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Glucose-responsive oral insulin delivery for postprandial glycemic regulation



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Contents

Review Articles

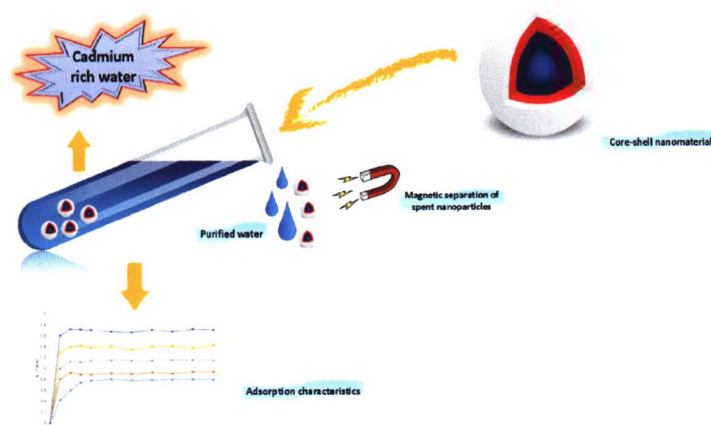
Nanomaterials for the abatement of cadmium (II) ions from water/wastewater

Kumar Vikrant¹, Vanish Kumar², Kowsalya Vellingiri³, and Ki-Hyun Kim^{1,*}

¹ Hanyang University, Republic of Korea

² National Agri-Food Biotechnology Institute (NABI), India

³ IIT Madras, India



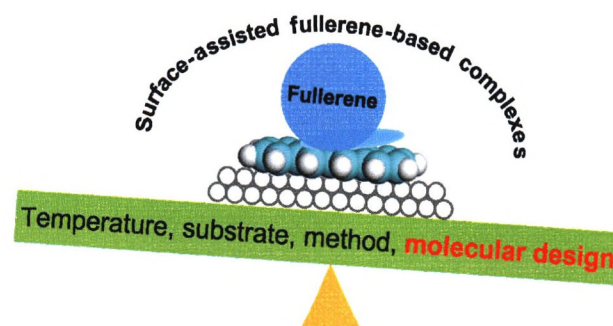
The advantageous characteristics of nanomaterials offer them superior performance in the treatment of Cd from aqueous solutions.

1489–1507

Dependence of the surface-assisted fullerene-based complex structure on the template molecule design

Yanfang Geng, Qingdao Zeng*, and Chen Wang*

National Center for Nanoscience and Technology, China



The present review specifically aims to comprehensively summarize the reported fullerene-based novel functional nanostructures thus far, generalize monolayer and multilayer of fullerenes such as C₆₀, C₇₀, and their derivatives by incorporating different organic molecules, and provide an overview and outlook for practical importance of these assembled structures.

1509–1537

Research Articles

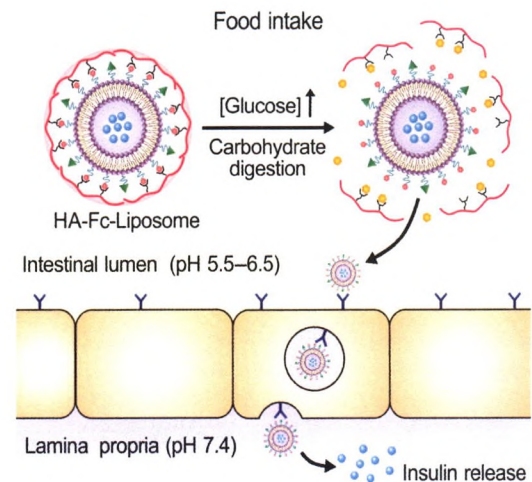
Glucose-responsive oral insulin delivery for postprandial glycemic regulation

Jicheng Yu¹, Yuqi Zhang¹, Jinqiang Wang^{1,2}, Di Wen^{1,2}, Anna R. Kahkoska³, John B. Buse³, and Zhen Gu^{1,2,3,*}

¹ University of North Carolina at Chapel Hill and North Carolina State University, USA

² University of California, Los Angeles, USA

³ University of North Carolina at Chapel Hill, USA



A transformative oral insulin delivery method is developed for postprandial glycemic regulation. Insulin-loaded liposomes with glucose-sensitive hyaluronic acid shell can respond to the elevated intestinal glucose levels following digestion of a meal, thereby facilitating enhanced intestinal absorption in an Fc receptor (FcRn)-mediated transport pathway. This glucose-triggered “smart insulin pill” can remarkably reduce postprandial blood sugar levels in a chemically-induced type 1 diabetic mouse model.

1539–1545

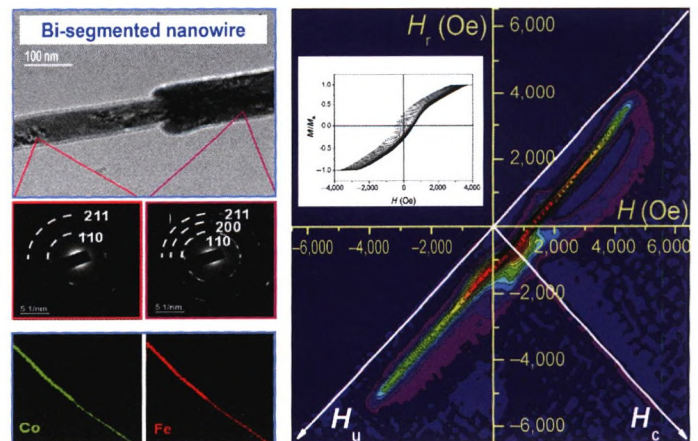
Stepwise magnetization reversal of geometrically tuned in diameter Ni and FeCo bi-segmented nanowire arrays

Ester M. Palmero^{1,3,*}, Miguel Méndez², Silvia González², Cristina Bran¹, Víctor Vega², Manuel Vázquez¹, and Víctor M. Prida²

¹ Institute of Materials Science of Madrid (ICMM-CSIC), Spain

² University of Oviedo, Spain

³ IMDEA Nanoscience, Spain



A combined fabrication method involving electrochemical anodization, atomic layer deposition (ALD) and electrodeposition techniques has allowed for the novel synthesis of bi-segmented nanowires with a well-defined and sharp transition between segments. Their magnetic characterization and study by the first-order reversal curve (FORC) determined stepwise magnetization reversal process that permits a controlled domain wall movement making these bi-segmented nanowires an interesting alternative for their application in novel ultrahigh-density data storage devices.

