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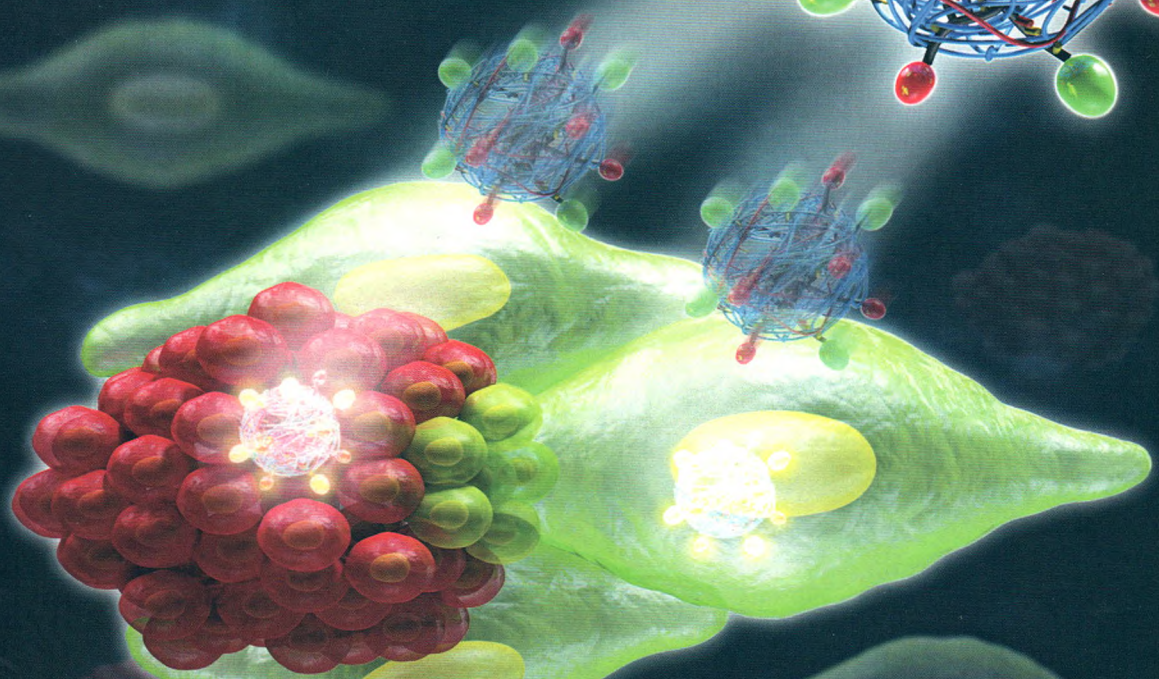
Nano Research

Fluorescent nanoswitch for monitoring specific pluripotency-related microRNAs of induced pluripotent stem cells: Development of polyethyleneimine-oligonucleotide hybridization probes

Simple, fast, label-free, and nanoquencher-free system for operating multivalued DNA logic gates using poly-thymine templated CuNPs as signal reporters

Ultrathin ZnS nanosheet/carbon nanotube hybrid electrode for high-performance flexible all-solid-state supercapacitor



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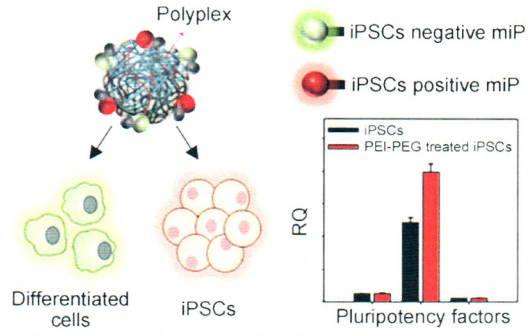
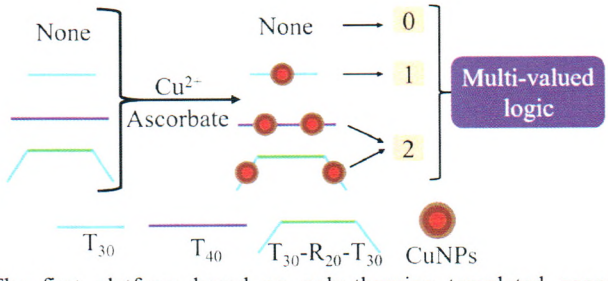
Research Articles



Polyethyleneimine-oligonucleotide fluorescent polyplex imaging probes can distinguish pluripotent stem cells from heterogeneous cells within 30 min by sensing specific target miRNAs associated with pluripotency of human induced pluripotent stem cells (hiPSCs) without affecting pluripotency.



