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Happy 80th Birthday to Professor Yitai Qian

Celebrating 60 Years of Innovation
in Solid-State Chemistry and Nanoscience



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Contents

Editorial

On the occasion of the 80th birthday of Professor Yitai Qian: Celebrating 60 years of innovation in solid-state chemistry and nanoscience

Shu-Hong Yu^{1,*}, Xiangfeng Duan^{2,*}, Yi Xie^{1,*}, Peidong Yang^{3,*}, and Yadong Li^{4,*}

¹ University of Science and Technology of China, China

² University of California, Los Angeles, USA

³ University of California, Berkeley, USA

⁴ Tsinghua University, China

3337–3342

Review & Research Articles

Octagold selenido nanoclusters: Significance of surface ligands on tuning geometric and electronic structure of Au_8Se_2 kernel

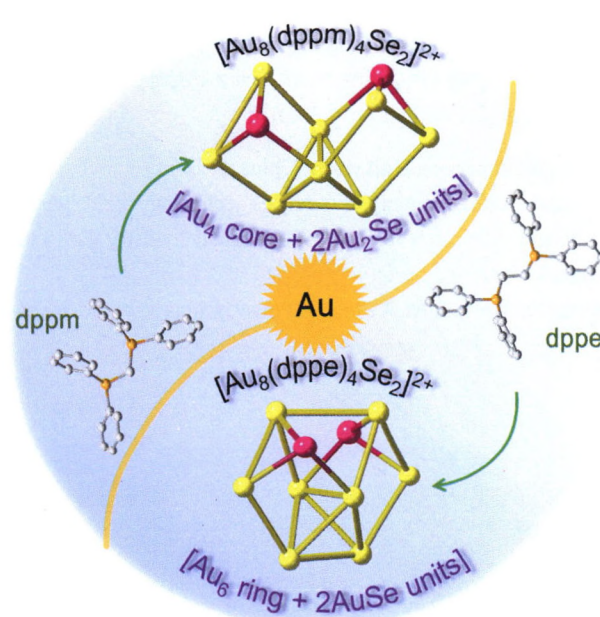
Shanshan Zhang¹, Yingzhou Li², Lei Feng¹, Qingwang Xue³, Zhiyong Gao⁴, Chenho Tung¹, and Di Sun^{1,*}

¹ Shandong University, China

² Qilu University of Technology (Shandong Academy of Science), China

³ Liaocheng University, China

⁴ Henan Normal University, China



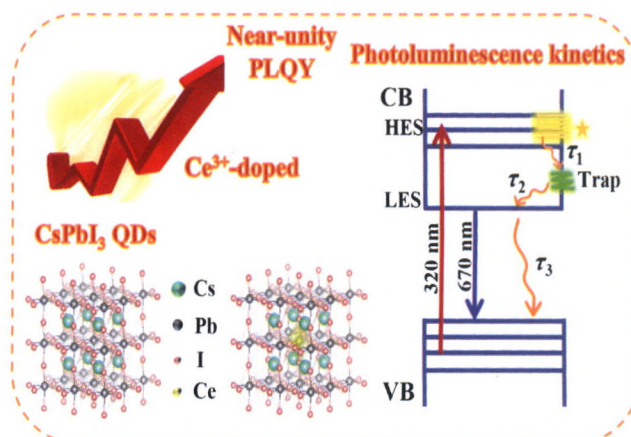
Two superatom gold selenido nanoclusters with different kernel geometric and electronic structure were obtained by tuning surface diphosphine ligand. They showed interesting thermochromic luminescence and gas-phase fragmentation phenomenon.

3343–3351

Synthesis and photoluminescence kinetics of Ce^{3+} -doped CsPbI_3 QDs with near-unity PLQY

Bowang Shu, Yajing Chang, Jinhua Zhang, Xiaopeng Cheng, and Dabin Yu*

National University of Defense Technology, China



Ce^{3+} -doped CsPbI_3 quantum dots (QDs) with near-unity photoluminescence quantum yield (PLQY) and stable photoluminescence (PL) emission were successfully synthesized, and photoluminescence kinetics process of the QDs was fully investigated.