1547–1553

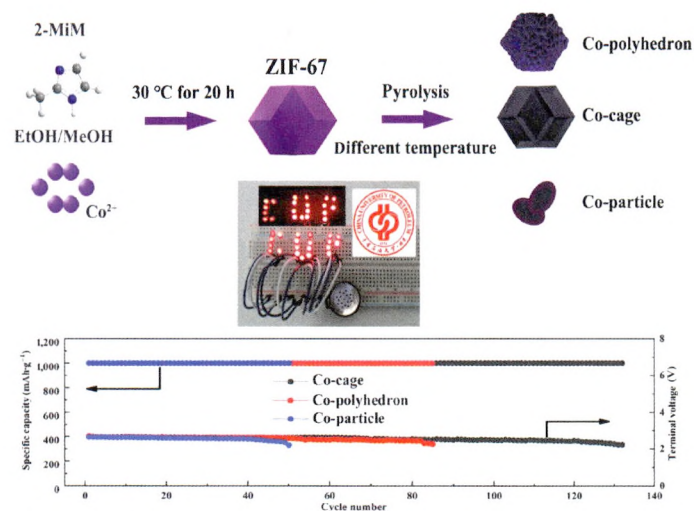
Co₃O₄ nanocage derived from metal-organic frameworks: An excellent cathode catalyst for rechargeable Li-O₂ battery

Zhuoliang Jiang¹, Hui Sun^{1,*}, Wenke Shi¹, Tianhang Zhou³,
Jianyong Hu¹, Jingyang Cheng¹, Pengfei Hu¹, and Shigang Sun²

¹ China University of Petroleum-Beijing, China

² Xiamen University, China

³ Technische Universitat, Germany



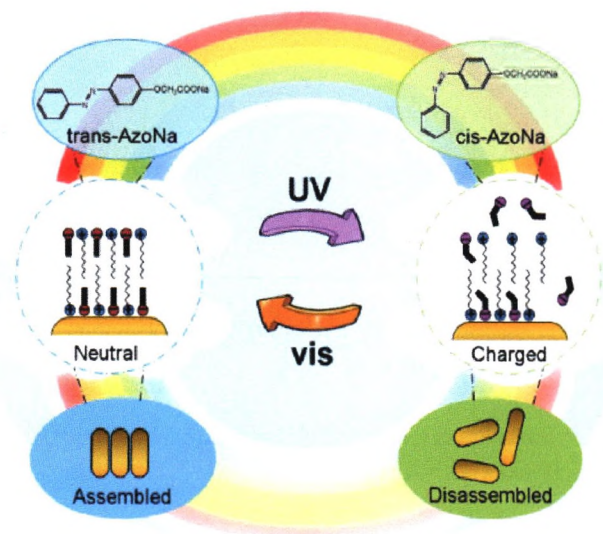
ZIF-67 was used as precursor template and heat treated at different temperature to produce Co₃O₄ catalysts with different morphologies. When calcinated at 350 °C, Co₃O₄ nanocage (Co-cage) with unique structure and excellent catalytic performance was obtained. The Co-cage stably delivered long cycle-life of 132 cycles at limited capacity of 1,000 mAh·g⁻¹ under current density of 0.5 A·g⁻¹.

1555–1562

Reversible self-assembly of gold nanorods mediated by photoswitchable molecular adsorption

Qian Wang, Di Li, Junyan Xiao, Fucheng Guo, and Limin Qi*

Peking University, China



Light-induced reversible self-assembly (LIRSA) of gold nanorods without any chemical functionalizations is realized through photoswitchable adsorption of an anionic azobenzene derivate AzoNa, which is caused by the reversible change between a nearly neutral state and a highly charged state of the gold nanorods (GNRs) arising from the photoswitchable adsorption of AzoNa triggered by photoisomerization.

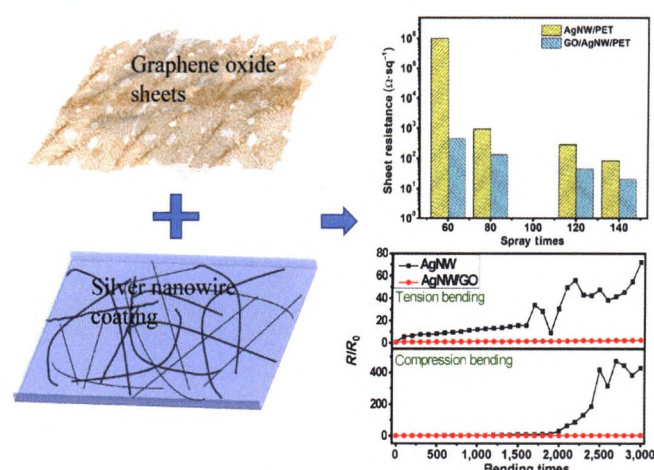
1563–1569

Can insulating graphene oxide contribute the enhanced conductivity and durability of silver nanowire coating?

Feng Duan^{1,2}, Weiwei Li¹, Guorui Wang¹, Chuanxin Weng^{1,2}, Hao Jin¹, Hui Zhang^{1,*}, and Zhong Zhang^{1,*}

¹ National Center for Nanoscience and Technology, China

² University of Chinese Academy of Sciences, China



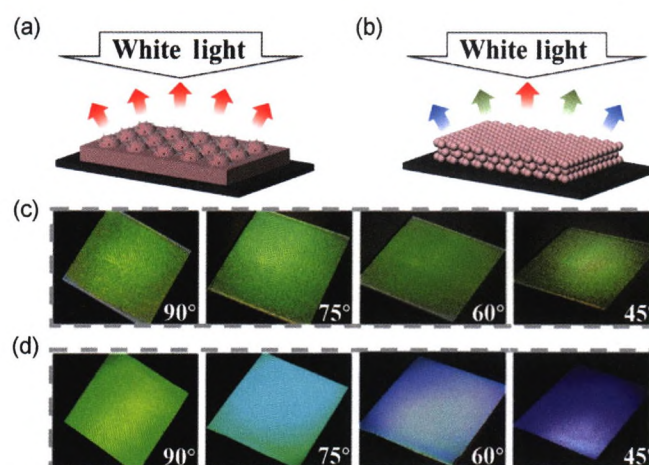
Insulating graphene oxide sheet is applied to work as a protect layer for flexible transparent conductive silver nanowire coating. The graphene oxide sheets effectively improve the electrical conductivity, chemical and mechanical durability of silver nanowire coating due to decreased contact resistance for strong interaction between graphene oxide and substrate as well as extra conductive channels provided by graphene oxide sheets.

