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Engineering carbon quantum dots for photomediated theranostics

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Extraction, detection, and profiling of serum biomarkers using designed $\text{Fe}_3\text{O}_4@\text{SiO}_2@\text{HA}$ core-shell particles



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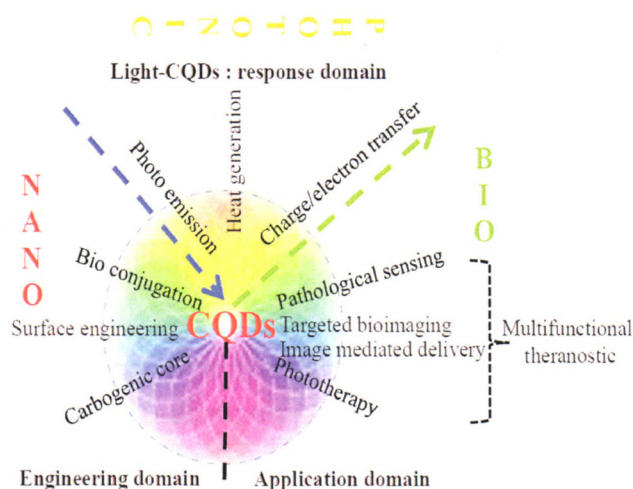
Review Articles

Engineering carbon quantum dots for photomediated theranostics

Mahbub Hassan, Vincent G. Gomes*, Alireza Dehghani, and Sara M. Ardekani

The University of Sydney, Australia

1–41



This article provides a comprehensive review of the engineering of carbon quantum dots for nanobiophotonic applications. It encompasses fundamental aspects to photomediated bioapplications of carbon quantum dots, with discussions on their prospects.

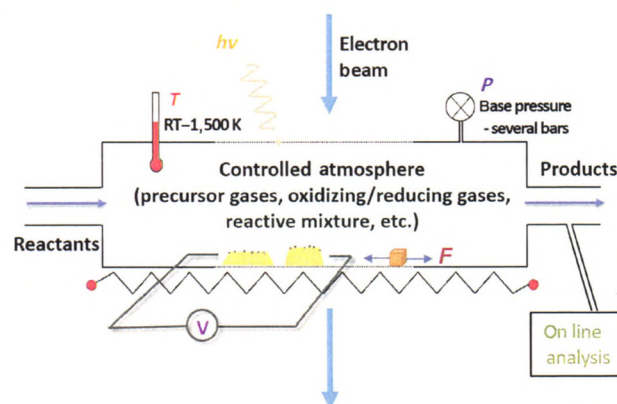
Recent advances in gas-involved *in situ* studies via transmission electron microscopy

Ying Jiang^{1,2}, Zhengfei Zhang¹, Wentao Yuan¹, Xun Zhang¹, Yong Wang^{1,*}, and Ze Zhang^{1,*}

¹ Zhejiang University, China

² Shanghai University, China

42–67



The recent progress in research on gas–solid interactions via controlled-atmosphere transmission electron microscopy is reviewed.

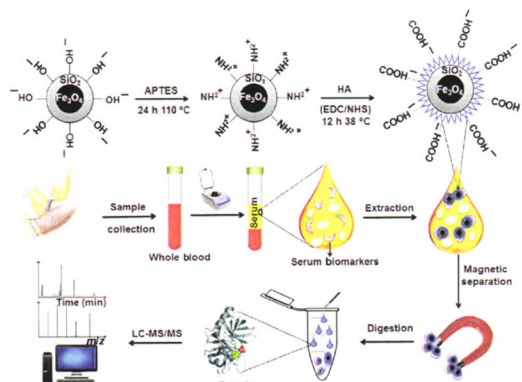
Research Articles

Extraction, detection, and profiling of serum biomarkers using designed $\text{Fe}_3\text{O}_4@\text{SiO}_2@\text{HA}$ core-shell particles

Chandrababu Rejeeth¹, Xuechao Pang¹, Ru Zhang¹, Wei Xu¹, Xuming Sun¹, Bin Liu¹, Jiatao Lou¹, Jingjing Wan², Hongchen Gu¹, Wei Yan^{1,*}, and Kun Qian^{1,*}

¹ Shanghai Jiao Tong University, China

² Shanghai University, China



We constructed hyaluronic acid (HA) based functional materials and device through layer-by-layer assembling. Further in combination with mass spectrometry and electrochemistry methods, we achieved efficient extraction, detection, and profiling of serum biomarkers via ligand-protein interactions.

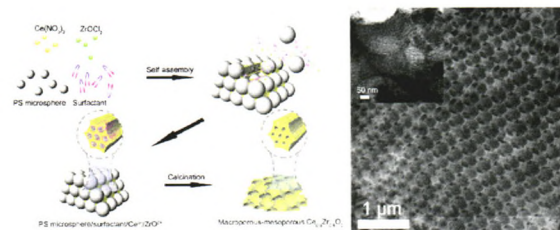
68–79

Highly ordered macroporous-mesoporous $\text{Ce}_{0.4}\text{Zr}_{0.6}\text{O}_2$ as dual-functional material in a polysulfide polymer

Zhenxing Li^{1,*}, Jianzheng Zhang^{2,*}, Mingming Li¹, Xiaofei Xing¹, and Qiuyu Zhang²

¹ China University of Petroleum (Beijing), China

² Northwestern Polytechnical University, China



A highly hierarchically ordered microporous-mesoporous $\text{Ce}_{0.4}\text{Zr}_{0.6}\text{O}_2$ solid solution with crystalline framework walls was directly and simply prepared using polystyrene (PS) microspheres and a block copolymer as dual templates. The PS microspheres and block copolymer were assembled into colloidal crystals and mesoscopic rod-like micelles to form macroporous and mesoporous templates, respectively, by a one-step process. The microporous-mesoporous $\text{Ce}_{0.4}\text{Zr}_{0.6}\text{O}_2$ material significantly improved the ultraviolet resistance and mechanical performance of a polysulfide polymer.

80–88

Low-cost disordered carbons for Li/S batteries: A highperformance carbon with dual porosity derived from cherry pits

Celia Hernández-Rentero¹, Rafael Córdoba¹, Noelia Moreno¹, Alvaro Caballero¹, Julian Morales^{1,*}, Mara Olivares-Marín², and Vicente Gómez-Serrano²

¹ Universidad de Córdoba, Spain

² Universidad de Extremadura, Spain



A hierarchical porous carbon (HPC) was synthesized from cherry pits using phosphoric acid as activating agent. HPC/S composite exhibits excellent performance as electrodes for Li/S batteries at both low and high rates. This outstanding property was observed without a preliminary thermal treatment of the composite and in the absence of doping elements such as N and/or S in the carbon.

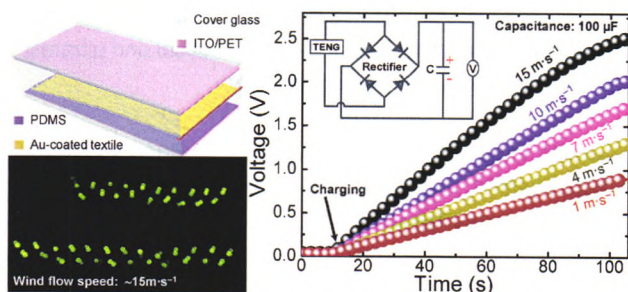
89–100

Triboelectric nanogenerators with gold-thin-film-coated conductive textile as floating electrode for scavenging wind energy

Bhaskar Dudem, Dong Hyun Kim, and Jae Su Yu*

Kyung Hee University, Republic of Korea

101–113



A triboelectric nanogenerator (TENG) with a simple fabrication process, low cost, and light weight was developed using a highly conductive and flexible Au-coated conductive textile to scavenge wind energy. The proposed wind-based TENG (W-TENG) was also tested in the outdoor environment, confirming that it can work efficiently in an actual windy situation to convert wind energy into electricity.

Bioluminescent nanopaper for rapid screening of toxic substances

Jie Liu^{1,2}, Eden Morales-Narváez¹, Jahir Orozco¹, Teresa Vicent³, Guohua Zhong^{2,*}, and Arben Merkoçi^{1,4,*}

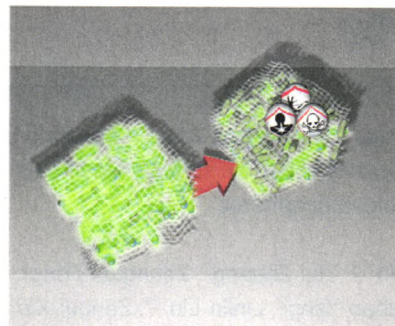
¹ Campus UAB, Spain

² South China Agricultural University, China

³ Universitat Autònoma de Barcelona, Spain

⁴ ICREA, Spain

114–125



A composite based on bacterial nanocellulose and the luminescent bacterium *Aliivibrio fischeri* is reported. Nanocellulose operates as both a culture scaffold and an optically transparent biosensing substrate, with the bioluminescent organism operating as a bio-indicator. This nanobiocomposite is utilized as a simple-to-fabricate and user-friendly device for toxicity detection via determination of bioluminescent inhibition caused by exposure to various contaminants.