3352–3357

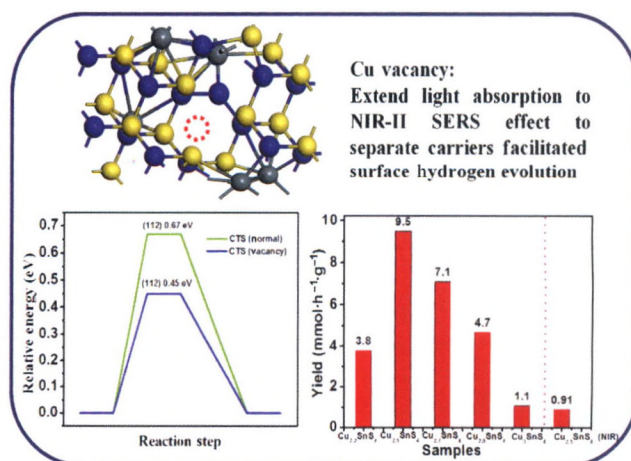
Copper vacancy activated plasmonic $\text{Cu}_{3-x}\text{SnS}_4$ for highly efficient photocatalytic hydrogen generation: Broad solar absorption, efficient charge separation and decreased HER overpotential

Nazakat Ali¹, Tsegaye Tadesse Tsega¹, Yucai Cao², Saghir Abbas¹, Wenjing Li¹, Asma Iqbal¹, Hira Fazal¹, Zhiling Xin^{3,*}, Jiantao Zai^{1,*}, and Xuefeng Qian^{1,*}

¹ Shanghai Jiao Tong University, China

² Shanghai Key Laboratory of Catalysis Technology for Polyolefins (Shanghai Research Institute of Chemical Industry Co., Ltd.), China

³ Shanghai University of Electric Power, China



Plasmonic $\text{Cu}_{3-x}\text{SnS}_4$ ($x = 0-0.8$) with copper vacancies was fabricated via economical solvothermal process. The optimal H_2 evolution rate of pure phase copper tin sulfide (CTS) flowerlike microspheres was $9.6 \text{ mmol} \cdot \text{g}^{-1} \cdot \text{h}^{-1}$ under visible–near infrared (vis–NIR) ($\lambda > 420 \text{ nm}$) light irradiation even without using any co-catalyst.

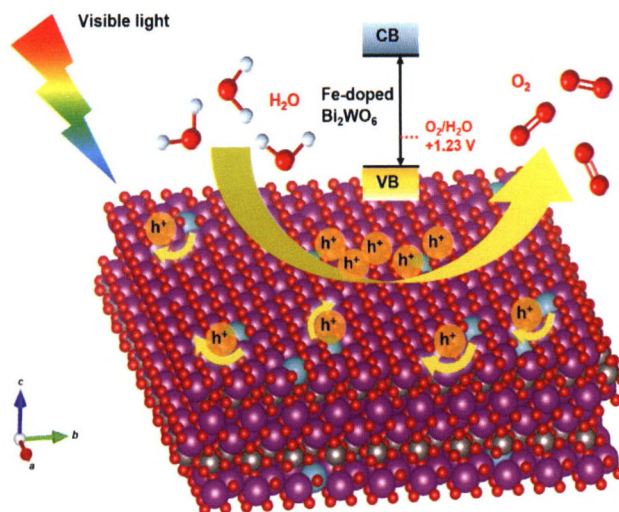
3358–3364

Constructing charge transfer channel between dopants and oxygen vacancies for enhanced visible-light-driven water oxidation

Ming Cheng¹, Lan Yang¹, Huiyi Li¹, Wei Bai¹, Chong Xiao^{1,2,*}, and Yi Xie^{1,2,*}

¹ University of Science and Technology of China, China

² Hefei Comprehensive National Science Center, China



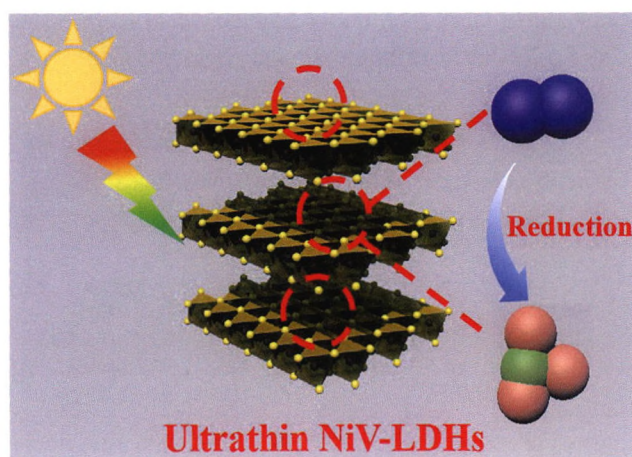
The Fe-doped Bi₂WO₆ nanosheets with oxygen vacancies were synthesized to obtain enhanced visible-light-driven photocatalytic water oxidation efficiency. The improvement resulted from the regulation of band structure of the catalysts, and construction of charge transfer channel by vacancy-related localized electron distribution.

3365–3371

Ultrathin Ni/V-layered double hydroxide nanosheets for efficient visible-light-driven photocatalytic nitrogen reduction to ammonia

Xuefei Liu, Yanmei Li, Junzheng Zhang, and Jun Lu*

Beijing University of Chemical Technology, China



This work prompts the development of nitrogen fixation in a sustainable way. And the Ni/V-layered double hydroxide (Ni/V-LDHs) nanosheets were prepared through aqueous miscible organic solvent (AMO) method, and were used as the photocatalyst for reducing nitrogen to ammonia, to achieve the higher yield of ammonia.