1571–1577

Bio-inspired angle-independent structural color films with anisotropic colloidal crystal array domains

Zhuohao Zhang, Zhuoyue Chen, Lingyu Sun, Xiaoxuan Zhang, and Yuanjin Zhao*

Southeast University, China



A novel bio-inspired angle-independent structural material by simply doping spinous pollen particles into the colloidal crystal arrays can reflect the light to a wide range of viewing angles, which impart the derived materials with the same wide angle of structural colors. These angle-independent structural color materials are expected to open a new chapter in the research fields of coloration sensing, anti-counterfeiting labels, etc.

1579–1584

Enhanced RuBisCO activity and promoted dicotyledons growth with degradable carbon dots

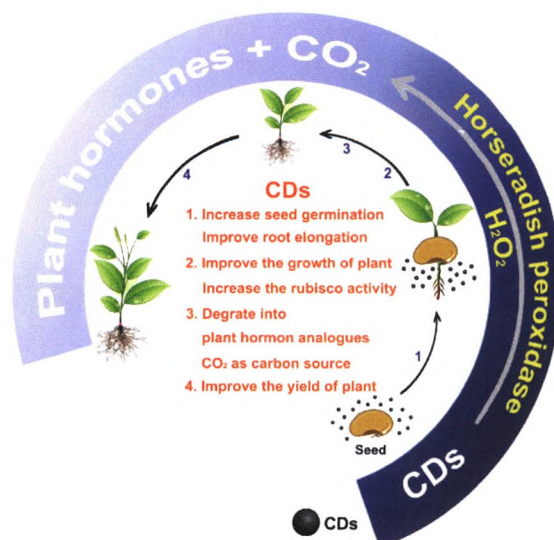
Hao Li¹, Jian Huang¹, Yang Liu^{1,*}, Fang Lu³, Jun Zhong¹, Yong Wang², Shuiming Li², Yeshayahu Lifshitz^{1,4,*}, Shuit-Tong Lee¹, and Zhenhui Kang^{1,*}

¹ Soochow University, China

² Shenzhen University, China

³ Beijing University of Chinese Medicine, China

⁴ Israel Institute of Technology, Israel



The degradable carbon dots are efficient and crucial in promoting dicotyledons growth.

1585–1593

Photoluminescence of Ag–In–S/ZnS quantum dots: Excitation energy dependence and low-energy electronic structure

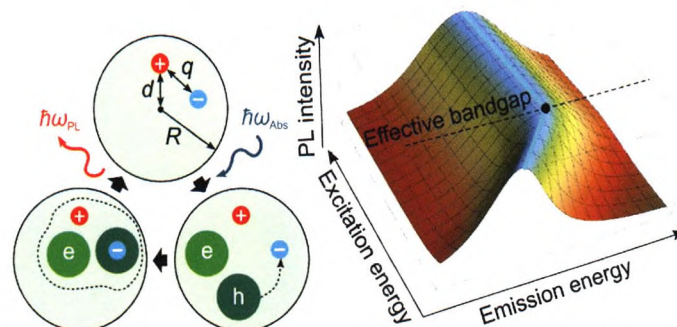
Irina V. Martynenko^{1,*}, Anvar S. Baimuratov², Florian Weigert¹, José X. Soares³, Lorena Dharmo¹, Philip Nickl¹, Ilona Doerfel¹, Jutta Pauli¹, Ivan D. Rukhlenko^{2,4}, Alexander V. Baranov^{2,*}, and Ute Resch-Genger^{1,*}

¹ Federal Institute for Materials Research and Testing (BAM), Germany

² ITMO University, Russia

³ University of Porto, Portugal

⁴ The University of Sydney, Australia



A systematic study of the excitation energy dependence (EED) of the spectral position, spectral bandwidth, and quantum yield (QY) of the photoluminescence (PL) of sets of ternary AgInS₂/ZnS quantum dots (QDs) of different size and size distribution, chemical composition, and surface ligands is presented. Our results demonstrate the considerable potential of EED PL spectroscopy for providing insights into the electronic energy structure and band gap energies of ternary I–III–VI group QDs with their inhomogeneously broadened PL. Single particle spectroscopy confirms the inhomogeneous broadening which was subsequently explained by theoretical modeling.

1595–1603

In-situ formation of MOF derived mesoporous Co₃N/amorphous N-doped carbon nanocubes as an efficient electrocatalytic oxygen evolution reaction

Bong Kyun Kang^{1,†}, Seo Young Im^{2,†}, Jooyoung Lee², Sung Hoon Kwag², Seok Bin Kwon², Sintayehu Nibret Tiruneh², Min-Jun Kim³, Jung Ho Kim^{4,5}, Woo Seok Yang¹, Byungkwon Lim², and Dae Ho Yoon^{2,*}

¹ Korea Electronics Technology Institute, Republic of Korea

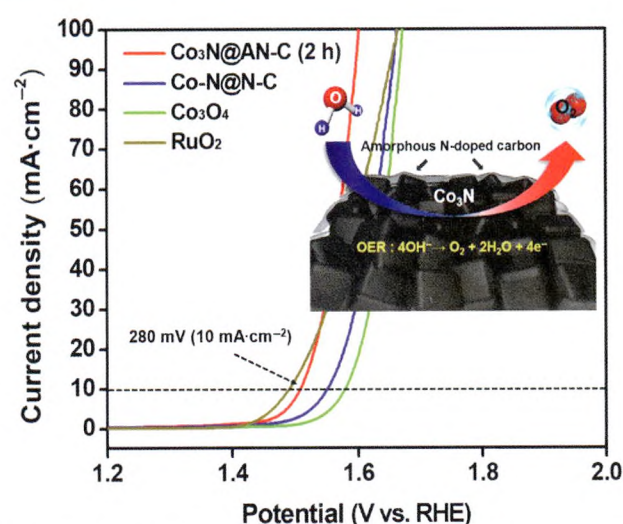
² Sungkyunkwan University, Republic of Korea

³ Institute for Advanced Engineering (IAE), Republic of Korea

⁴ University of Wollongong, Australia

⁵ Kyung Hee University, Republic of Korea

[†] Present address: Korea Electronics Technology Institute and Sungkyunkwan University, Republic of Korea



Co₃N@amorphous N-doped carbon nanocubes with well controlled open framework structures not only demonstrate enhanced OER activity with remarkably low overpotential (280 mV, 10 mA·cm⁻²), but also exhibit excellent cycling stability in alkaline electrolytes (24 h) without morphological changes and voltage elevations.