The first platform based on poly-thymine templated copper nanoparticles (CuNPs) for operating various label-free multi-valued DNA logic gates was constructed.

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Ultrathin ZnS nanosheet/carbon nanotube hybrid electrode for high-performance flexible all-solid-state supercapacitor

Xiaoyi Hou[1], Tao Peng[1], Jinbing Cheng[1], Qiuhong Yu[1], Rongjie Luo[1], Yang Lu[1], Xianming Liu[2], Jang-Kyo Kim[3], Jun He[4], and Yongsong Luo[1,*]

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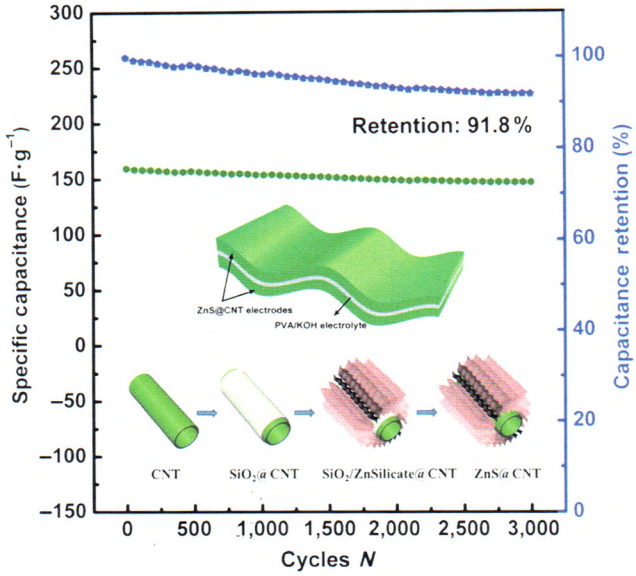
[2] Luoyang Normal University, China
[3] Hong Kong University of Science and Technology, Hong Kong, China
[4] National Center for Nanoscience and Technology, China



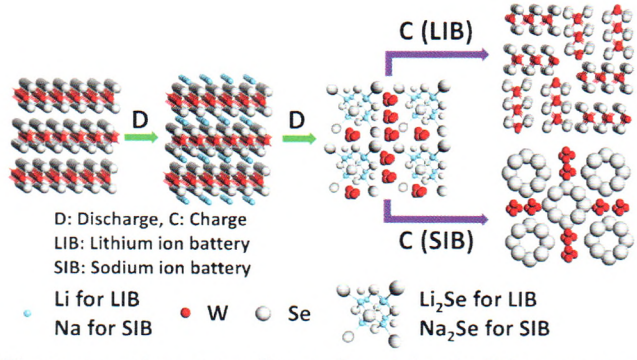
Hierarchical ultrathin ZnS nanosheet arrays supported on a C-nanotube surface are synthesized via a multistep hydrothermal approach and investigated as electrode materials for a supercapacitor and a flexible all-solid-state device.

2570–2583

Tungsten diselenide nanoplates as advanced lithium/sodium ion electrode materials with different storage mechanisms

Wanfeng Yang[1], Jiawei Wang[2], Conghui Si[1], Zhangquan Peng[2,*], and Zhonghua Zhang[1,*]

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



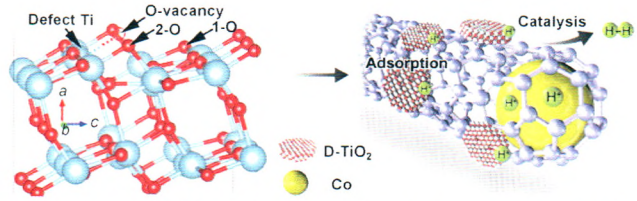
The *in situ* and *ex situ* studies confirmed that the WSe_2-nanoplate electrode had different lithium- and sodium-storage mechanisms.

