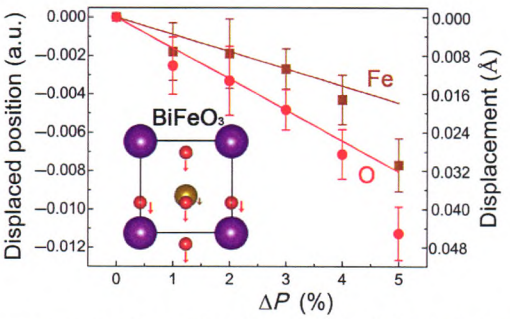
Ultrahigh-performance mesoporous $ZnMn_2O_4$ microspheres as anode materials for lithium-ion batteries and their *in situ* Raman investigation

Xiaobin Zhong[1], Xiaoxiao Wang[1], Huiyuan Wang[2,*], Zhizheng Yang[2], Yuxiong Jiang[1,*], Jianfeng Li[1,*], and Zhongqun Tian[1]

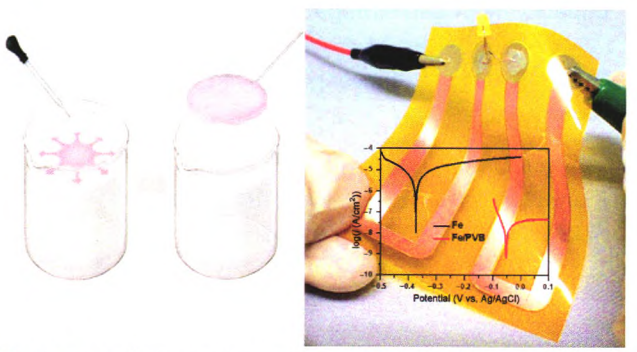
[1] Xiamen University, China
[2] Jilin University, China



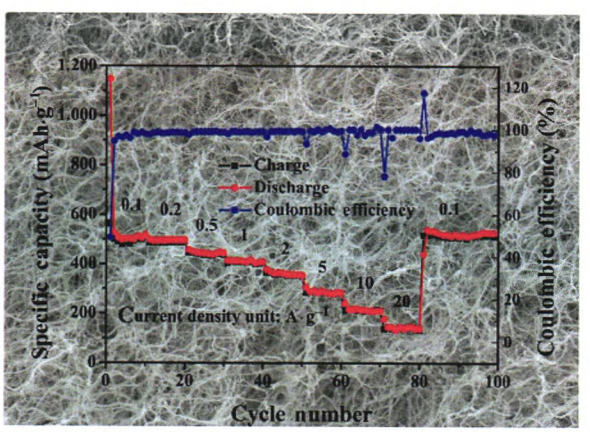
High-performance mesoporous $ZnMn_2O_4$ microspheres were fabricated using a solvothermal method to finely control the viscosity of the synthesis solution. We used *in situ* Raman spectroscopy to acquire insight into the electrochemical process for mesoporous $ZnMn_2O_4$.



Atomic movement in a ferroelectric thin film under external electric field and stress was demonstrated for the first time using time-resolved X-ray diffraction. This study indicates that the distance between Fe and O atoms is a key factor determining the polarization in $BiFeO_3$ thin films, rather than the simple displacement of the center atom and/or tetragonality of the unit cell.



We report a facile and scalable method to obtain large-scale freestanding polymer membranes with thicknesses below 10 nm at an air–water interface. These polymer membranes exhibited effective anti-corrosion protection for flexible electronic circuits.

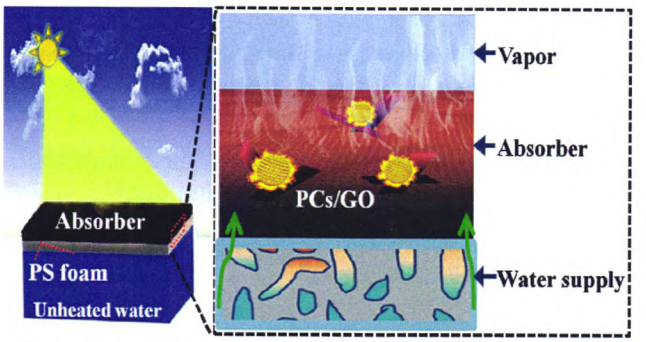


Nanosized MoS_2 embedded in a three-dimensional interconnected carbon nanofibers film was synthesized through a facile, scalable, and effective synthesis process. The synthesized material exhibits superior sodium storage performance.