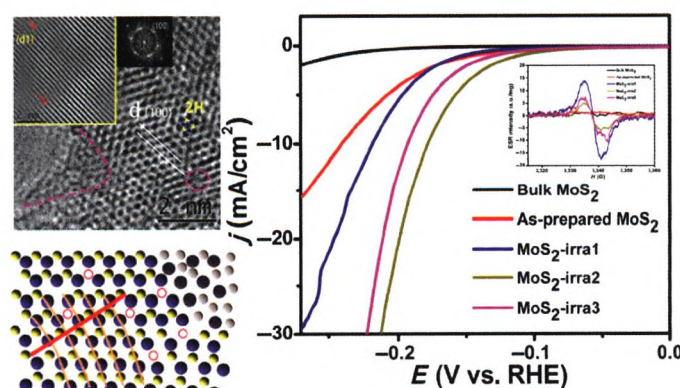
1605–1611

Defect engineering of molybdenum disulfide through ion irradiation to boost hydrogen evolution reaction performance

Cheng Sun¹, Peipei Wang², Hao Wang¹, Chuan Xu², Juntong Zhu¹, Yanxia Liang², Ying Su¹, Yining Jiang¹, Wenqi Wu¹, Engang Fu^{2,*}, and Guifu Zou^{1,*}

¹ Soochow University, China

² Peking University, China



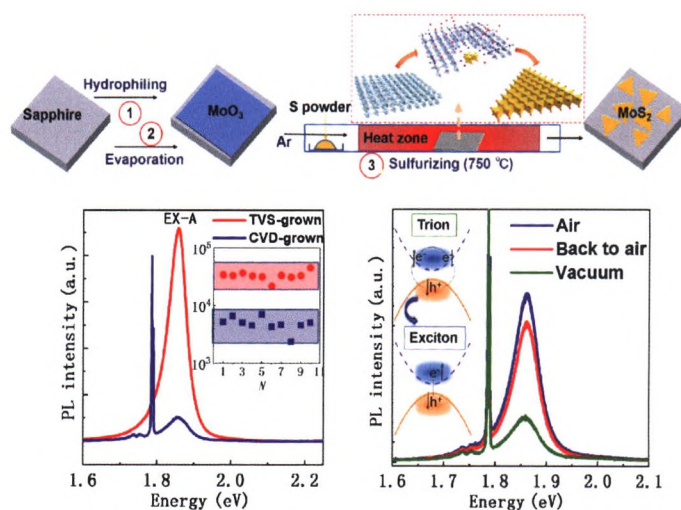
Ion irradiation is used to activate inert basal plane of MoS₂ nanosheets. Sulphur vacancy generated by ion irradiation boosts the efficient hydrogen evolution reaction (HER) performance. The study could further realize the desirable vacancies of other electrocatalyst.

1613–1618

Analysis of photoluminescence behavior of high-quality single-layer MoS₂

Lu Xu, Liyun Zhao, Yunsong Wang, Mingchu Zou, Qing Zhang, and Anyuan Cao*

Peking University, China



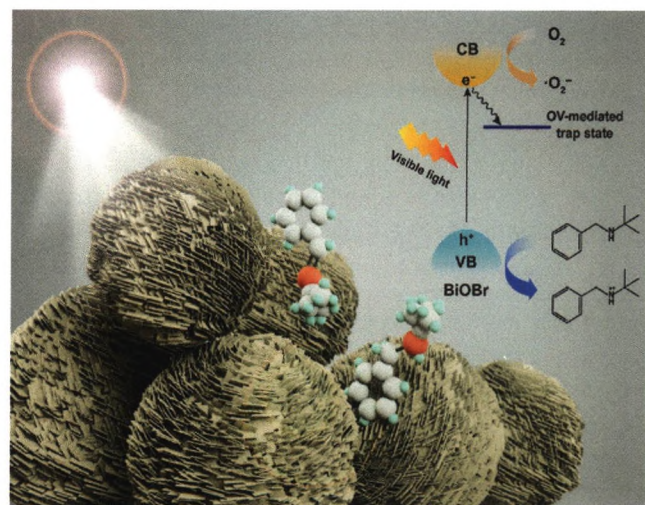
Single-layer MoS₂ synthesized by thermal vapor sulfurization (TVS) shows prominent photoluminescence (PL) performance, which is facilitated by molecular adsorption on S vacancies in air.

1619–1624

Convenient fabrication of BiOBr ultrathin nanosheets with rich oxygen vacancies for photocatalytic selective oxidation of secondary amines

Xuanjue Tong, Xing Cao, Tong Han, Weng-Chon Cheong, Rui Lin, Zheng Chen, Dingsheng Wang, Chen Chen, Qing Peng*, and Yadong Li*

Tsinghua University, China



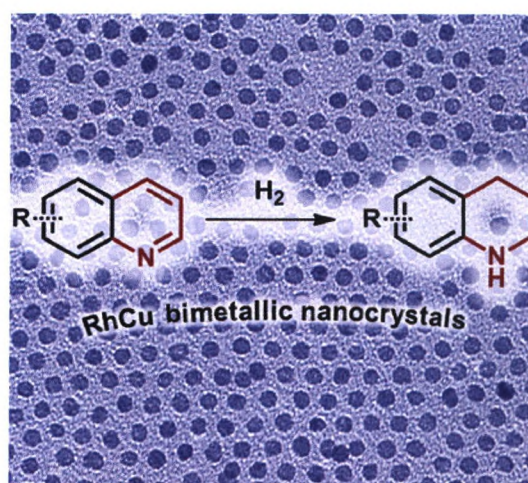
Ultrathin BiOBr nanosheets with rich oxygen vacancies (OVs) created and sufficiently distributed on the surface are prepared by a facile solvothermal method, which exhibit an excellent photocatalytic ability of oxide secondary amines with high efficiency, selectivity and stability.

1625–1630

Selective hydrogenation of N-heterocyclic compounds over rhodiumcopper bimetallic nanocrystals under ambient conditions

Muhammad Mateen, Khadim Shah, Zheng Chen*, Chen Chen, and Yadong Li

Tsinghua University, China



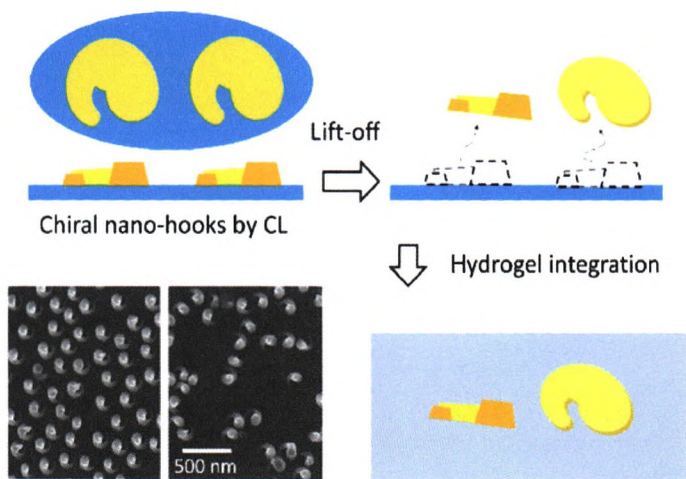
We describe the synthesis of various RhCu bimetallic nanocrystals and their composition dependent performance for selective hydrogenation of quinolines at ambient conditions.