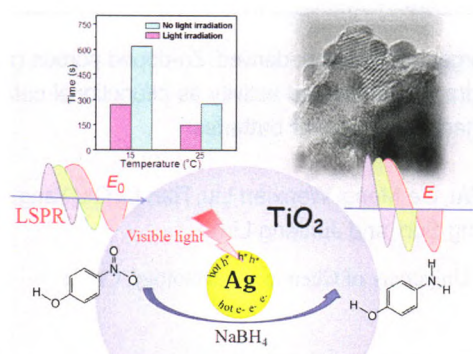
Strongly coupled Ag/TiO₂ heterojunctions for effective and stable photothermal catalytic reduction of 4-nitrophenol

Ying Gu¹, Yanqing Jiao², Xiaoguang Zhou^{1,*}, Aiping Wu², Bater Buhe², and Honggang Fu^{2,*}

¹ Northeast Forestry University, China

² Heilongjiang University, China

126–141



An easy and salable method was developed for the construction of strongly coupled Ag/TiO₂ heterojunctions for the effective and stable catalytic conversion of 4-nitrophenol (4-NP) into 4-aminophenol (4-AP) in the presence of NaBH₄. The conversion of 4-NP into 4-AP was significantly enhanced under light irradiation. This is ascribed to the localized surface plasmon resonance effect of Ag, which generated hot e⁻ and h⁺ particles under light irradiation and local heating around the particles via their absorption of the light.

Hybridized electronic states between CdSe nanoparticles and conjugated organic ligands: A theoretical and ultrafast photo-excited carrier dynamics study

Tersilla Virgili^{1,*}, Arrigo Calzolari², Inma Suárez López¹, Alice Ruini^{2,3}, Alessandra Catellani², Barbara Vercelli⁴, and Francesco Tassone^{5,*}

¹ IFN-CNR, Italy

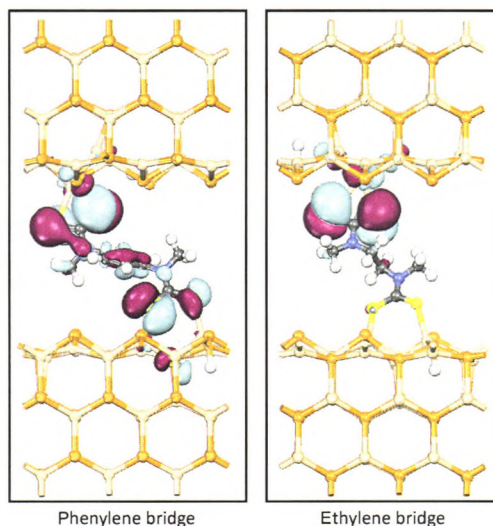
² Istituto Nanoscienze CNR-NANO-S3, Italy

³ Università di Modena e Reggio Emilia, Italy

⁴ ICMATE-CNR SS di Milano, Italy

⁵ Istituto Italiano di Tecnologia, Italy

142–150



Theoretical model of hybridized states between nanoparticles (NPs) and organic ligands confirm the experimental pump-and-probe observation and explain the large observed photocurrents.

Simultaneous red–green–blue electroluminescent enhancement directed by surface plasmonic “far-field” of facile gold nanospheres

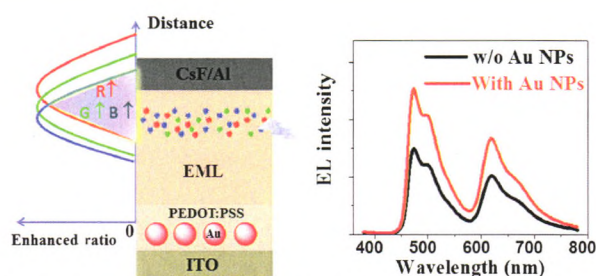
Xiaoyan Wu^{1,3}, Yiqi Zhuang¹, Zhongtao Feng¹, Xuehong Zhou¹, Yuzhao Yang², Linlin Liu^{1,*}, Zengqi Xie¹, Xudong Chen², and Yuguang Ma^{1,*}

¹ South China University of Technology, China

² Sun Yat-sen University, China

³ China Academy of Engineering Physics, China

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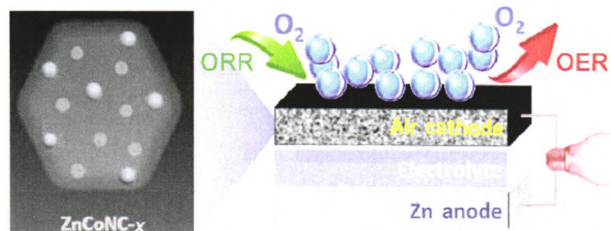


Simultaneous red–green–blue electroluminescence enhancement by the “far-field” effect of facile synthesized gold nanospheres in white polymer light-emitting diodes was realized in this work. Yield enhancement is achieved in more than 95% devices with the best enhancing ratio of 60%.

Metal-organic framework-derived, Zn-doped porous carbon polyhedra with enhanced activity as bifunctional catalysts for rechargeable zinc-air batteries

Xuan Wu, Ge Meng, Wenxian Liu, Tian Li, Qiu Yang, Xiaoming Sun, and Junfeng Liu*

Beijing University of Chemical Technology, China



Porous carbon polyhedra (ZnCoNC) were fabricated using Zn-doped, Co-based metal-organic frameworks as precursors. Doping with Zn species reduces the Co nanoparticle size and increases the nitrogen content of the products, endowing the as-prepared ZnCoNC with enhanced oxygen reduction reaction (ORR) and oxygen evolution reaction (OER) electrocatalytic activity in alkaline media, thus making them promising cathode materials for zinc-air batteries.

163–173

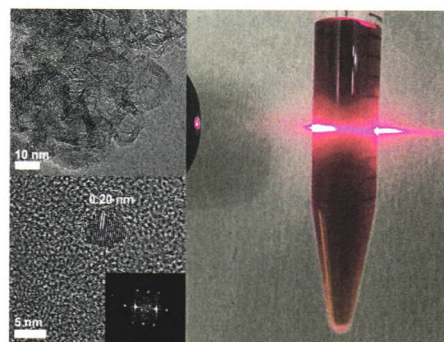
Graphene quantum dots derived from hollow carbon nano-onions

Chenguang Zhang^{1,3}, Jiajun Li², Xianshun Zeng¹, Zhihao Yuan^{1,3,*}, and Naiqin Zhao^{2,*}

¹ Tianjin University of Technology, China

² Tianjin University, China

³ Tianjin Key Lab for Photoelectric Materials & Devices, China



Hollow carbon nano-onions (CNOs) are preferred precursors for the synthesis of graphene quantum dots (GQDs) with a uniform size distribution, whereas metal encapsulation in the CNO structure is disadvantageous for the same. Furthermore, acid oxidation of hollow CNOs can result in GQDs with a yellow-green hybrid luminescence and long excitation wavelength (λ_{ex})-ranged λ_{ex} -independent photoluminescent (PL) behavior, in which the λ_{ex} upper limit is 480 nm. This enables sensing and cell imaging under visible light excitation with no need for UV excitation.

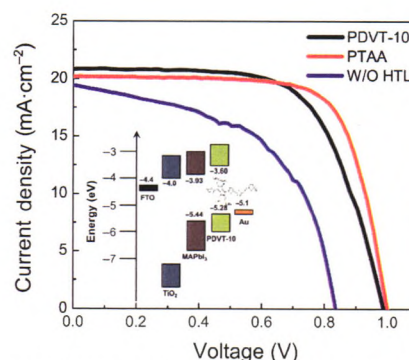
174–184

Highly π -extended copolymer as additive-free holetransport material for perovskite solar cells

Jie Liu^{1,2}, Qianqing Ge^{1,2}, Weifeng Zhang^{1,2}, Jingyuan Ma^{1,2}, Jie Ding^{1,2}, Gui Yu^{1,2,*}, and Jinsong Hu^{1,2,*}

¹ Institute of Chemistry, Chinese Academy of Sciences, China

² University of Chinese Academy of Sciences, China



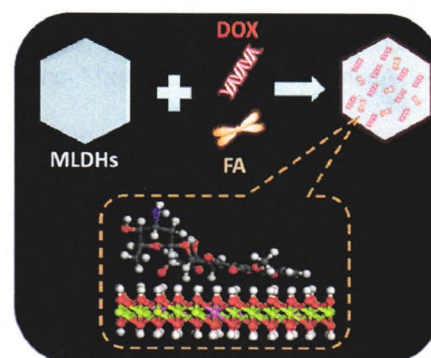
A polythiophene-based copolymer (PDVT-10) with a hole mobility up to $8.2 \text{ cm}^2 \cdot \text{V}^{-1} \cdot \text{s}^{-1}$ and a highest occupied molecular orbital level of -5.28 eV is used as a hole-transport layer for perovskite solar cells for the first time. The new additive-free hole-transport material exhibits better photovoltaic performance than poly(triarylamine)-based devices and can function as an encapsulation layer for $\text{NH}_3\text{CH}_3\text{PbI}_3$ to maintain long-term stability.