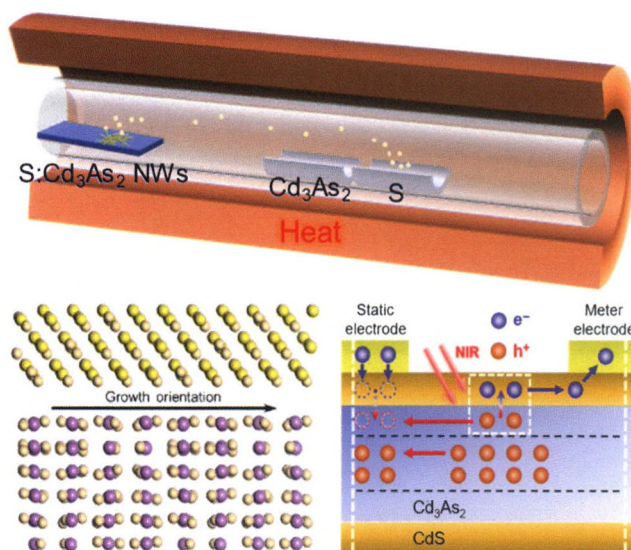
3372–3378

Modify Cd_3As_2 nanowires with sulfur to fabricate self-powered NIR photodetectors with enhanced performance

Yongxu Yan^{1,2}, Wenhao Ran^{1,2}, Zhexin Li^{1,2}, Linlin Li^{1,2}, Zheng Lou^{1,*}, and Guozhen Shen^{1,2,*}

¹ Institute of Semiconductors, Chinese Academy of Sciences, China

² University of Chinese Academy of Sciences, China



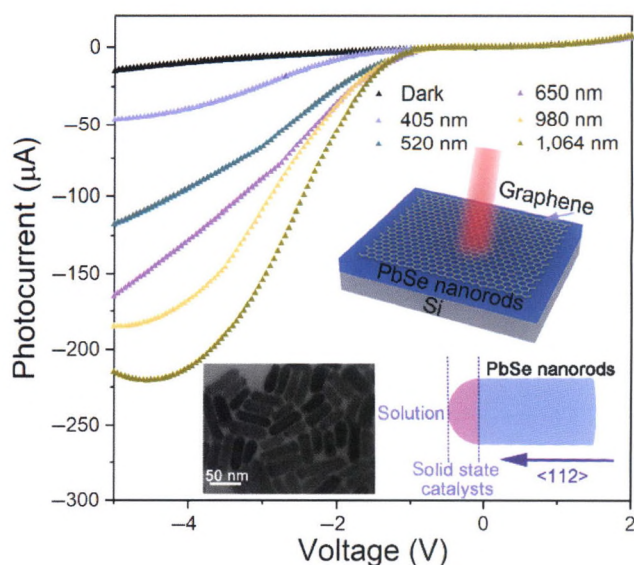
A modification method of preventing nanowires from oxidizing is demonstrated. After modifying the surface of Cd_3As_2 nanowires with sulfur, a layer of CdS is formed to remove electron traps in oxidation layer and lower electron barrier, which can extend carrier lifetime and increase near-infrared (NIR) photocurrent. This study suggests an effective method to stop oxidation and promote photoresponse performance.

3379–3385

Unconventionally anisotropic growth of PbSe nanorods: Controllable fabrication under solution–solid–solid regime over Ag_2Se catalysis for broadband photodetection

Su You, Li Zhang, and Qing Yang*

University of Science and Technology of China, China



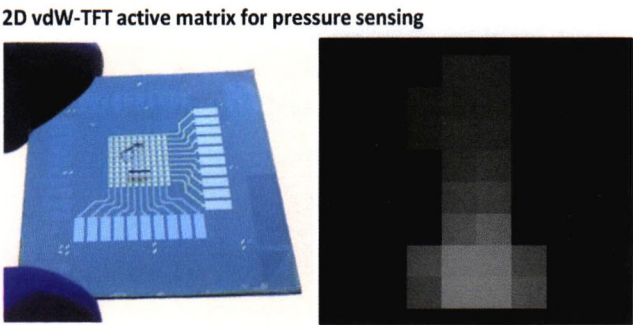
High-quality unconventionally anisotropic PbSe nanorods grown along $\langle 112 \rangle$ direction have been synthesized by a solution-phase strategy under solution–solid–solid growth regime over the catalysis of $\text{bcc-Ag}_2\text{Se}$. The PbSe nanorods were applied for fabrication of a broadband photodetector, which exhibits excellent performance with a high responsivity of $0.78 \text{ A} \cdot \text{W}^{-1}$ and a fast response time of $17.5 \mu\text{s}$.