2584–2598

Enhanced electrocatalytic activity of Co@N-doped carbon nanotubes by ultrasmall defect-rich TiO_2 nanoparticles for hydrogen evolution reaction

Jiayuan Yu[1,2], Weijia Zhou[1,*], Tanli Xiong[1], Aili Wang[1,2], Shaowei Chen[1,3], and Benli Chu[2]

[1] South China University of Technology, China
[2] South China Normal University, China
[3] University of California, USA

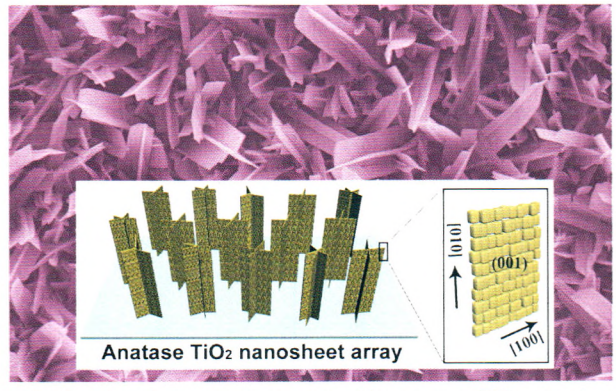


A durable and highly active electrochemical hydrogen-evolution reaction catalyst based on defect-rich TiO_2 nanoparticles loaded on Co nanoparticles@N-doped carbon nanotubes is synthesized by electrostatic spinning and a subsequent calcining process. It exhibits a small onset potential of –57.5 mV and a Tafel slope of 73.5 mV·dec^{-1}.

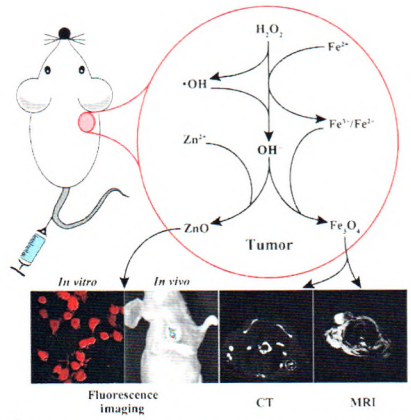
Mesocrystalline TiO_2 nanosheet arrays with exposed {001} facets: Synthesis via topotactic transformation and applications in dye-sensitized solar cells

Yanhe Zhang, Jinguang Cai, Yurong Ma, and Limin Qi*

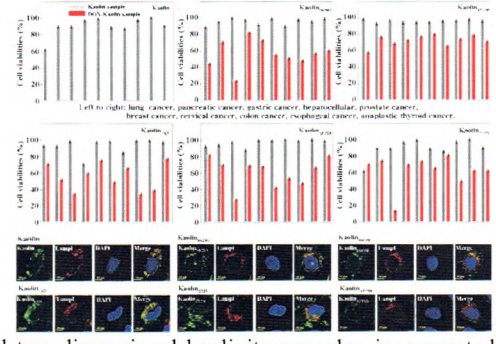
Peking University, China



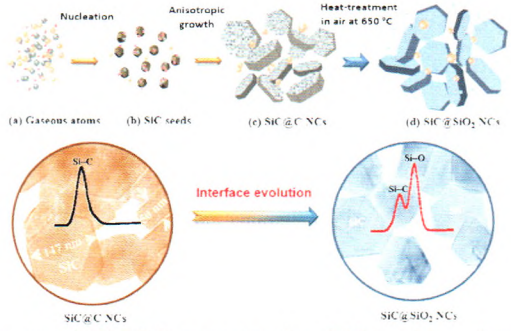
Vertically aligned arrays of mesocrystalline anatase TiO_2 nanosheets with exposed {001} facets were fabricated through a fluorine-free topotactic transformation approach. An efficiency of 8.85% was achieved for a dye-sensitized solar cell based on double-layered TiO_2 nanosheet arrays.



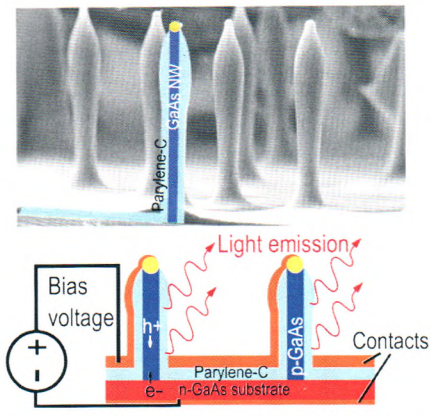
Fe^{2+} and Zn^{2+} were used to force cancer cells to spontaneously synthesize fluorescent ZnO nanoclusters and magnetic Fe_3O_4 nanoclusters, which could then be visualized using cancer multimodal imaging.