1631–1634

Oxidation controlled lift-off of 3D chiral plasmonic Au nano-hooks

Gunnar Klös, Amanda Andersen, Matteo Miola, Henrik Birkedal, and Duncan S. Sutherland*

Aarhus University, Denmark



In this work, we report a novel approach to prepare chiral plasmonic nanoparticles by lithographic approaches for solution applications. As a proof of principle, we utilize the capabilities of the chiral plasmonic nanoparticles to monitor the water content in a hydrogel.

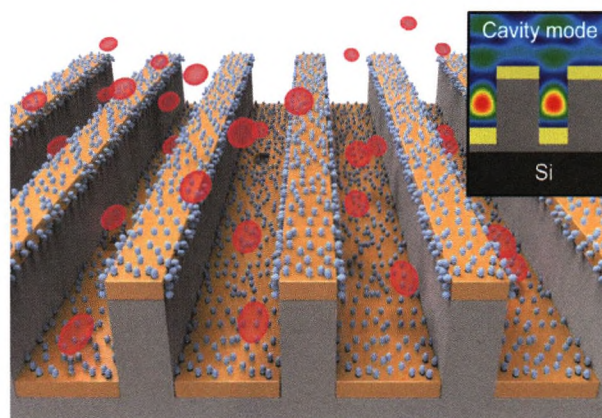
1635–1642

Real-time Raman detection by the cavity mode enhanced Raman scattering

Yang Liu¹, Xiaorui Tian², Weiran Guo¹, Wenqiang Wang¹, Zhiqiang Guan^{1,*}, and Hongxing Xu^{1,2,*}

¹ Wuhan University, China

² Shandong Normal University, China



The cavity mode enhanced surface enhanced Raman scattering (SERS) phenomena for both surface-adsorbed and non-surface-adsorbed molecules Raman detection in the aqueous solution environment were reported. This is an important step toward the realization of highly sensitive, repeatable, stable, reusable and real-time Raman detection of molecules in microfluidic SERS.

1643–1649

Fe₂N nanoparticles boosting FeN_x moieties for highly efficient oxygen reduction reaction in Fe-N-C porous catalyst

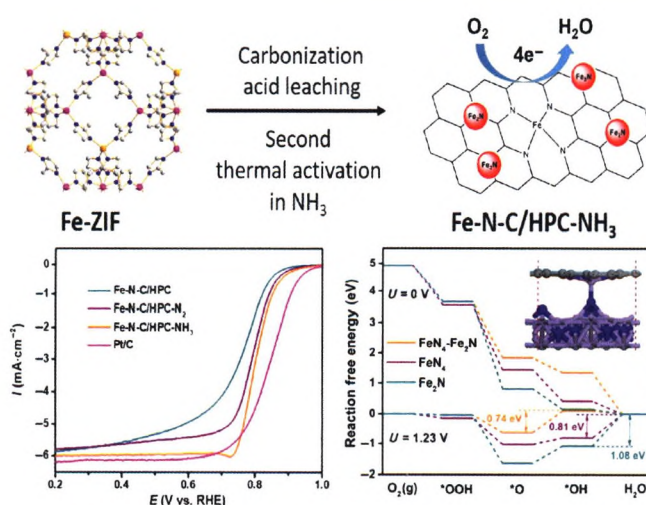
Xiao Liu^{1,2}, Hong Liu^{2,3}, Chi Chen¹, Liangliang Zou¹, Yuan Li⁴, Qing Zhang⁴, Bo Yang^{3,*}, Zhiqing Zou¹, and Hui Yang^{1,*}

¹ Shanghai Advanced Research Institute, Chinese Academy of Sciences, China

² University of the Chinese Academy of Sciences, China

³ ShanghaiTech University, China

⁴ Evergrande Neoenenergy Technology Group, China



A porous Fe-N-C/HPC-NH₃ catalyst containing both FeN_x moieties and Fe₂N nanoparticles is successfully synthesized by pyrolyzing the Fe-doped zeolitic imidazolate framework (Fe-ZIF) precursors and the mechanism of Fe₂N nanoparticles boosting FeN_x moieties for highly efficient oxygen reduction reaction (ORR) is illuminated.

1651–1657

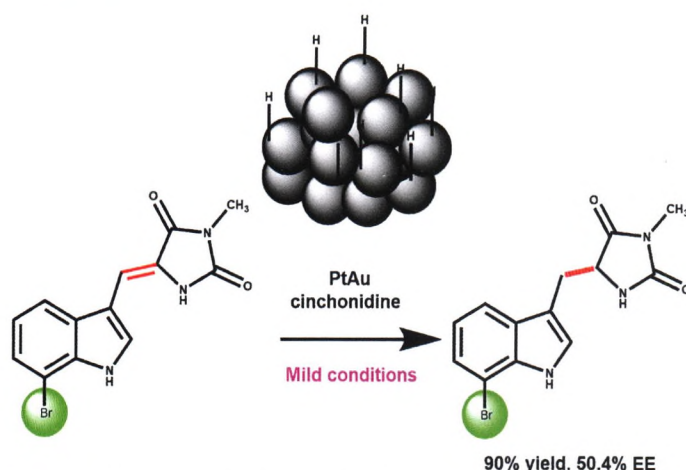
PtAu bimetallic nanocatalyst for selective hydrogenation of alkenes over aryl halides

Le Guo¹, Junjie Mao³, Shuangxi Guo¹, Qi Zhang¹, Shuangfei Cai^{2,*}, and Wei He^{1,*}

¹ Tsinghua University, China

² University of Chinese Academy of Sciences, China

³ Anhui Normal University, China



Chemo- and enantio-selective hydrogenation of alkenes was achieved by using supported bimetallic PtAu nanocatalyst, where the chemoselectivity was controlled by the composition of the PtAu catalyst and the enantioselectivity was achieved by surface modifying chiral ligands.