Bifunctional plasmonic colloidosome/graphene oxide-based floating membranes for recyclable high-efficiency solar-driven clean water generation

Minmin Wang[1,2], Jie Zhang[1], Ping Wang[1], Chuanping Li[1,2], Xiaolong Xu[1], and Yongdong Jin[1,*]

[1] Changchun Institute of Applied Chemistry, Chinese Academy of Sciences, China
[2] University of Chinese Academy of Sciences, China

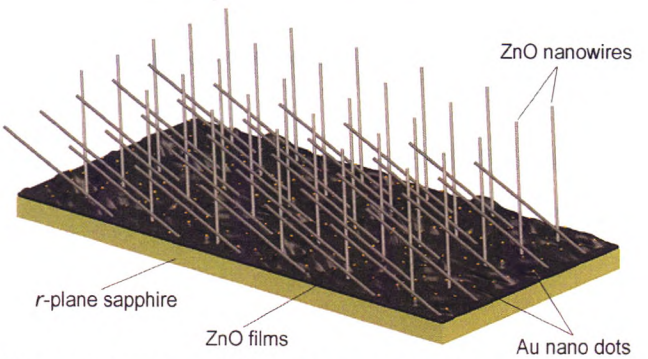


A high-efficiency solar steam generation membrane system (with a solar thermal conversion efficiency up to 92% at 10 $kW \cdot m^{-2}$) based on plasmonic colloidosome (PCs) and graphene oxide (GO) was developed and further exploited by modification with TiO_2 nanoparticles for solar-driven catalytic generation of clean water.

Growth modulation of simultaneous epitaxy of ZnO obliquely aligned nanowire arrays and film on *r*-plane sapphire substrate

Yongchun Xiao[1,2], Yaoyao Tian[1,2], Shujing Sun[1], Chenlong Chen[1,*], and Buguo Wang[3,*]

[1] Fujian Institute of Research on the Structure of Matter, Chinese Academy of Sciences, China
[2] Fujian Normal University, China
[3] Wright State University, USA



We report the successful simultaneous epitaxial growth of ZnO obliquely aligned nanowire arrays and film on *r*-plane sapphire substrate. We propose a simple approach for *in situ* building conductive connection between individually separated nanowires grown on an insulating substrate and describe the detailed synthesis strategy, mechanism, and material properties.

Piezo-phototronic and pyro-phototronic effects to enhance Cu(In, Ga)Se_2 thin film solar cells

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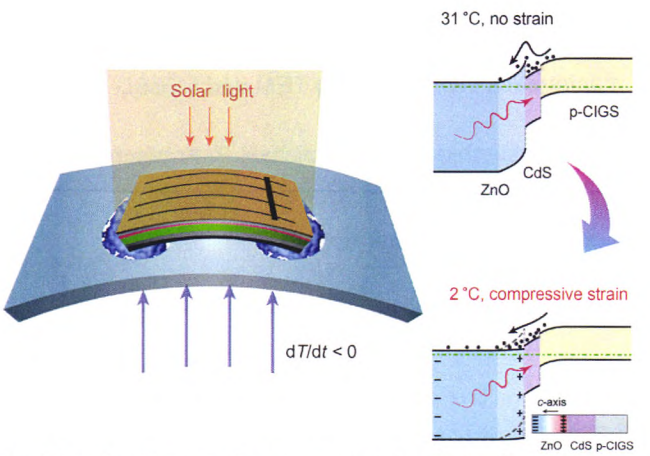
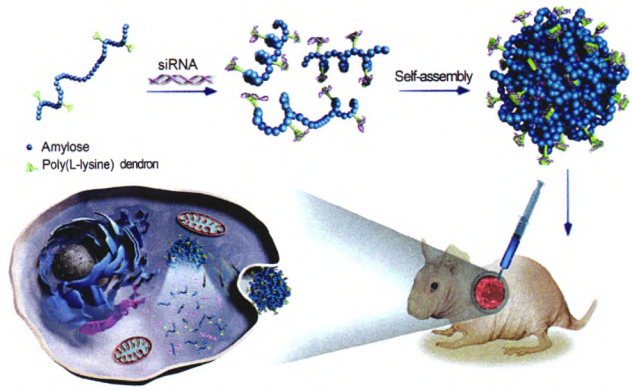
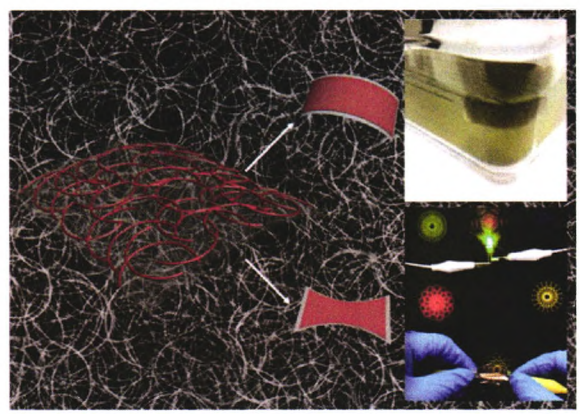
[1] Beijing Institute of Nanoenergy and Nanosystems, Chinese Academy of Sciences, China
[2] University of Chinese Academy of Sciences, China



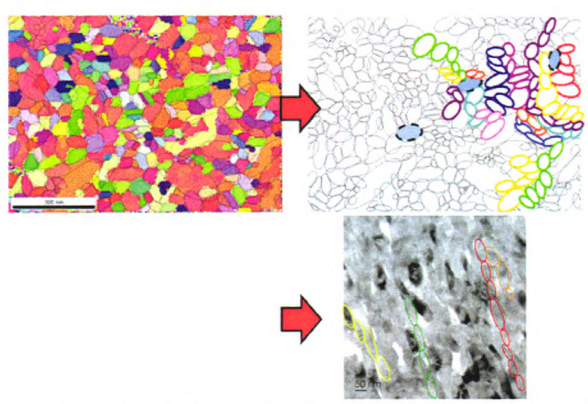
Applying the piezo- and pyro-phototronic effects simultaneously offers a new opportunity for enhancing the output performance of commercial Cu(In, Ga)Se_2 thin film solar cells.