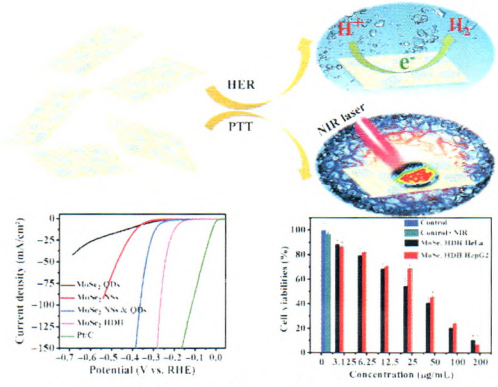
Natural two-dimensional kaolinite nanoclay incorporated into an emerging drug delivery system could feasibly pave a way towards high-performance nanotherapeutics, with a high level of biocompatibility and very low toxicity towards pancreatic cancer, gastric cancer, prostate cancer, breast cancer, colorectal cancer, esophageal cancer, and differentiated thyroid cancer cells. Fluorescein isothiocyanate (FITC)-labeled original kaolinite (Kaolin) and Kaolin intercalation compounds (green) were shown to be gradually taken up by the cells and demonstrated good colocalization with lysosome (Lamp1, red).



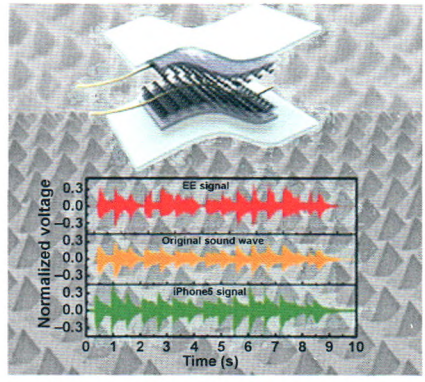
Carbon-coated SiC@C nanocapsules (NCs) with a hexagonal platelet-like morphology were fabricated by a simple direct current (DC) arc-discharge plasma method. The carbon shells of SiC@C NCs were subsequently converted into SiO_2 shells by a heat-treatment process at 650 °C in air, during such a process the shape and inherent characters of crystalline SiC core were inherited.



Nanowire encapsulation with parylene-C is investigated. The encapsulation provides electrical insulation from the substrate, greatly reduces reflectance, improves the optical response of the nanowire array, and is suitable for various nanowire types.



Molybdenum selenide hetero-dimensional hybrid ($MoSe_2$ HDH) self-assembled by nanodots and nanosheets was first reported. The $MoSe_2$ HDH displays excellent hydrogen evolution reaction activity and possesses not only remarkable photothermal therapy effect for cancer but also significant X-ray computed tomography/photoaccoustic imaging signal enhancement.

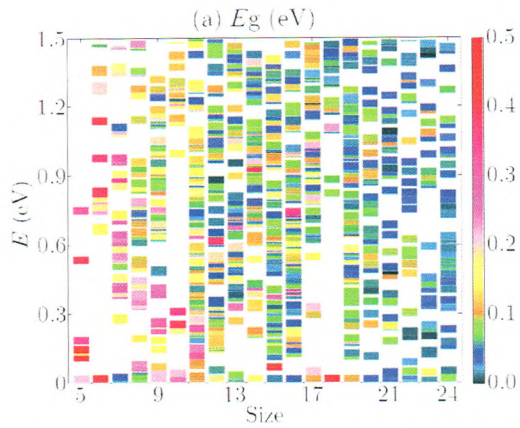


Flexible electronic eardrum is achieved by combining a polyethylene (PE)–polydimethylsiloxane (PDMS) bilayer with a single-walled carbon nanotube (SWNT) ultrathin film and a micro-pyramid structure. The device demonstrates superior sensitivity, stability, and high frequency response for recording and recognizing voice and may be used as a low-cost implantable acoustical bioelectronics device.

Glass-like energy and property landscape of Pt nanoclusters

Zhanghui Chen[1,2], Jingbo Li[2], Shushen Li[2], and Lin-Wang Wang[1,*]

[1] Lawrence Berkeley National Laboratory, USA
[2] Institute of Semiconductors, Chinese Academy of Sciences, China

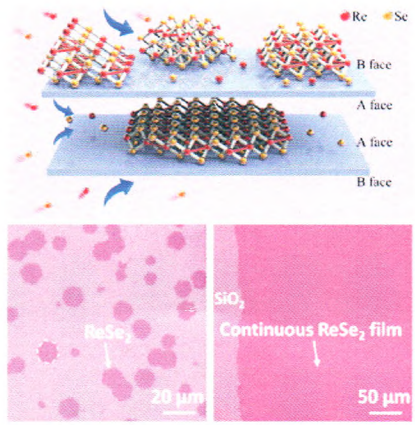


Using global search and data mining methods, the energy and property landscape of Pt nanoclusters are found to be glass-like.