1659–1662

Spectroscopic signatures of edge states in hexagonal boron nitride

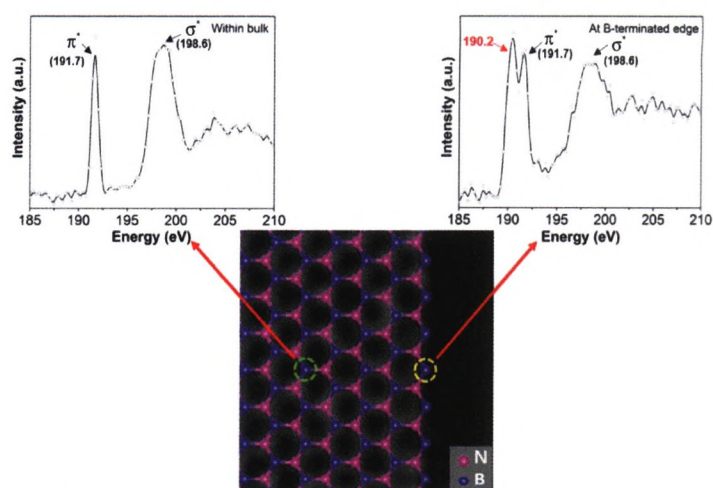
Chuang Gao¹, Lei Tao^{1,2,3}, Yu-Yang Zhang^{1,*}, Shixuan Du^{1,2}, Sokrates T. Pantelides^{1,3}, Juan Carlos Idrobo⁴, Wu Zhou^{1,*}, and Hong-Jun Gao^{1,2}

¹ University of Chinese Academy of Sciences, China

² Institute of Physics, Chinese Academy of Sciences, China

³ Vanderbilt University, USA

⁴ Oak Ridge National Laboratory, USA



Edges in monolayer or bilayer h-BN with bonding unsaturated sp^2 boron atoms have a unique spectroscopic signature with a prominent pre-peak at ~ 190.2 eV in the B K-edge electron energy-loss fine structure.

1663–1667

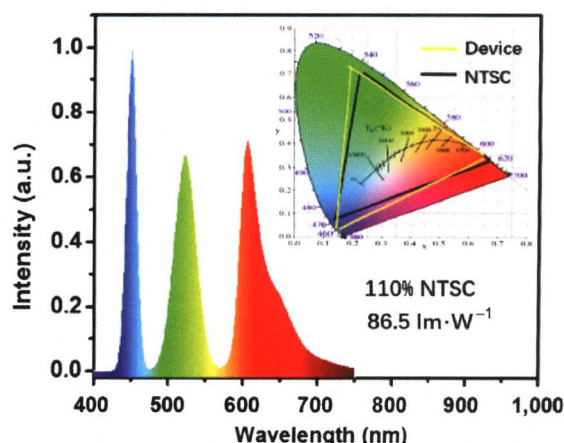
Highly efficient and stable white LEDs based on pure red narrow bandwidth emission triangular carbon quantum dots for wide-color gamut backlight displays

Fanglong Yuan¹, Ping He¹, Zifan Xi¹, Xiaohong Li¹, Yunchao Li¹, Haizheng Zhong², Louzhen Fan^{1,*}, and Shihe Yang^{3,*}

¹ Beijing Normal University, China

² Beijing Institute of Technology, China

³ Peking University, China



Pure red and pure green narrow bandwidth emission triangular carbon quantum dots with high quantum yields over 70% are obtained. Highly efficient and stable white light-emitting diodes (LEDs) with wide-color gamut of 110% NTSC and high power efficiency of 86.5 lumens per Watt are achieved.

1669–1674

Atomic-scale structural and chemical evolution of $\text{Li}_3\text{V}_2(\text{PO}_4)_3$ cathode cycled at high voltage window

Shulin Chen^{1,2,3}, Jian Zou¹, Yuehui Li³, Ning Li³, Mei Wu³, Jinghuang Lin², Jingmin Zhang³, Jian Cao², Jicai Feng², Xiaobin Niu¹, Jianming Bai⁴, Junlei Qi^{2,*}, Peng Gao^{2,3,5,*}, Liping Wang^{1,*}, and Hong Li⁶

¹ University of Electronic Science and Technology of China, China

² Harbin Institute of Technology, China

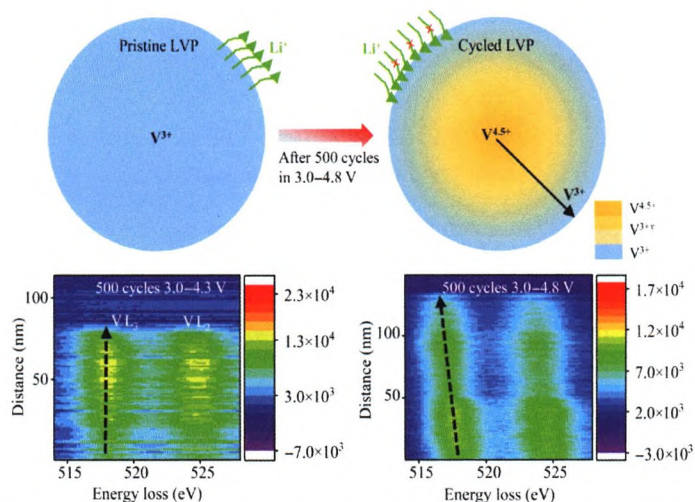
³ Peking University, China

⁴ Brookhaven National Laboratory, USA

⁵ Collaborative Innovation Center of Quantum Matter, China

⁶ Institute of Physics, Chinese Academy of Sciences, China

1675–1681



By using atomically resolved scanning transmission electron microscopy and electron energy loss spectroscopy, we investigate the structural and chemical evolution of $\text{Li}_3\text{V}_2(\text{PO}_4)_3$ upon the high-voltage window (3.0–4.8 V) and find the capacity fading is mainly attributed to the formation of massive electrochemically inactive $\text{Li}_{3-x}\text{V}_2(\text{PO}_4)_3$ phases in the particle core.

van der Waals epitaxial growth of ultrathin metallic NiSe nanosheets on WSe_2 as high performance contacts for WSe_2 transistors

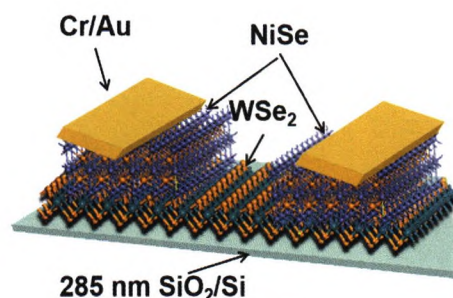
Bei Zhao¹, Weiqi Dang¹, Xiangdong Yang¹, Jia Li¹, Haihong Bao², Kai Wang², Jun Luo², Zhengwei Zhang¹, Bo Li¹, Haipeng Xie³, Yuan Liu¹, and Xidong Duan^{1,*}

¹ Hunan University, China

² Tianjin University of Technology, China

³ Central South University, China

1683–1689



Ultrathin metallic NiSe nanosheets with thickness down to the monolayer are synthesized on WSe_2 in which the metallic NiSe nanosheets function as the contact electrodes to WSe_2 without direct chemical bonding, creating an interface that is essentially free from chemical disorder. This study provides an effective pathway to reduce the electrode contact resistance and improve the performance of two-dimensional (2D) semiconductor.