3386–3394

Two-dimensional van der Waals thin film transistors as active matrix for spatially resolved pressure sensing

Chao Ma^{1,2}, Dong Xu¹, Peiqi Wang¹, Zhaoyang Lin¹, Jingyuan Zhou¹, Chuancheng Jia¹, Jin Huang¹, Shengtao Li², Yu Huang^{1,*}, and Xiangfeng Duan^{1,*}

¹ University of California, Los Angeles, USA
² Xi'an Jiaotong University, China



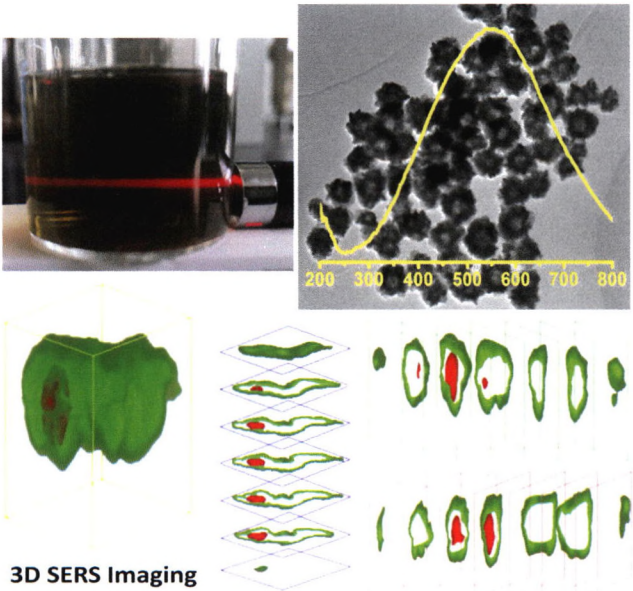
Solution-processed two-dimensional (2D) van der Waals thin film transistor (vdW-TFT) active matrix combined with microstructured rubber electrodes enables high-performance spatially resolved pressure sensing.

3395–3401

Determine the position of nanoparticles in cells by using surface-enhanced Raman three-dimensional imaging

Wei Liu, Wentao Li, Yahui Li, Junfang Li, Hua Bai, Mingqiang Zou, and Guangcheng Xi*

Chinese Academy of Inspection and Quarantine, China



MoO₂ hollow nanosphere with a strong surface plasmon resonance effect in the visible light region exhibits an excellent surface enhanced Raman scattering effect, which can be efficiently used as Raman probes to perform three-dimensional cell imaging.

3402–3406

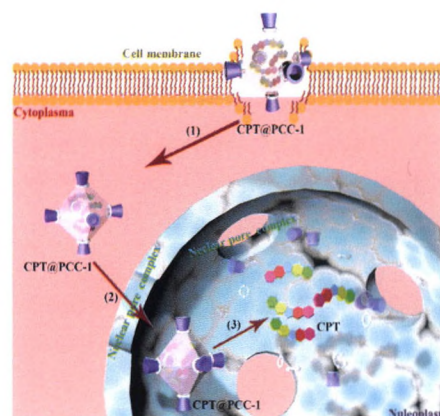
A stable biocompatible porous coordination cage promotes *in vivo* liver tumor inhibition

Yu Liang¹, Yu Fang^{1,*}, Yong Cui^{2,*}, and Hongcai Zhou^{3,*}

¹ Hunan University, China

² Shanghai Jiao Tong University, China

³ Texas A&M University, USA



Intranuclear DNA inhibitor delivery: porous coordination cage (PCC) carried the drug in its cavity, passed through cytoplasm membrane (1), nuclear pore complex (2), and delivered the drug into the nucleus (3). The intranuclear delivery by PCC dramatically improved the anti-cancer efficacy of camptothecin, when comparing to control groups and other delivery vectors. By taking advantage of its modulated structure and functionality, PCC can be designed for designated nucleus-targeting, depending on specific imaging or therapeutic purpose. This work paved the road to the design of porous materials for mechanobiology-related research, as well as cell imaging, diagnosing, and therapeutic applications.

3407–3415

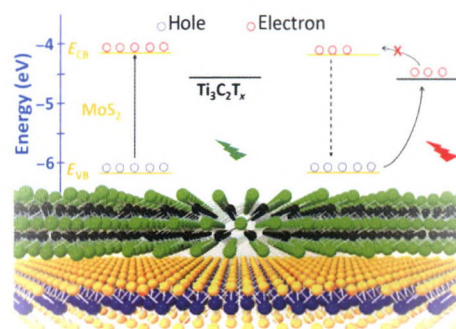
Observation of ambipolar photoresponse from 2D MoS₂/MXene heterostructure

Juntong Zhu^{1,3}, Hao Wang^{2,*}, Liang Ma¹, and Guifu Zou^{1,*}

¹ Soochow University, China

² Nanjing University, China

³ University of Chinese Academy of Sciences, China



A photodetector based on the two-dimensional (2D) van der Waals heterostructure of MoS₂ and Ti₃C₂T_x MXene was constructed to observe the ambipolar photoresponse of the optoelectronic properties under different light illuminations. Such unique optoelectronic phenomena open up new potential applications of MXene-based heterostructures.