Epitaxial growth of large-area and highly crystalline anisotropic $ReSe_2$ atomic layer

Fangfang Cui[1], Xiaobo Li[1], Qingliang Feng[2], Jianbo Yin[2], Lin Zhou[3], Dongyan Liu[1], Kaiqiang Liu[1], Xuexia He[1], Xing Liang[1], Shengzhong Liu[1], Zhibin Lei[1], Zonghuai Liu[1], Hailin Peng[2], Jin Zhang[2], Jing Kong[3], and Hua Xu[1,*]

[1] Shaanxi Normal University, China
[2] Peking University, China
[3] Massachusetts Institute of Technology, USA

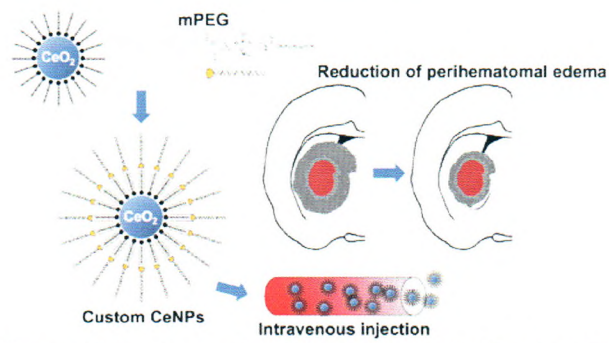


Anisotropic two-dimensional (2D) layered rhenium diselenide ($ReSe_2$) with a high crystal quality and uniform monolayer thickness is synthesized via epitaxial growth with a confined reaction space. The as-grown $ReSe_2$ exhibits superior electrical and near-infrared photoresponse properties.

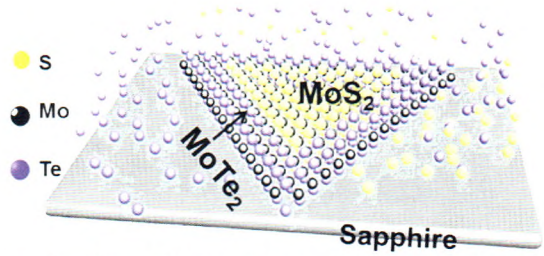
Biocompatible custom ceria nanoparticles against reactive oxygen species resolve acute inflammatory reaction after intracerebral hemorrhage

Dong-Wan Kang[1], Chi Kyung Kim[1,2], Han-Gil Jeong[1], Min Soh[3,4], Taeho Kim[3,4], In-Young Choi[1], Seul-Ki Ki[1], Do Yeon Kim[1], Wookjin Yang[1], Taeghwan Hyeon[3,4], and Seung-Hoon Lee[1,*]

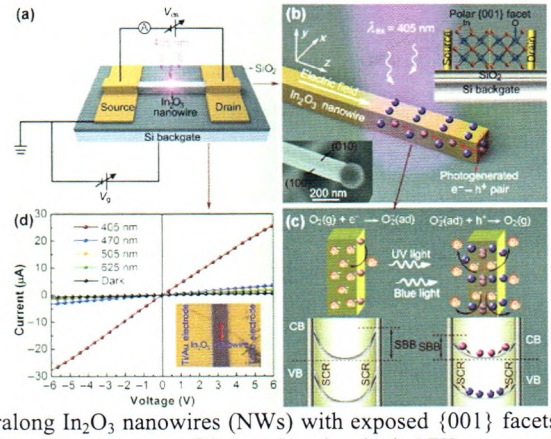
[1] Seoul National University Hospital, Republic of Korea
[2] Korea University Guro Hospital and Korea University College of Medicine, Republic of Korea
[3] Institute for Basic Science (IBS), Republic of Korea
[4] Seoul National University, Republic of Korea