185–194

Layered double hydroxide monolayers for controlled loading and targeted delivery of anticancer drugs

Xuan Mei, Simin Xu, Tongyang Hu, Liuqi Peng, Rui Gao, Ruizheng Liang*, Min Wei*, David G. Evans, and Xue Duan

Beijing University of Chemical Technology, China



Monolayered double hydroxide (MLDH) nanosheets with a high specific surface area are prepared and serve as a drug carrier for the chemotherapeutic agent doxorubicin with an extremely large loading capacity and controllable release.

195–205

Energy-driven surface evolution in beta-MnO₂ structures

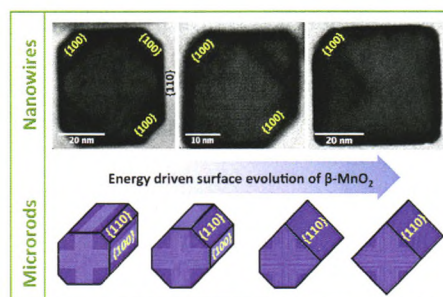
Wentao Yao¹, Yifei Yuan^{2,3}, Hasti Asayesh-Ardakani¹, Zhennan Huang³, Fei Long¹, Craig R. Friedrich¹, Khalil Amine², Jun Lu^{2,*}, and Reza Shahbazian-Yassar^{1,3,*}

¹ Michigan Technological University, USA

² Argonne National Laboratory, USA

³ The University of Illinois at Chicago, USA

206–215



The energy-controlled lateral surface evolution in β -MnO₂ nanowires and microrods followed the elimination of {100} facets and the increased occupancy of {110} facets.

Facile growth of homogeneous Ni(OH)₂ coating on carbon nanosheets for high-performance asymmetric supercapacitor applications

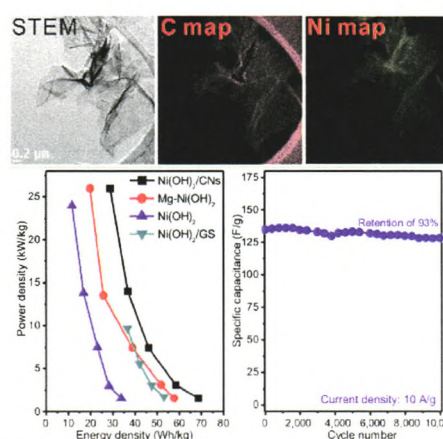
Mingjiang Xie¹, Zhicheng Xu¹, Shuyi Duan¹, Zhengfang Tian^{1,2}, Yu Zhang¹, Kun Xiang¹, Ming Lin³, Xuefeng Guo^{1,2,*}, and Weiping Ding^{1,*}

¹ Nanjing University, China

² Huanggang Normal University, China

³ Institute of Materials Research and Engineering (IMRE), Singapore

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A homogeneous Ni(OH)₂ coating was grown on carbon nanosheets by a facile ion-exchange reaction, via the *in situ* transformation of MgO/C to Ni(OH)₂/C. The obtained Ni(OH)₂/C composite exhibits superior performances as an asymmetric supercapacitor, with a large capacity (198 F/g), high energy density (56.7 Wh/kg at 4.0 kW/kg), and excellent cycling stability, with 93% capacity retention after 10,000 cycles.

Strain-induced band gap engineering in layered TiS₃

Robert Biele^{1,*}, Eduardo Flores², Jose Ramón Ares², Carlos Sanchez^{2,3}, Isabel J. Ferrer^{2,3}, Gabino Rubio-Bollinger^{2,3}, Andres Castellanos-Gomez^{4,*}, and Roberto D'Agosta^{1,5,*}

¹ Universidad del País Vasco, Spain

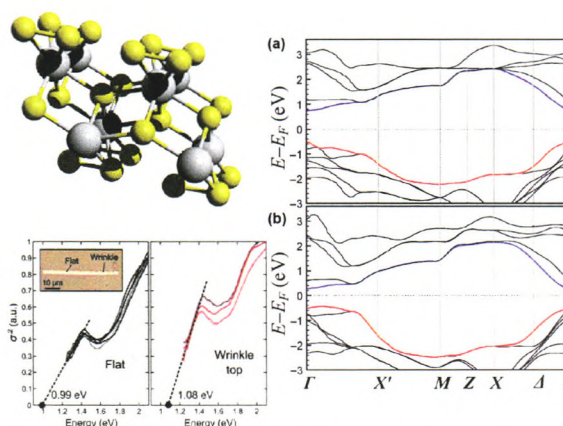
² Universidad Autónoma de Madrid, Spain

³ Instituto de Ciencia de Materiales "Nicolás Cabrera", Spain

⁴ Instituto de Ciencia de los Materiales de Madrid (ICMM-CSIC), Spain

⁵ IKERBASQUE, Basque Foundation for Science, Spain

225–232



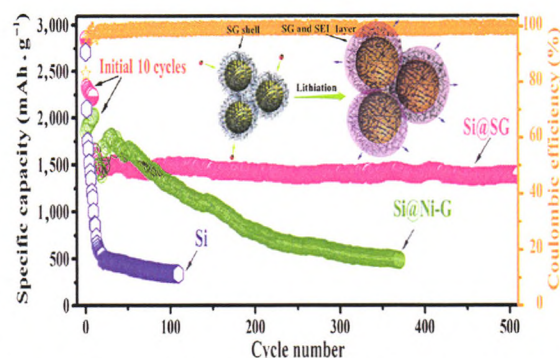
The band gap of titanium trisulfide is extremely sensitive to the application of uniaxial strain, especially in the facile transport direction. Moreover, for large enough strain (but still within the elastic limit) the nature of the band gap changes from direct to indirect, with strong implications for the potential application of these materials in optical devices.

Three-dimensional spongy nanographene-functionalized silicon anodes for lithium ion batteries with superior cycling stability

Chunfei Zhang, Tong-Hyun Kang, and Jong-Sung Yu*

DGIST, Republic of Korea

233–245



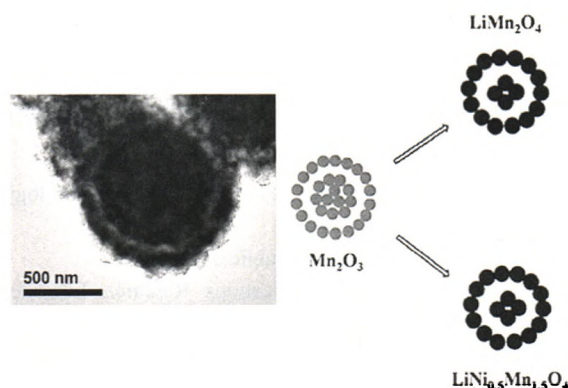
An innovative three-dimensional sponge-like nanographene (SG) shell is designed and applied on a silicon substrate, resulting in a Si@SG hybrid with unique properties, suitable to overcome the main issues affecting the application of silicon in lithium ion batteries. Electrodes based on the novel Si@SG hybrids achieve excellent electrochemical performance in terms of long-term cycling stability and rate performance at different current densities.

Scalable and general synthesis of spinel manganese-based cathodes with hierarchical yolk-shell structure and superior lithium storage properties

Yu Wu, Junting Zhang, and Chuanbao Cao*

Beijing Institute of Technology, China

246–253



Spinel manganese-based cathodes with a hierarchical yolk-shell structure were prepared via a simple and scalable morphology-inheritance strategy. The as-prepared materials exhibit superior lithium storage properties as cathodes of lithium ion batteries.