Thickness determination of MoS_2 , MoSe_2 , WS_2 and WSe_2 on transparent stamps used for deterministic transfer of 2D materials

Najme S. Taghavi^{1,2}, Patricia Gant^{1,*}, Peng Huang^{1,3}, Iris Niehues⁴, Robert Schmidt⁴, Steffen Michaelis de Vasconcellos⁴, Rudolf Bratschitsch⁴, Mar García-Hernández¹, Riccardo Frisenda^{1,*}, and Andres Castellanos-Gomez^{1,*}

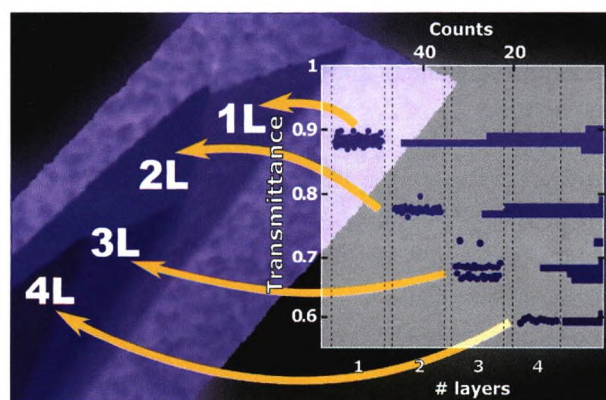
¹ Consejo Superior de Investigaciones Científicas (CSIC), Spain

² Khaje Nasir Toosi University of Technology (KNTU), Iran

³ Tsinghua University, China

⁴ University of Münster, Germany

1691–1695



Identifying and determining the number of layers of transition metal dichalcogenides (TMDCs) when they are on the surface of polymer stamps used for their deterministic transfer results a challenging task. We present a fast and reliable method to determine the number of layers of thickness of TMDCs by the quantitative analysis of the blue channel of transmission mode optical microscopy images.

Nanoscale imaging of electric pathways in epitaxial graphene nanoribbons

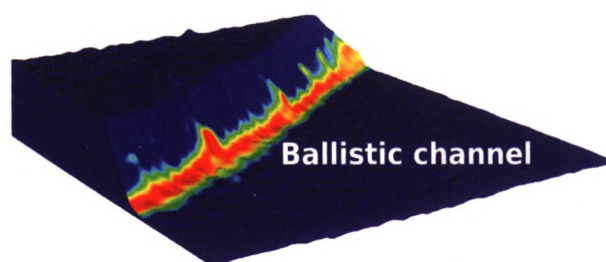
Johannes Aprozanz^{1,2}, Pantelis Bampoulis^{2,3}, Alexei A. Zakharov⁴, Harold J. W. Zandvliet³, and Christoph Tegenkamp^{1,2,*}

¹ Technische Universität Chemnitz, Germany

² Leibniz Universität Hannover, Germany

³ University of Twente, The Netherlands

⁴ MAX IV Laboratory and Lund University, Sweden



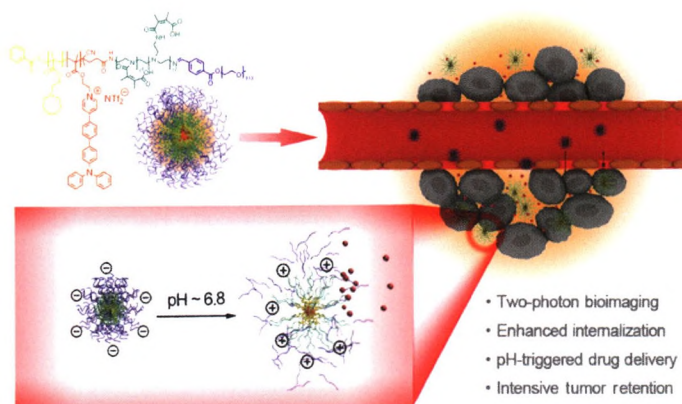
High-resolution conductive atomic force microscopy (AFM) studies complemented by nanoprobe measurements revealed electronically different transport channels in both zig-zag and armchair graphene nanoribbons on the nanoscale.

1697–1702

Two-photon AIE probe conjugated theranostic nanoparticles for tumor bioimaging and pH-sensitive drug delivery

Boxuan Ma, Weihua Zhuang, Haiyang He, Xin Su, Tao Yu, Jun Hu, Li Yang*, Gaocan Li*, and Yunbing Wang

Sichuan University, China



A novel theranostic nanoplatform labeled with newly designed two-photon fluorophore has been developed for tumor bioimaging and efficient therapy, which features pH triggered enhanced endocytosis, drug delivery and tumor retention.

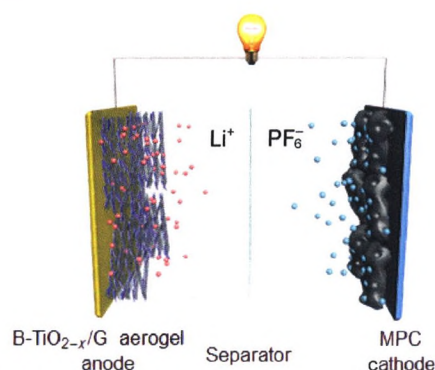
1703–1712

High-performance Li-ion capacitor based on black-TiO_{2-x}/graphene aerogel anode and biomass-derived microporous carbon cathode

Guoyin Zhu¹, Lianbo Ma¹, Huinan Lin¹, Peiyang Zhao¹, Lei Wang¹, Yi Hu¹, Renpeng Chen¹, Tao Chen¹, Yanrong Wang¹, Zuoxiu Tie^{1,*}, and Zhong Jin^{1,2,*}

¹ Nanjing University, China

² Shenzhen Research Institute of Nanjing University, China



The oxygen-deficient black TiO_{2-x}/graphene aerogel||microporous carbon (MPC) lithium-ion capacitors (LICs) exhibit long cycle life, high energy density, and high power output.