3416–3422

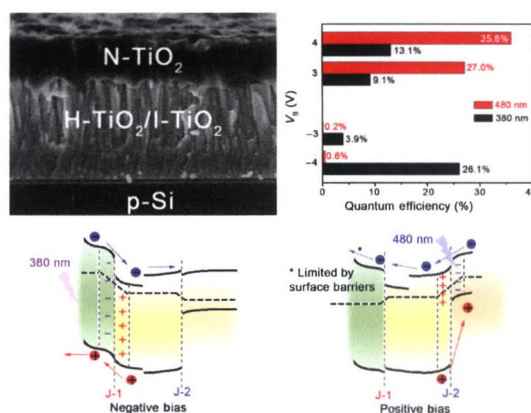
An adjustable multi-color detector based on regulating TiO₂ surface adsorption and multi-junction synergy

Tao Ji^{1,*}, Shuqing He^{1,3}, Fujin Ai^{1,3}, Jianghong Wu¹, Li Yan¹, Junqing Hu^{1,3,*}, and Meiyong Liao²

¹ Shenzhen Technology University, China

² National Institute for Materials Science (NIMS), Japan

³ Shenzhen Bay Laboratory, China



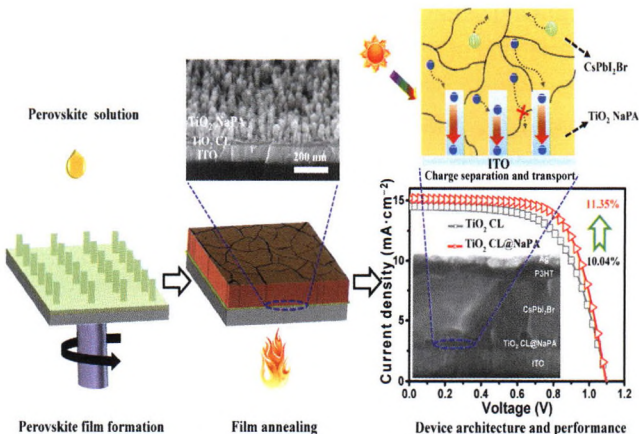
A multi-color photodetector based on N-TiO₂/H-TiO₂(I-TiO₂)/p-Si junction could control photoelectric response to ultraviolet (UV) and visible light by using band regulation technologies such as multi-junction synergy and surface adsorption.

3423–3430

Interface engineering of high performance all-inorganic perovskite solar cells via low-temperature processed TiO₂ nanopillar arrays

Bingkun Pan, Jiahao Gu, Xiaoli Xu, Lingbo Xiao, Jie Zhao*, and Guifu Zou*

Soochow University, China



Low-temperature and well-arranged TiO₂ nanopillar arrays are designed for enhancing electron transporting ability and light harvesting efficiency by interface engineering, which enables high performance and stable all-inorganic perovskite solar cells.

3431–3438

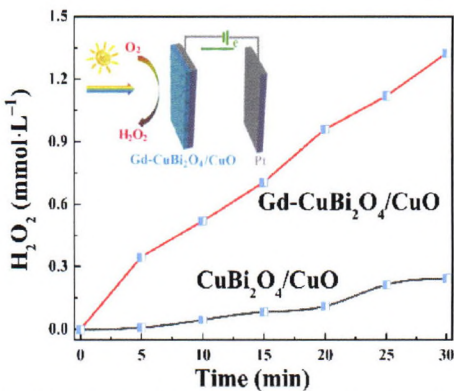
Gd-doped CuBi₂O₄/CuO heterojunction film photocathodes for photoelectrochemical H₂O₂ production through oxygen reduction

Zixin Li², Quanlong Xu², Faliang Gou¹, Bing He¹, Wei Chen², Weiwei Zheng³, Xu Jiang¹, Kai Chen¹, Chenze Qi¹, and Dekun Ma^{1,*}

¹ Shaoxing University, China

² Wenzhou University, China

³ Syracuse University, USA



Gd-CBO/CuO heterojunction submicrocrystalline film photocathode could achieve highly efficient O₂ reduction reaction toward H₂O₂ production.