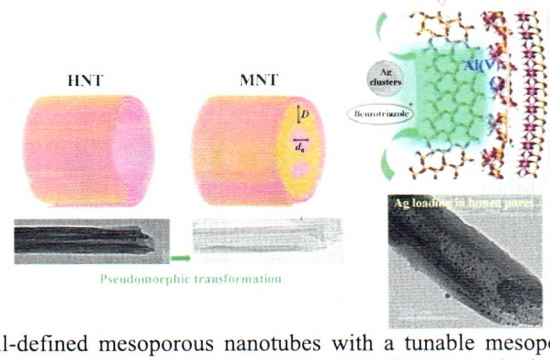
Biocompatible custom-made ceria nanoparticles significantly reduce perihematomal edema formation by attenuating inflammation and oxidative injury in an intracerebral hemorrhage model. Intravenously administered ceria nanoparticles pass through the damaged blood–brain barrier, and are strongly recruited to the perihematomal area, where they can exert maximum protective effect.



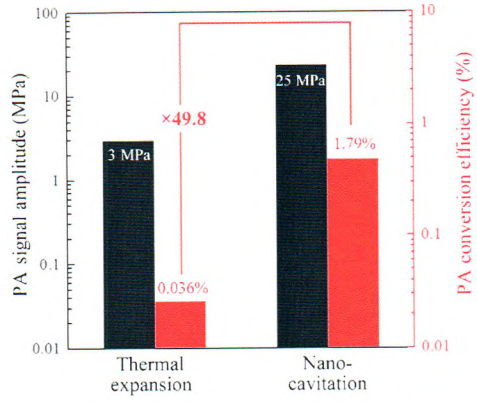
We developed a chalcogen atom-exchange synthesis route for synthesizing monolayer multiphasic $MoTe_2$ from monolayer MoS_2 and examined the growth process. This method provides a controllable approach for fabricating monolayer $MoTe_2$. We also conducted an in-depth study of the phase transformation of the monolayer transition-metal dichalcogenide.



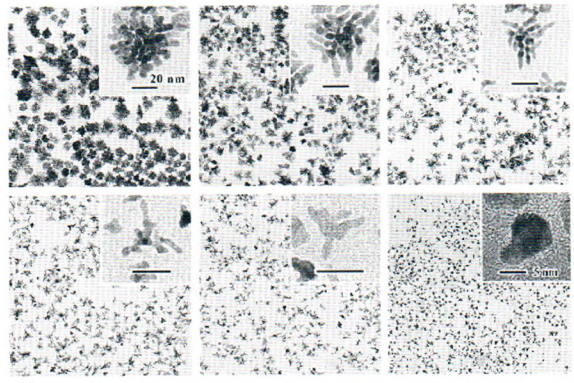
Ultralong In_2O_3 nanowires (NWs) with exposed {001} facets and uniform diameters were fabricated, and a single NW was assembled into a high-performance photodetector. An ultrahigh external quantum efficiency of 1.46×10^9% was obtained, which is the highest among reported In_2O_3-based photodetectors.



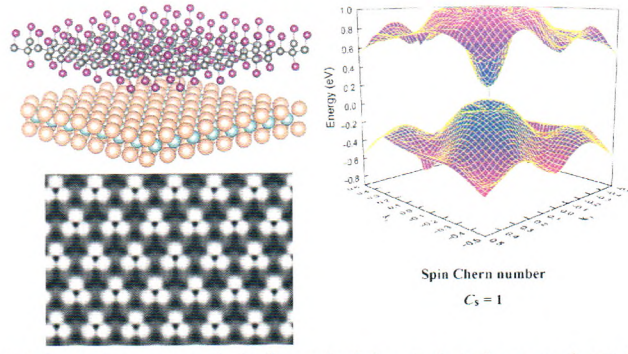
Well-defined mesoporous nanotubes with a tunable mesoporous silica inner shell and a preserved clay outer shell were obtained by exploiting the chemical components and morphology of natural clay. Using density functional theory calculations, the structure and energetics of Al leaching and Si condensation were analyzed in detail. The mesoporous silica nanotubes had numerous active Al(V) species and a large surface area up to 583 m^2/g (increased by a factor of 10). They are promising candidates as drug-loading nanocontainers and nanoreactors.