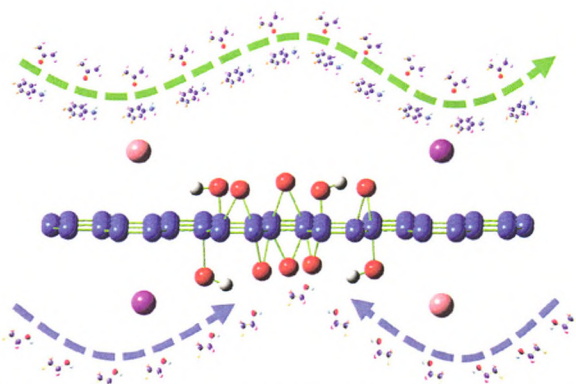
Theoretical investigations of transport properties of organic solvents in cation-functionalized graphene oxide membranes: Implications for drug delivery

Kai Song¹, Yong Long², Xun Wang^{2,*}, and Gang Zhou^{1,*}

¹ Beijing University of Chemical Technology, China

² Tsinghua University, China

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The solvent-cation interaction dominates directional transport of organic solvent in the alkali and alkaline earth cationdecorated graphene oxide (M-GO) membranes by the site-to-site mechanism. The competition between energy consumption by the solvent-cation interaction and energy expenditure by the solvent-epoxy (–hydroxyl) interaction enables the M-GO membranes with the selective permeability to a wide range of solvents.

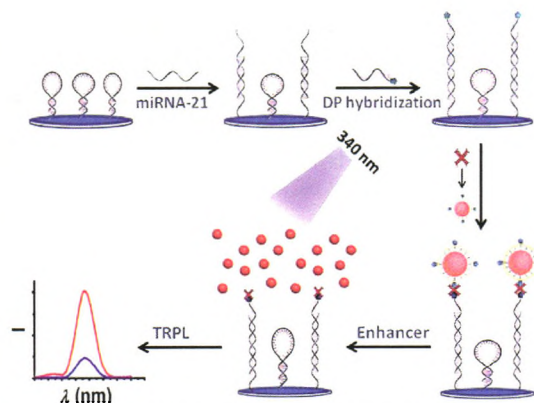
Ultrasensitive detection of cancer biomarker microRNA by amplification of fluorescence of lanthanide nanoprobe

Lianyu Lu^{1,2}, Datao Tu^{2,*}, Yan Liu², Shanyong Zhou², Wei Zheng², and Xueyuan Chen^{1,2,*}

¹ Fuzhou University, China

² Fujian Institute of Research on the Structure of Matter, Chinese Academy of Sciences, China

264–273



We demonstrate application of a strategy based on nanoprobe dissolution-enhanced fluorescence amplification combined with a reconstructive molecular beacon for sensitive and specific detection of cancer biomarker microRNA.

Graphene electrode with tunable charge transport in thin-film transistors

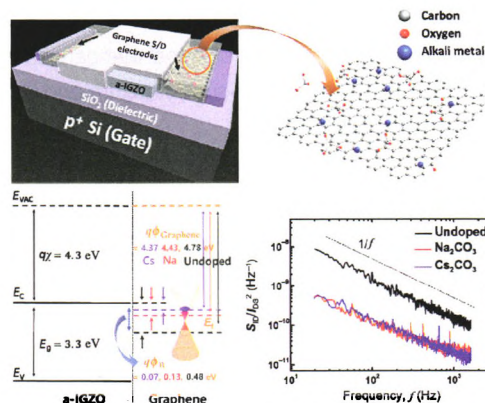
Ick-Joon Park¹, Tae In Kim¹, In-Tak Cho², Chang-Woo Song³, Ji-Woong Yang³, Hongkeun Park¹, Woo-Seok Cheong³, Sung Gap Im⁴, Jong-Ho Lee², and Sung-Yool Choi^{1,*}

¹ Korea Advanced Institute of Science and Technology (KAIST), Republic of Korea

² Seoul National University, Republic of Korea

³ Electronics and Telecommunications Research Institute, Republic of Korea

274–286



We systematically investigate the tunable charge transport in n-channel thin film transistors by n-type doping of graphene electrodes with alkali metal carbonates, which effectively controls the carrier injection from graphene to the channel material, and results in improved electrical characteristics in the devices. Furthermore, the level of contact noise originating from the barrier height fluctuation is analyzed by low-frequency $1/f$ noise measurements for the first time to understand the tunable charge transport mechanism.

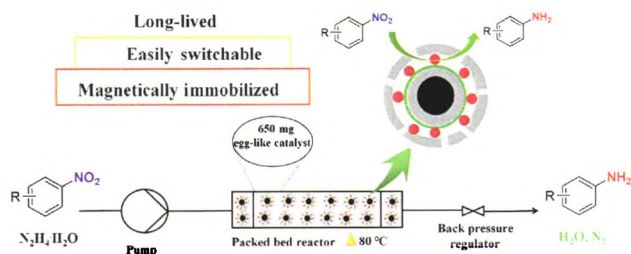
Egg-like magnetically immobilized nanospheres: A longlived catalyst model for the hydrogen transfer reaction in a continuous-flow reactor

Yongjian Ai^{1,2}, Zenan Hu¹, Zixing Shao², Li Qi¹, Lei Liu¹, Junjie Zhou¹, Hongbin Sun^{1,*}, and Qionglin Liang^{2,*}

¹ Northeastern University, China

² Tsinghua University, China

287–299

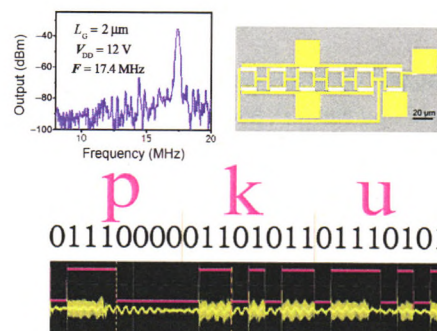


An egg-like $\text{Fe}_3\text{O}_4@\text{nSiO}_2\text{-NH}_2\text{-Fe}_2\text{O}_3\cdot x\text{Bi}_2\text{O}_3@\text{mSiO}_2$ magnetically immobilized nanocatalyst was developed to reduce nitroarenes. The active species, $\text{Fe}_2\text{O}_3\cdot x\text{Bi}_2\text{O}_3$, was immobilized on the magnetic silica sphere and further encapsulated with a mesoporous silica shell; thus, the catalyst showed such a long lifetime that it maintained its activity for more than 1,500 cycles in a packed-bed continuous microreactor.

Carbon nanotube network film-based ring oscillators with sub 10-ns propagation time and their applications in radio-frequency signal transmission

Yingjun Yang, Li Ding, Hengjia Chen, Jie Han, Zhiyong Zhang*, and Lian-Mao Peng*

Peking University, China



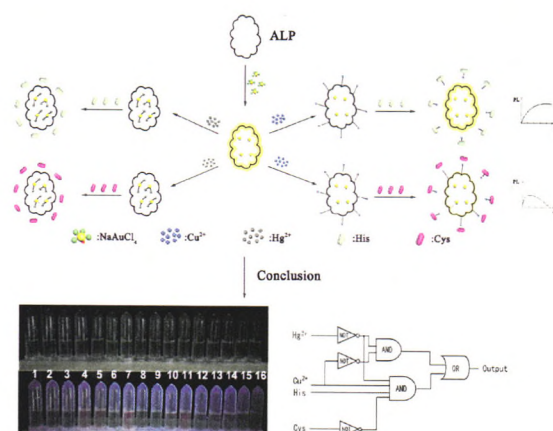
We report high-performance field-effect transistors based on solution-derived carbon nanotube films and explore their applications in radio-frequency integrated circuits. The oscillation frequency of the optimized five-stage ring oscillator (RO) based on carbon nanotube film is up to 17.4 MHz. The ROs are used as carrier-wave generators in radio-frequency systems to demonstrate a complete signal transmission process, which suggests that carbon nanotube (CNT) thin-film electronics may soon find their way to radio-frequency applications.

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Design of dual metal ions/dual amino acids integrated photoluminescent logic gate by high-molecular weight protein-localized Au nanoclusters

Liu Liu, Hui Jiang*, and Xuemei Wang*

Southeast University, China



An integrated logic gate was fabricated based on the photoluminescent response of alkaline phosphatase-coated Au nanoclusters to dual metal ions/dual amino acids.