3439–3445

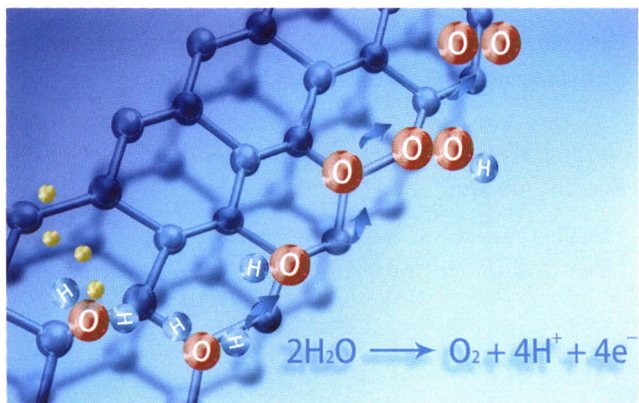
Mechanisms of water oxidation on heterogeneous catalyst surfaces

Xiaogang Yang^{1,*}, Yuanxing Wang², Chang Ming Li^{1,3}, and Dunwei Wang^{2,*}

¹ Suzhou University of Science and Technology, China

² Boston College, USA

³ Southwest University, China



What is the fundamental limitation for water oxidation and the relationship between the reaction process and the intermediates?

3446–3457

Accelerating water dissociation kinetics of Ni_3N by tuning interfacial orbital coupling

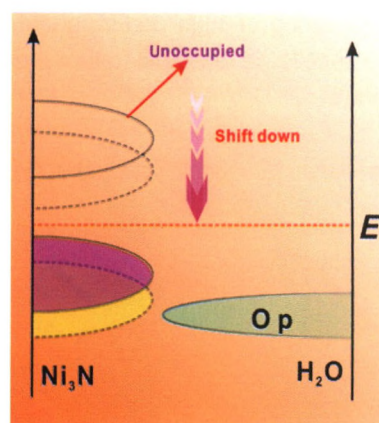
Yishang Wu¹, Yufang Xie¹, Shuwen Niu^{1,*}, Yipeng Zang¹, Jinyan Cai¹, Zenan Bian¹, Xuanwei Yin¹, Yanyan Fang¹, Da Sun¹, Di Niu¹, Zheng Lu¹, Amirabbas Mosallanezhad¹, Huijuan Wang¹, Dewei Rao^{2,*}, Hongge Pan^{3,4}, and Gongming Wang^{1,*}

¹ University of Science and Technology of China, China

² Jiangsu University, China

³ Xi'an Technological University, China

⁴ Zhejiang University, China



The Cr-N_6 embedded in the Ni_3N crystal can facilitate water dissociation kinetics due to downshifting the unoccupied d orbitals and further strengthening the interfacial orbital coupling.

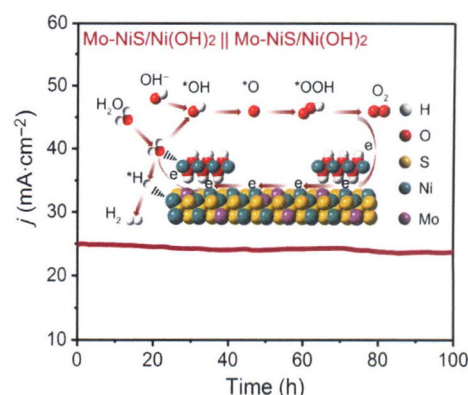
3458–3465

Interface engineering and heterometal doping Mo-NiS/Ni(OH)_2 for overall water splitting

Hua Zhang¹, Baojuan Xi¹, Yu Gu¹, Weihua Chen², and Shenglin Xiong^{1,*}

¹ Shandong University, China

² Zhengzhou University, China



Based on the interface interaction and electronic structure regulating, the Mo-NiS/Ni(OH)_2 shows outstanding water splitting activity. That only needs 1.5 V to achieve the current density of $10 \text{ mA} \cdot \text{cm}^{-2}$ and presents roust stability for 100 h at $25 \text{ mA} \cdot \text{cm}^{-2}$.

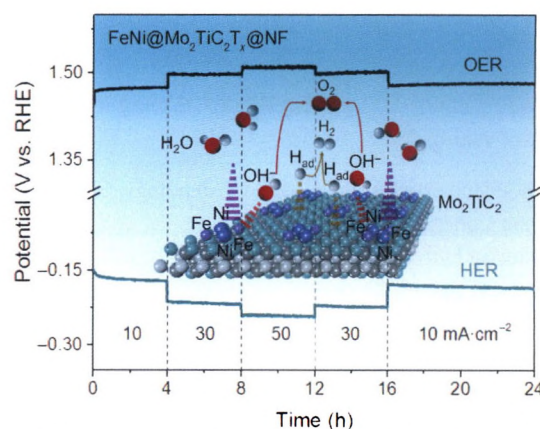
3466–3473

FeNi nanoparticles on $\text{Mo}_2\text{TiC}_2\text{T}_x$ MXene@nickel foam as robust electrocatalysts for overall water splitting

Jiayang Wang^{1,2}, Peilei He², Yongli Shen¹, Linxiu Dai¹, Zhe Li², Yue Wu^{2,*}, and Changhua An^{1,*}

¹ Tianjin University of Technology, China

² Iowa State University, USA



Efficient electrocatalyst of $\text{FeNi@Mo}_2\text{TiC}_2\text{T}_x$ @nickel foam (NF) has been designed for overall water spitting. The interfacial electronic interaction between FeNi nanoparticles and $\text{Mo}_2\text{TiC}_2\text{T}_x$ MXene is responsible for the enhancement of the performance.