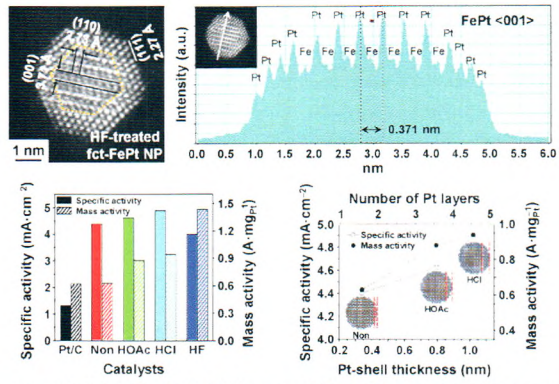
Plasmon-mediated nanocavitation induces an ultrahigh photoacoustic conversion efficiency compared with the thermal-expansion mechanism.



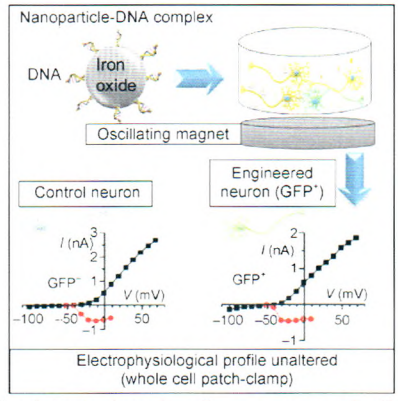
We develop a facile ultrafine sub-3 nm Cu seed-mediated approach for fabricating Pd–Cu bimetallic trigonal hierarchical nanoframes (THNFs), whereby the size of the Pd–Cu THNFs is tuned from 45 to 5 nm.



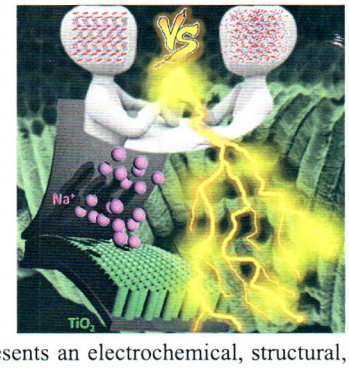
$MoTe_2$ is demonstrated via first-principles study to be a good match for a GeI monolayer because it preserves the nontrivial quantum spin Hall phase. The spin Chern number is directly calculated to be −1. The sizable bandgap is 0.24 eV and can be detected at room temperature.



We controlled the Pt-shell thickness of fully $L1_0$-ordered face-centered tetragonal (fct) FePt nanoparticles (NPs) by using several acids with different acid strengths for surface-Fe etching and studied the effects of both surface-Fe etching and Pt-shell thickness on the electrocatalytic properties of fct-FePt NPs for the methanol oxidation reaction (MOR).



An electrophysiological study of neurons genetically engineered using iron oxide nanoparticles reveals the high safety of this approach.



This work presents an electrochemical, structural, and theoretical investigation of the controversial mechanism of reversible Na^+ storage in TiO_2 nanotube arrays, with the aim of showing the potential of these systems as anode materials for sodium-ion batteries.

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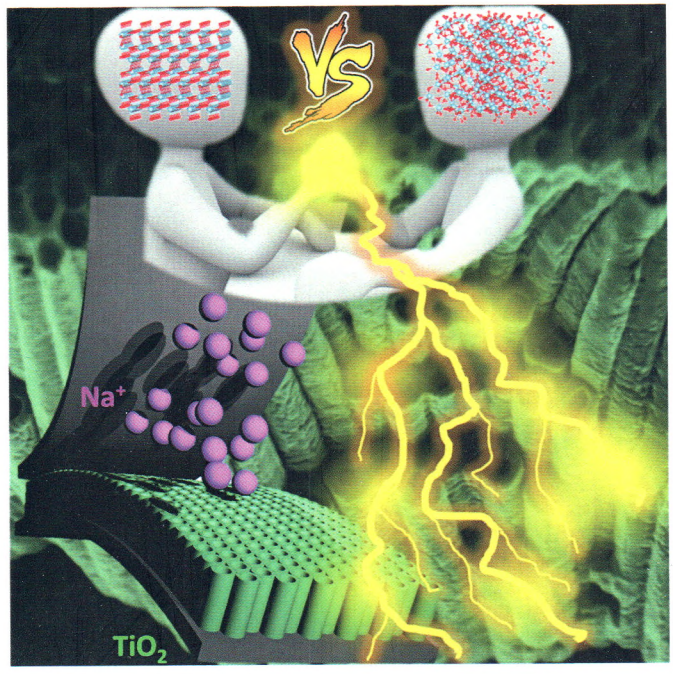

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