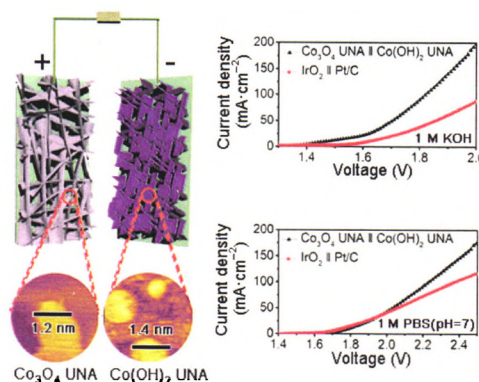
311–322

Electrosynthesis of Co_3O_4 and $\text{Co}(\text{OH})_2$ ultrathin nanosheet arrays for efficient electrocatalytic water splitting in alkaline and neutral media

Lin Zhang¹, Bingrui Liu¹, Ning Zhang^{1,2,*}, and Mingming Ma^{1,*}

¹ University of Science and Technology of China, China

² Hefei University, China



We report a simple electrodeposition method for synthesizing Co_3O_4 and $\text{Co}(\text{OH})_2$ ultrathin nanosheet arrays (UNA) without templates or surfactants; the Co_3O_4 and $\text{Co}(\text{OH})_2$ UNA exhibit high activity for oxygen and hydrogen evolution reactions, respectively, in both alkaline and neutral media.

323–333

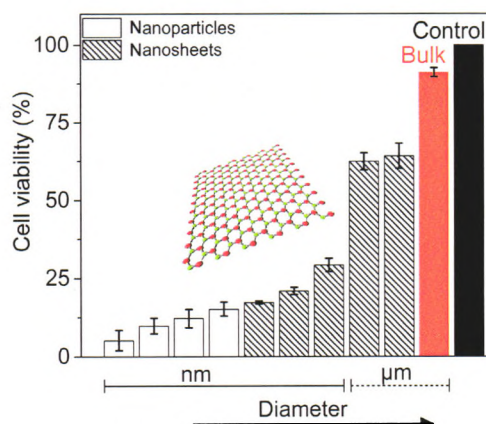
Biocompatibility of boron nitride nanosheets

Srikanth Mateti¹, Cynthia S. Wong¹, Zhen Liu¹, Wenrong Yang¹,
Yuncang Li², Lu Hua Li¹, and Ying Chen^{1,*}

¹ Deakin University, Australia

² RMIT University, Australia

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The biocompatibility of boron nitride (BN) nanosheets was evaluated using osteoblast-like cells (SaOS₂). The biocompatibility of BN nanomaterials depends on their size, shape, structure, and surface chemical properties.

High-yield synthesis and liquid-exfoliation of two-dimensional belt-like hafnium disulphide

Harneet Kaur^{1,2,*}, Sandeep Yadav³, Avanish K. Srivastava¹,
Nidhi Singh¹, Shyama Rath⁴, Jörg J. Schneider³, Om P. Sinha⁵,
and Ritu Srivastava^{1,*}

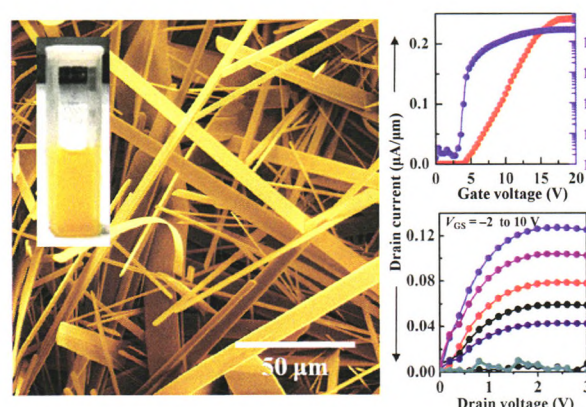
¹ Council of Scientific and Industrial Research, India.

² NPL, India

³ Technische Universität Darmstadt, Germany

⁴ University of Delhi, India

⁵ Amity University UP, India

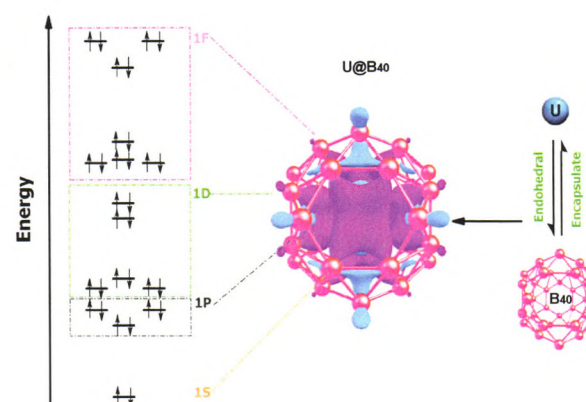


A simple chemical-vapor transport route is demonstrated to synthesize layered belt-like nano-crystals of hafnium disulphide followed by liquid-phase exfoliation to produce stable few-layer nanosheets for electronic applications.

Actinide endohedral boron clusters: A closed-shell electronic structure of U@B_{40}

Tianrong Yu, Yang Gao, Dexuan Xu, and Zhigang Wang*

Jilin University, China



Molecular orbital energy levels and electron density difference map of U@B_{40} indicate strong covalent bonding.

354-359

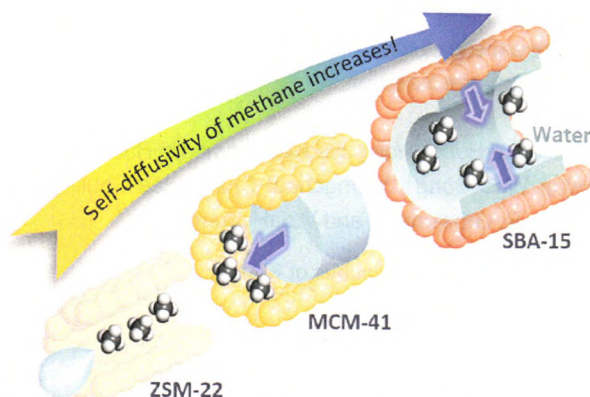
The role of water in methane adsorption and diffusion within nanoporous silica investigated by hyperpolarized ^{129}Xe and ^1H PFG NMR spectroscopy

Yuanli Hu^{1,2}, Mingrun Li¹, Guangjin Hou¹, Shutao Xu¹,
Ke Gong^{1,2}, Xianchun Liu¹, Xiuwen Han¹, Xiulian Pan^{1,*},
and Xinhe Bao^{1,*}

¹ Dalian Institute of Chemical Physics, Chinese Academy of Sciences, China

² University of Chinese Academy of Sciences, China

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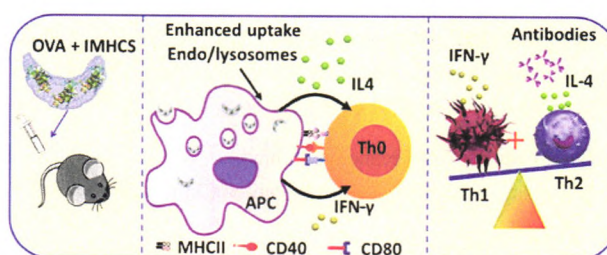
Silica materials with one-dimensional pores, ZSM-22, MCM-41, and SBA-15, were chosen to model the inorganic nanopores in shale. Water adsorption does not affect the pore size of ZSM-22 and MCM-41 zeolites, and hence has little influence on the self-diffusivity of methane. However, water reduces the pore size of SBA-15, which retards diffusion of methane.

Pristine mesoporous carbon hollow spheres as safe adjuvants induce excellent Th2-biased immune response

Manasi Jambhrunkar, Meihua Yu, Hongwei Zhang,
Prasanna Abbaraju, Anand Kumar Meka,
Antonino Cavallaro, Yao Lu, Neena Mitter*,
and Chengzhong Yu*

The University of Queensland, Australia

370–382



Mesoporous hollow carbon spheres with a high antigen loading capacity, enhanced uptake by antigen presenting cells (APCs), and an excellent safety profile are an effective adjuvant for stimulating the immune response in a Th2-biased manner.

Spermine induced reversible collapse of deoxyribonucleic acid-bridged nanoparticle-based assemblies

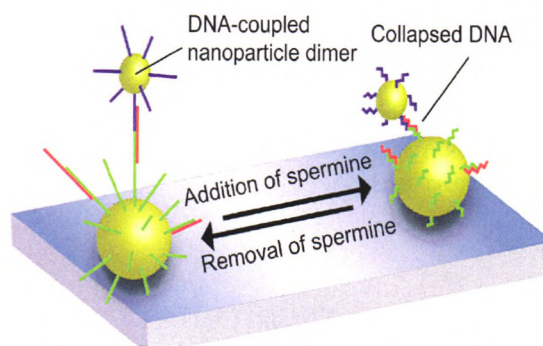
Kristian L. Göeken¹, Richard B. M. Schasfoort¹,
Vinod Subramaniam^{1,2}, and Ron Gill^{1,3,*}

¹ University of Twente, the Netherlands

² Vrije Universiteit Amsterdam, the Netherlands

³ Saxion University of Applied Sciences, the Netherlands

383–396



Distances in DNA-bound nanoparticle assemblies can be reversibly modulated using spermine-induced DNA collapse. This allows dynamic nanometer-scale movement by reducing the nanoparticle gap size to less than 15% of the original size, resulting in strong plasmon–plasmon coupling.