3474–3481

Atomic Co/Ni dual sites with N/P-coordination as bifunctional oxygen electrocatalyst for rechargeable zinc–air batteries

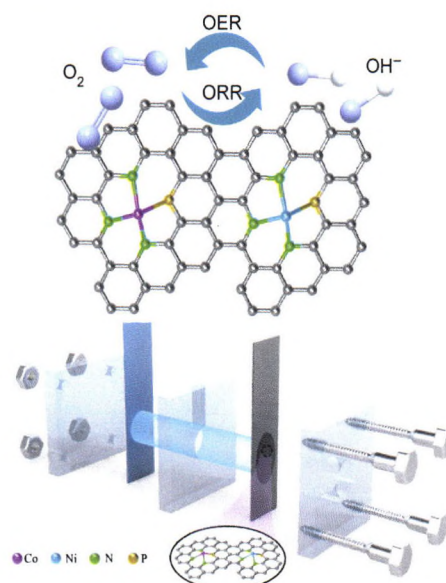
Botao Hu¹, Aijian Huang^{1,2}, Xuejiang Zhang³, Zheng Chen⁴,
Renyong Tu¹, Wei Zhu³, Zhongbin Zhuang³, Chen Chen^{1,*},
Qing Peng^{1,*}, and Yadong Li^{1,*}

¹ Tsinghua University, China

² University of Electronic Science and Technology of China, China

³ Beijing University of Chemical Technology, China

⁴ Anhui Normal University, China



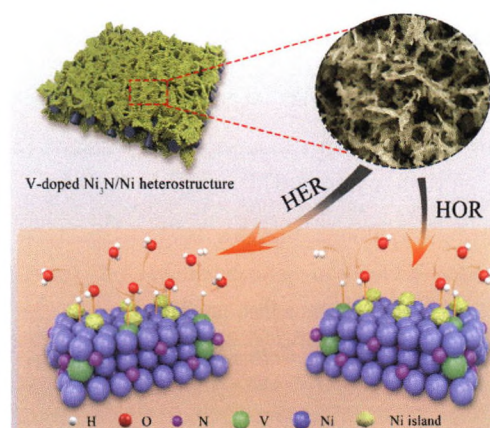
The Co₁-PNC/Ni₁-PNC dual atomic sites catalyst exhibits excellent bifunctional electrocatalytic performance.

3482–3488

V-doped Ni₃N/Ni heterostructure with engineered interfaces as a bifunctional hydrogen electrocatalyst in alkaline solution: Simultaneously improving water dissociation and hydrogen adsorption

Huan Zhang, Juan Wang, Fengqi Qin, Huiling Liu*, and Cheng Wang*

Tianjin University of Technology, China



Through a controlled nitridation treatment, V-Ni₃N/Ni heterostructure with engineered interface was fabricated and exhibits remarkable performance towards both hydrogen evolution and oxidation reactions in alkaline medium. Theoretical calculations reveal that the synergistic effect between interface constructing and ions doping simultaneously boosts the electrochemical activity, further realizing hydrogen economy.

3489–3496

Intimate atomic Cu-Ag interfaces for high CO₂RR selectivity towards CH₄ at low over potential

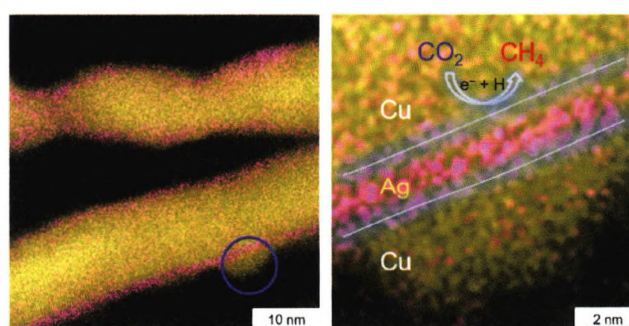
Chungseok Choi¹, Jin Cai¹, Changsoo Lee^{1,2,3}, Hyuck Mo Lee³,
Mingjie Xu⁴, and Yu Huang^{1,*}

¹ University of California, Los Angeles, USA

² Korea Institute of Energy Research, Republic of Korea

³ Korea Advanced Institute of Science and Technology, Republic of Korea

⁴ University of California, Irvine, USA



Atomic Cu-Ag ensemble interfaces preferentially enhance CH₄ production.