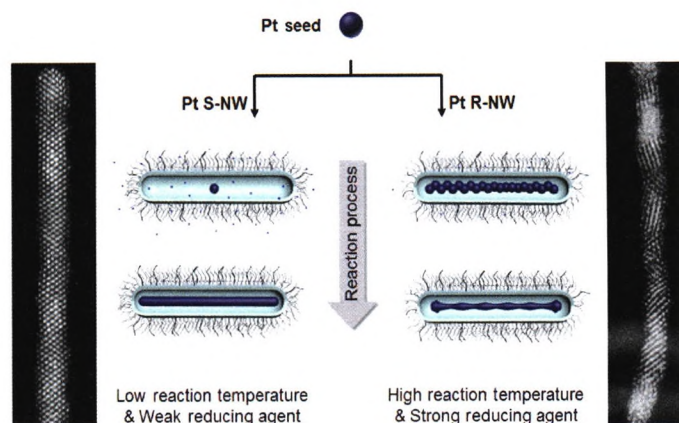
1713–1719

One-nanometer-thick platinum-based nanowires with controllable surface structures

Xiaokun Fan^{1,2}, Shuiping Luo¹, Xixia Zhao¹, Xiaotong Wu^{1,2}, Zhishan Luo¹, Min Tang¹, Wen Chen¹, Xing Song¹, and Zewei Quan^{1,*}

¹ Southern University of Science and Technology, China

² Peking University, China



Engineering the surface structures of one-nanometer-thick Pt-based nanowires is one of the most promising methods to tune their electrocatalytic activities.

1721–1726

Luminescent single-molecule magnet of metallofullerene DyErScN@I_h-C₈₀

Mingzhe Nie^{1,5}, Jin Xiong², Chong Zhao^{1,5}, Haibing Meng^{1,5}, Kun Zhang⁴, Yibo Han⁴, Jie Li¹, Bingwu Wang^{2,*}, Lai Feng^{3,*}, Chunru Wang^{1,*}, and Taishan Wang^{1,*}

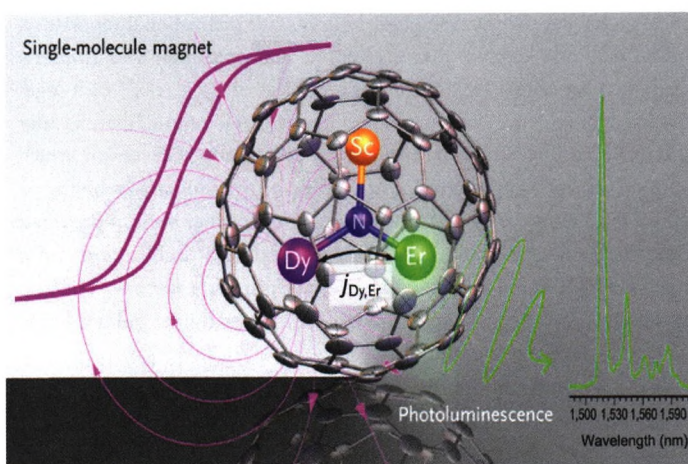
¹ Institute of Chemistry, Chinese Academy of Sciences, China

² Peking University, China

³ Soochow University, China

⁴ Huazhong University of Science and Technology, China

⁵ University of Chinese Academy of Sciences, China



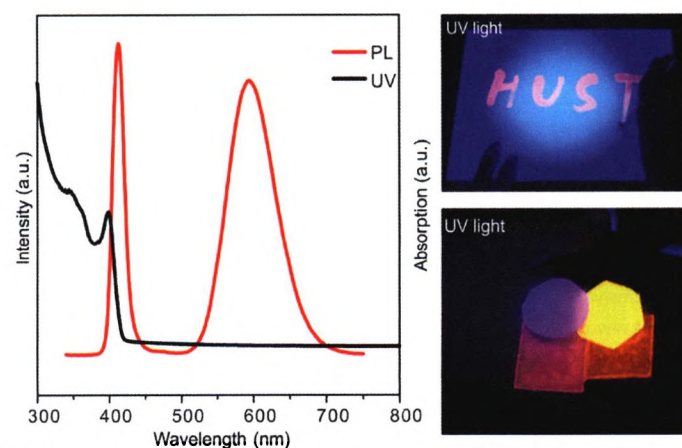
A novel metallofullerene DyErScN@I_h-C₈₀ exhibiting both single-molecule magnet (SMM) behavior and near-infrared photoluminescence was designed.

1727–1731

Gram-scale synthesis of all-inorganic perovskite quantum dots with high Mn substitution ratio and enhanced dual-color emission

Lvming Dong, Zhuo Chen, Lei Ye*, Yan Yu, Jianbing Zhang, Huan Liu, and Jianfeng Zang*

Huazhong University of Science and Technology, China

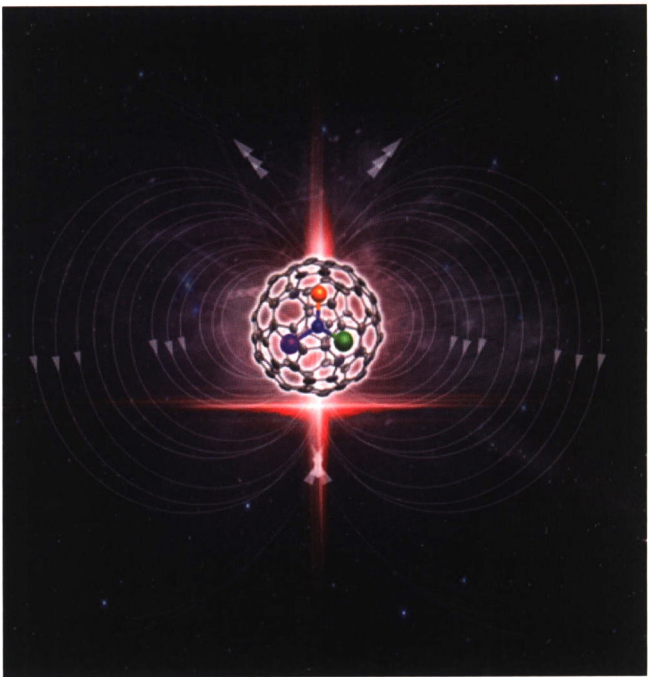


We report gram-scale synthesis of high Mn-doped CsPbX₃ quantum dots (QDs) with high photoluminescence quantum yields (PLQYs), and their applications on invisible ink and polymer composites.

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