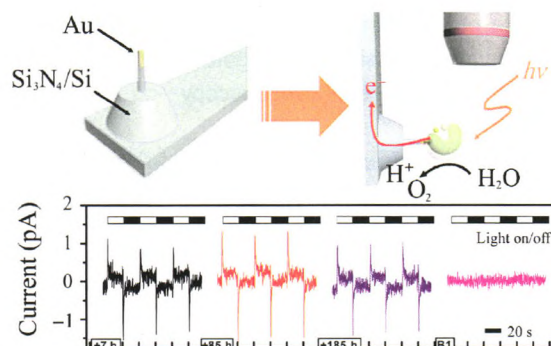
Prolonged and highly efficient intracellular extraction of photosynthetic electrons from single algal cells by optimized nanoelectrode insertion

Hyeonug Hong¹, Yong Jae Kim¹, Myungjin Han¹, Gu Yoo¹, Hyun Woo Song¹, Youngcheol Chae¹, Jae-Chul Pyun¹, Arthur R. Grossman², and Wonhyoung Ryu^{1,*}

¹ Yonsei University, Republic of Korea

² Stanford University, USA

397–409



A cantilever nanoelectrode (CNE) system for directly extracting photosynthetic electrons from single algal cells is developed. The CNE system enables *in situ* cell insertion analysis as well as prolonged and highly efficient harvesting of photosynthetic electrons.

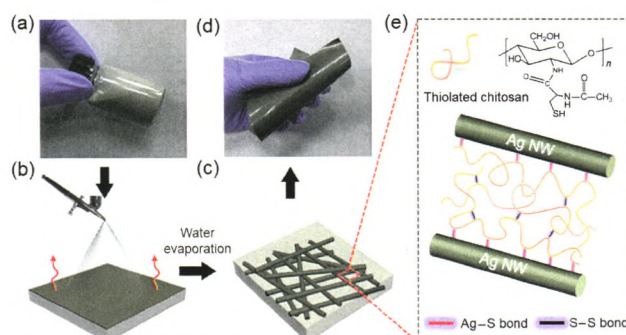
Strong and stiff Ag nanowire-chitosan composite films reinforced by Ag–S covalent bonds

Xiao-Feng Pan¹, Huai-Ling Gao², Yang Su¹, Ya-Dong Wu¹, Xiang-Ying Wang¹, Jing-Zhe Xue², Tao He¹, Yang Lu^{1,*}, Jian-Wei Liu², and Shu-Hong Yu^{2,*}

¹ Hefei University of Technology, China

² University of Science and Technology of China, China

410–419



Silver nanowire (NW)-reinforced chitosan (CS) and thiolated chitosan (TCS) films were fabricated by a facile spray induced self-assembly process, in which the films are reinforced by Ag–S covalent bonds. The tensile strength of the optimized Ag NW-TCS film was up to 3.9 and 1.5 times higher than that of pure TCS and Ag NW-CS films.

Layered material GeSe and vertical GeSe/MoS₂ p-n heterojunctions

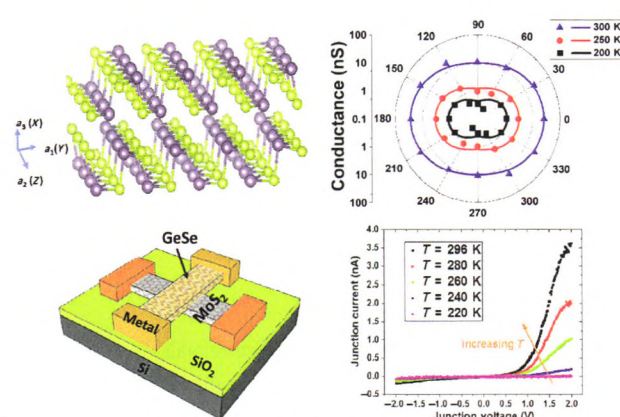
Wui Chung Yap¹, Zhengfeng Yang¹, Mehrshad Mehboudi², Jia-An Yan³, Salvador Barraza-Lopez², and Wenjuan Zhu^{1,*}

¹ University of Illinois at Urbana-Champaign, USA

² University of Arkansas, USA

³ Towson University, USA

420–430



Transport properties of GeSe and its heterostructures with MoS₂ were investigated both experimentally and theoretically. GeSe exhibits a markedly anisotropic electronic transport, with maximum conductance along the armchair direction. Density functional theory calculations reveal that the effective mass is 2.7 times larger along the zigzag direction than the armchair direction. The temperature dependence of the currents in GeSe/MoS₂ heterojunction reveal that GeSe and MoS₂ have a type-II band alignment with a conduction band offset of ~ 0.234 eV.

Fabrication of rigid and flexible SrGe_4O_9 nanotube-based sensors for room-temperature ammonia detection

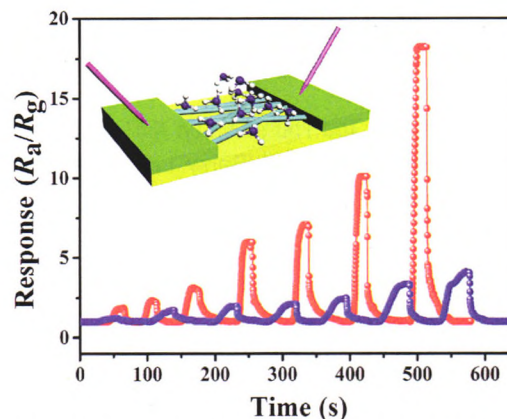
Tingting Huang^{1,2}, Zheng Lou², Shuai Chen^{1,2}, Rui Li^{1,2}, Kai Jiang³, Di Chen^{1,*}, and Guozhen Shen^{2,4,*}

¹ University of Science and Technology Beijing, China

² Institute of Semiconductors, Chinese Academy of Sciences, China

³ Chinese PLA General Hospital, China

⁴ University of Chinese Academy of Sciences, China



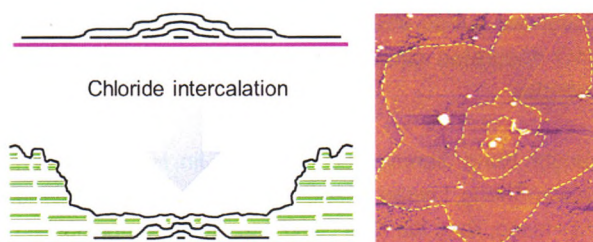
Polycrystalline SrGe_4O_9 nanotubes were prepared to fabricate high-performance rigid, flexible gas sensors for detecting ammonia at room temperature.

431–439

Chloride-intercalated continuous chemical vapor deposited graphene film with discrete adlayers

Qiao Chen, Li Zhang, and Hongwei Zhu*

Tsinghua University, China



Iron chloride flake crystals integrate with a graphene surface and are intercalated between graphene adlayers. Thus, heavy doping of graphene is achieved.

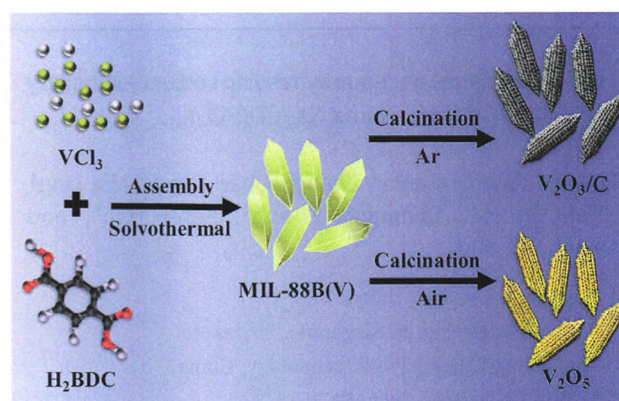
440–448

Metal-organic framework-derived porous shuttle-like vanadium oxides for sodium-ion battery application

Yangsheng Cai¹, Guozhao Fang¹, Jiang Zhou^{1,*}, Sainan Liu¹, Zhigao Luo¹, Anqiang Pan^{1,*}, Guozhong Cao², and Shuquan Liang^{1,*}

¹ Central South University, China

² University of Washington, USA



Porous shuttle-like vanadium oxides (i.e., V_2O_5 , $\text{V}_2\text{O}_3/\text{C}$) were prepared by using MIL-88B (V) as precursors with a specific calcination process. The derived $\text{V}_2\text{O}_3/\text{C}$ exhibited excellent electrochemical performance as an anode material for sodium-ion batteries.