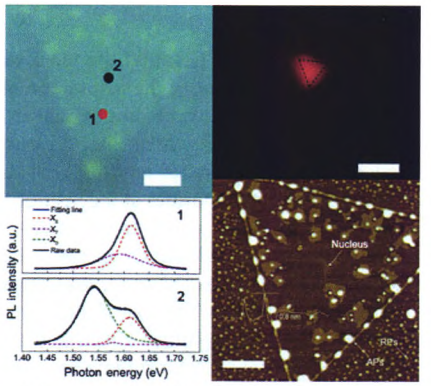
Amylose-derived cationic carrier was employed as a delivery reagent to study the interference of astrocyte elevated gene-1 (AEG-1) in osteosarcoma cells.



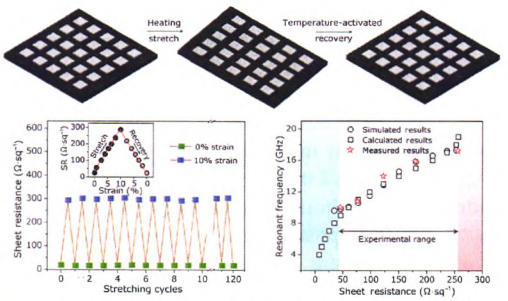
Ultrathin semicircle-shaped copper nanowires were synthesized in ethanol solution and were applied as flexible transparent conductors (FTCs). The fabricated FTCs show excellent optoelectrical performance during stretching indicating their enormous potential in flexible optical devices.



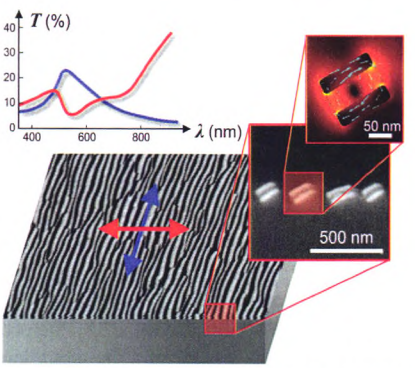
Herein, human dental enamel was studied using transmission electron microscopy (TEM) and electron backscatter diffraction (EBSD). The determination of apatite grain orientation enables the deduction of a chain formation mechanism of apatite grains with similar orientation, which can then be seen in the TEM images.



A strong and sharp defect-related photoluminescence (PL) peak detected at ambient conditions is reported in as-prepared chemical vapor deposition (CVD)-grown tungsten diselenide nanosheets.



Nanocomposite ink is applied to construct metamaterial structures on a flexible shape memory polymer composite. The composites effectively improve the repeatability, reliability, and tunability of sheet resistance because of the shape memory effect of the dielectric substrate and piezoresistive effect of the nanocomposite, and provide a new design concept of a microwave absorber and other electromagnetic devices.



The engineering of self-organized plasmonic metasurfaces is demonstrated using a maskless technique. The proposed nanofabrication approach enables gap-plasmon nanostrip dimer arrays providing optical dichroism and magnetic dipole resonance.

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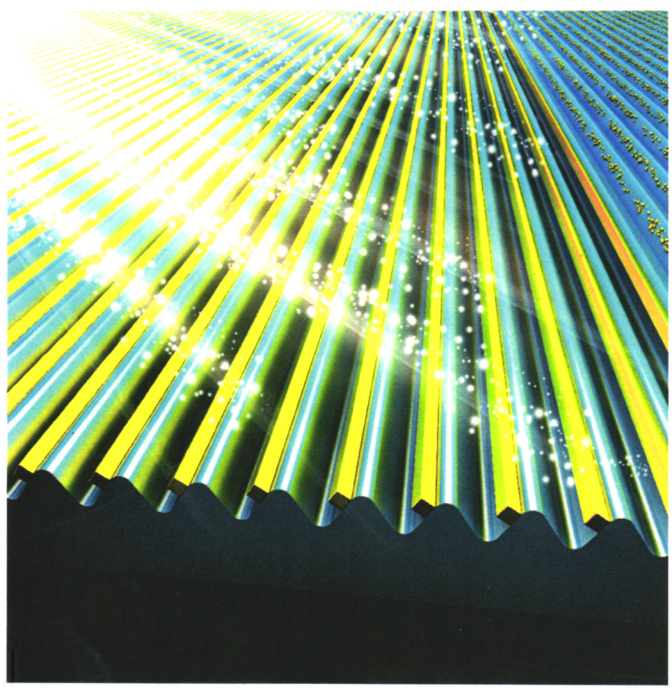

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