449–463

Intracellular *in situ* labeling of TiO₂ nanoparticles for fluorescence microscopy detection

Koshonna Brown¹, Ted Thurn^{1,†}, Lun Xin¹, William Liu^{1,‡}, Remon Bazak^{1,§}, Si Chen², Barry Lai², Stefan Vogt², Chris Jacobsen³, Tatjana Paunesku¹, and Gayle E. Woloschak^{1,*}

¹ Northwestern University, USA

² Argonne National Laboratory, USA

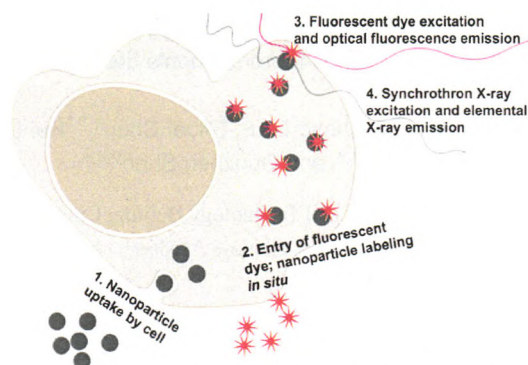
³ Weinberg College of Arts and Sciences, USA

[†] Present Address: U.S. Department of State, USA

[‡] Present Address: Food and Drug Administration, USA

[§] Present Address: Azarita Medical Campus, Egypt

464–476



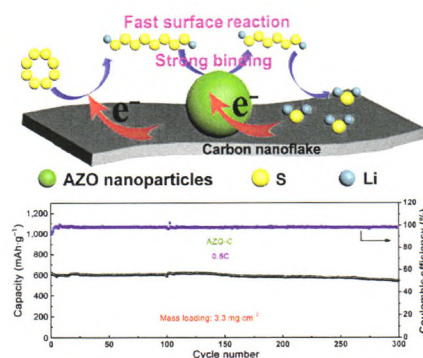
TiO₂ nanoparticles have low natural contrast; two novel ways to label them *in situ* to enable optical microscopy were developed, based on standard tools used in cell biology. In each case, visible fluorescence was achieved *in situ* in cells fixed after nanoparticle uptake. Specificity of labeling was confirmed by X-ray fluorescence microscopy.

Enhanced sulfide chemisorption by conductive Al-doped ZnO decorated carbon nanoflakes for advanced Li–S batteries

Yangbo Kong, Jianmin Luo, Chengbin Jin, Huadong Yuan, Ouwei Sheng, Liyuan Zhang, Cong Fang, Wenkui Zhang, Hui Huang, Yang Xia, Chu Liang, Jun Zhang, Yongping Gan, and Xinyong Tao*

Zhejiang University of Technology, China

477–489



Aluminium-doped zinc oxide (AZO@C) nanocomposites have been successfully synthesized through a facile biotemplating method using kapok fibers as both the template and carbon source. When applied in Li–S batteries, the corresponding cathodes showed excellent electrochemical performance owing to the high conductivity of AZO, which can effectively suppress the shuttle effect of lithium polysulfides (LiPSs), and increase the LiPSs conversion and Li₂S precipitation rates.

High-performance aqueous symmetric sodium-ion battery using NASICON-structured Na₂VTi(PO₄)₃

Hongbo Wang¹, Tianran Zhang², Chao Chen³, Min Ling⁴, Zhan Lin^{1,3,*}, Shanqing Zhang⁴, Feng Pan⁵, and Chengdu Liang¹

¹ Zhejiang University, China

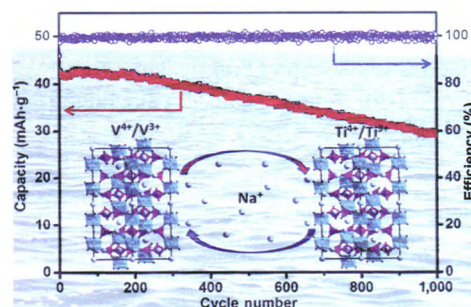
² National University of Singapore, Singapore

³ Guangdong University of Technology, China

⁴ Griffith University, Australia

⁵ Peking University, China

490–498



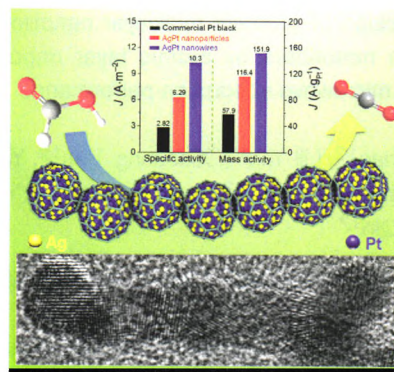
An aqueous sodium-ion battery is fabricated using a single NASICON-structured Na₂VTi(PO₄)₃ material with the redox couples of V⁴⁺/V³⁺ and Ti⁴⁺/Ti³⁺ working on the cathode and anode, respectively. The high-safety and low-cost symmetric full-cell exhibits an impressive cyclability suitable for applications in stationary batteries.

Ultrathin AgPt alloy nanowires as a high-performance electrocatalyst for formic acid oxidation

Xian Jiang¹, Gengtao Fu¹, Xia Wu¹, Yang Liu¹, Mingyi Zhang², Dongmei Sun¹, Lin Xu^{1,*}, and Yawen Tang^{1,*}

¹ Nanjing Normal University, China

² Harbin Normal University, China



Ultrathin AgPt alloy nanowires are successfully achieved with a high yield and uniformity by a facile hydrothermal synthetic strategy. Due to the alloyed composition and one-dimensional (1D) structure, the ultrathin AgPt nanowires exhibit a superior electrocatalytic activity and better CO tolerance for the formic acid oxidation reaction than AgPt nanoparticles or a commercial Pt black catalyst.

499–510

Fiber gas sensor-integrated smart face mask for room-temperature distinguishing of target gases

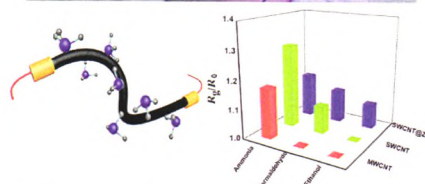
Zhiyi Gao^{1,2}, Zheng Lou², Shuai Chen², La Li², Kai Jiang³, Zuoling Fu^{1,*}, Wei Han^{1,*}, and Guozhen Shen^{2,4,*}

¹ Jilin University, China

² Institute of Semiconductors, Chinese Academy of Sciences, China

³ Chinese PLA General Hospital, China

⁴ University of Chinese Academy of Sciences, China



A smart multi-functional face mask was fabricated with three types of wearable fiber gas sensors that had the ability to selectively distinguish gases at room temperature.

511–519

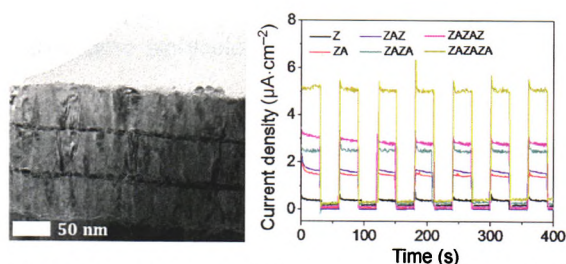
Improved plasmon-assisted photoelectric conversion efficiency across entire ultraviolet–visible region based on antenna-on zinc oxide/silver three-dimensional nanostructured films

Lijuan Yan¹, Yang Liu², Yaning Yan¹, Lanfang Wang¹, Juan Han¹, Yanan Wang¹, Guowei Zhou¹, Mark T. Swihart², and Xiaohong Xu^{1,3,*}

¹ Information Materials of Ministry of Education, China

² University at Buffalo (SUNY), USA

³ Research Institute of Materials Science of Shanxi Normal University, China



We designed and fabricated ZnO/Ag nanostructured films to enhance the photoelectric conversion efficiency. The photocurrent increased 3.75 times for the antenna-on ZnO/Ag three-dimensional nanostructured film (ZAZAZA) relative to a pure ZnO film (Z) under ultraviolet–visible light illumination, indicating great potential for application in photovoltaic or photoelectrochemical devices.

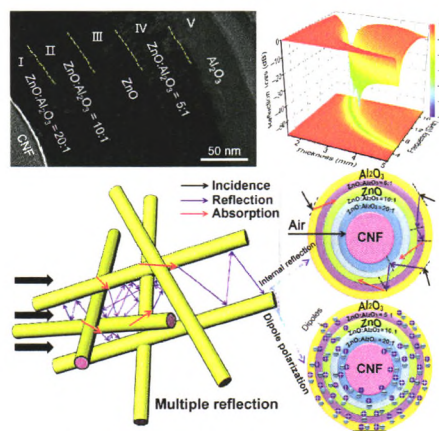
520–529

Flexible design of gradient multilayer nanofilms coated on carbon nanofibers by atomic layer deposition for enhanced microwave absorption performance

Shichao Zhao^{1,2}, Lili Yan^{1,2}, Xiaodong Tian^{1,2}, Yequn Liu¹, Chaoqiu Chen¹, Yunqin Li^{1,2}, Jiankang Zhang^{1,2}, Yan Song¹, and Yong Qin^{1,*}

¹ Institute of Coal Chemistry, Chinese Academy of Sciences, China

² University of Chinese Academy of Sciences, China



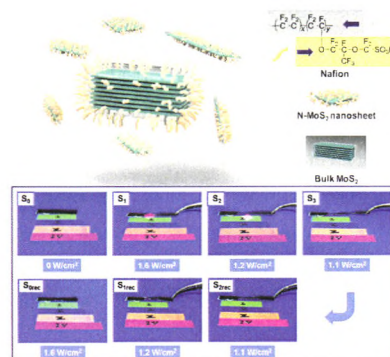
Specifically designed gradient multilayer nanofilms with gradually increasing conductivity coated on electrospun carbon nanofibers by atomic layer deposition act as an intermediate layer leading to a remarkably enhanced impedance matching between air and the carbon nanofibers, and an excellent microwave absorption performance.

530–541

Nafion-assisted exfoliation of MoS₂ in water phase and the application in quick-response NIR light controllable multi-shape memory membrane

Wei Jia, Beibei Tang*, and Peiyi Wu*

Fudan University, China



Nafion is adopted as a dispersant for assisting the water-phase exfoliation of MoS₂. Composite membranes of Nafion-modified MoS₂/Nafion show excellent near-infrared light-controllable multi-shape memory performance with convenient operation and quick response.

542–553

Highly-anisotropic optical and electrical properties in layered SnSe

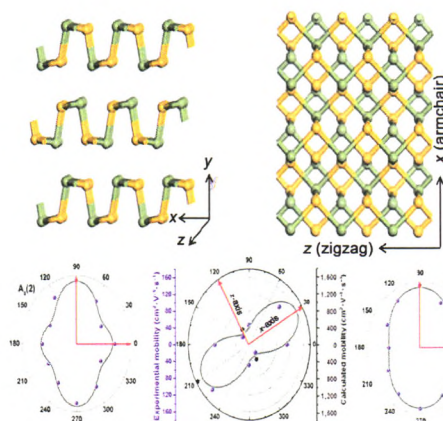
Shengxue Yang^{1,2,*}, Yuan Liu¹, Minghui Wu³, Li-Dong Zhao², Zhaoyang Lin¹, Hung-chieh Cheng¹, Yiliu Wang¹, Chengbao Jiang², Su-Huai Wei⁴, Li Huang³, Yu Huang¹, and Xiangfeng Duan^{1,*}

¹ University of California, Los Angeles, USA

² Beihang University, China

³ South University of Science and Technology of China, China

⁴ Beijing Computational Science Research Center, China



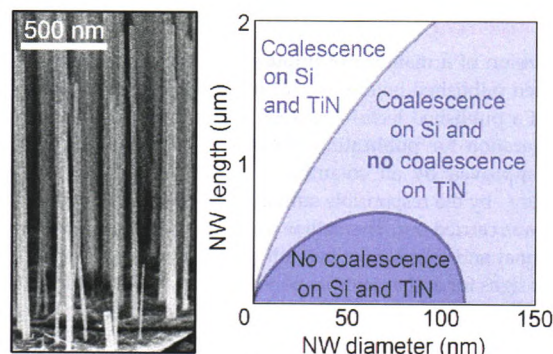
We report a systematic study of the in-plane anisotropic properties of layered SnSe, using angle-resolved Raman scattering, optical absorption, and electrical transport methods.

554–564

Self-assembled formation of long, thin, and uncoalesced GaN nanowires on crystalline TiN films

David van Treeck*, Gabriele Calabrese, Jelle J. W. Goertz, Vladimir M. Kaganer, Oliver Brandt, Sergio Fernández-Garrido, and Lutz Geelhaar

Leibniz-Institut im Forschungsverbund Berlin e.V., Germany



We investigate in detail the self-assembled nucleation and growth of GaN nanowires on TiN. It is demonstrated that the TiN substrate allows the growth of long, thin and uncoalesced GaN nanowires which are suitable for the growth of core-shell heterostructures.

565–576

Site-specific determination of TTR-related functional peptides by using scanning tunneling microscopy

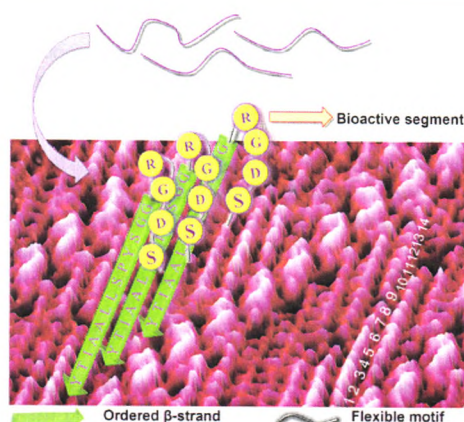
Lanlan Yu^{1,3,4}, Yongfang Zheng^{1,3,4}, Jing Xu^{1,4}, Fuyang Qu^{1,4}, Yuchen Lin^{1,4}, Yimin Zou^{1,4}, Yanlian Yang^{1,*}, Sally L. Gras^{2,*}, and Chen Wang^{1,*}

¹ National Center for Nanoscience and Technology, China

² The University of Melbourne, Australia

³ Tsinghua University, China

⁴ University of Chinese Academy of Sciences, China



TTR-related functional peptides were designed with two different functional motifs. Here, we used scanning tunneling microscopy to achieve site-specific analyses of their assembly structures for rational design and optimization.

577–585

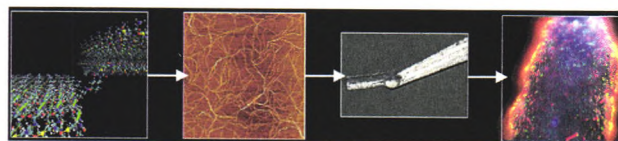
Cross-linked self-assembling peptide scaffolds

Raffaele Pugliese¹, Amanda Marchini^{1,2}, Gloria Anna Ada Saracino², Ronald N. Zuckermann³, and Fabrizio Gelain^{1,2,*}

¹ Opera di San Pio da Pietralcina, Italy

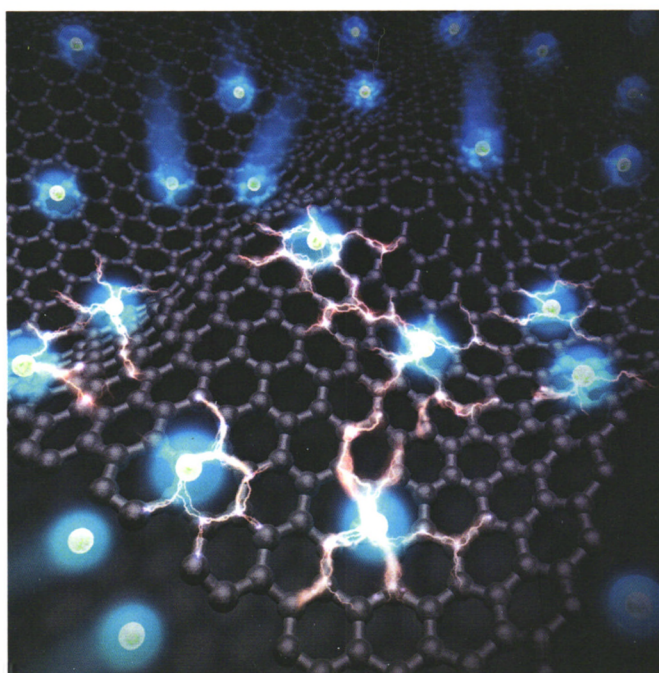
² A. O. Ospedale Niguarda Cà Granda, Italy

³ Lawrence Berkeley National Laboratory, USA



Self-assembling peptides have an unquestionable impact on regenerative medicine applications, because they feature biomimetic nano-architectures that mimic the complexity of natural peptide-based extracellular matrices of living tissues. Although self-assembling peptides have attracted increasing interest in the scientific community as tailorable, synthetic, and biocompatible biomaterials, their applications have been hampered so far by their poor mechanical properties, yielding soft and fragile scaffolds unsuitable for many medical applications. Here, by using a tailored cross-linking reaction, it was possible to covalently link peptide molecules after self-assembly, giving rise to dramatically stiffer, flexible, and tailorable biomimetic scaffolds, thus expanding their potential for many applications in regenerative medicine and beyond.

586–602



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