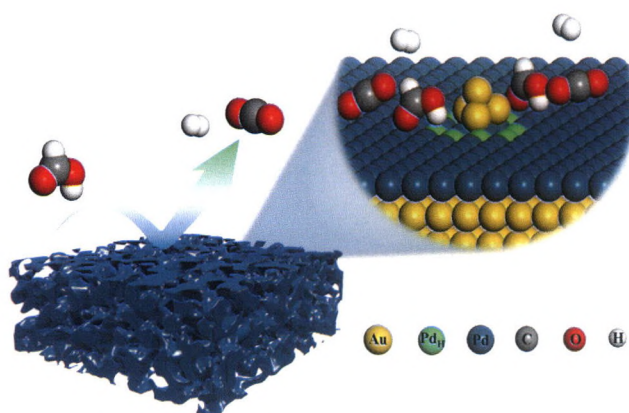
3497–3501

Highly coordinated Pd overlayers on nanoporous gold for efficient formic acid electro-oxidation

Qinqin Sang¹, Shuai Yin¹, Feng Liu², Huiming Yin¹, Jia He¹, and Yi Ding^{1,*}

¹ Tianjin University of Technology, China

² Kunming Institute of Precious Metals, China



Constructing highly coordinated Pd sites onto the nanoporous gold substrate can finely adjust their adsorption energies of CO and OH, thereby demonstrating very high activity and durability for formic acid electro-oxidation.

3502–3508

Sulfur-doped graphene anchoring of ultrafine Au₂₅ nanoclusters for electrocatalysis

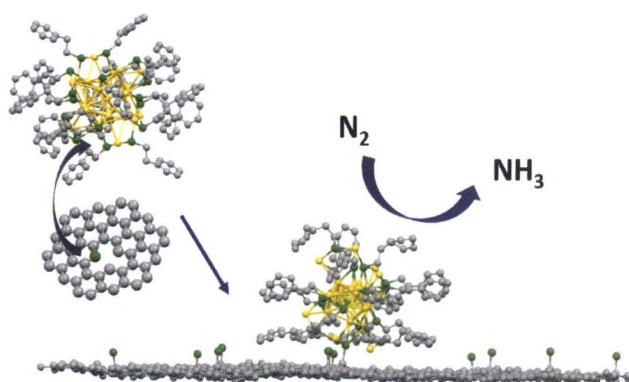
Mufan Li^{1,2}, Bei Zhang¹, Tao Cheng⁴, Sunmoon Yu^{1,2}, Sheena Louisia^{1,2}, Chubai Chen¹, Shouping Chen¹, Stefano Cestellos-Blanco¹, William A. Goddard III⁴, and Peidong Yang^{1,2,3,*}

¹ University of California, Berkeley, USA

² Lawrence Berkeley National Laboratory, USA

³ Kavli Energy NanoScience Institute, USA

⁴ California Institute of Technology, USA



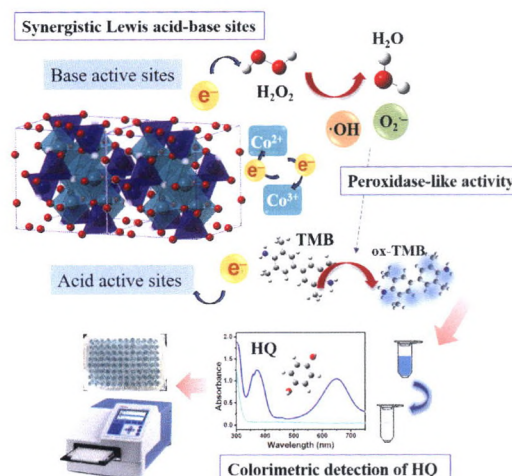
The anchoring effect originating from sulfur-doped graphene enables a significantly enhanced stability of ultrafine Au nanoclusters during electrocatalytic nitrogen reduction.

3509–3513

Synergistic Lewis acid-base sites of ultrathin porous Co₃O₄ nanosheets with enhanced peroxidase-like activity

Wenhui Lu, Ming Yuan, Jing Chen, Jiaxin Zhang, Lingshuai Kong, Zhenyu Feng, Xicheng Ma, Jie Su, and Jinhua Zhan*

Shandong University, China



Understanding the synergistic mechanism of Co₃O₄ nanozymes towards substances (3,3',5,5'-tetramethylbenzidine (TMB) and hydrogen peroxide (H₂O₂)) induced by Lewis acid-base sites is important for the development of peroxidase-like reaction.

3514–3522

N, P-codoped graphene supported few-layered MoS₂ as a long-life and high-rate anode materials for potassium-ion storage

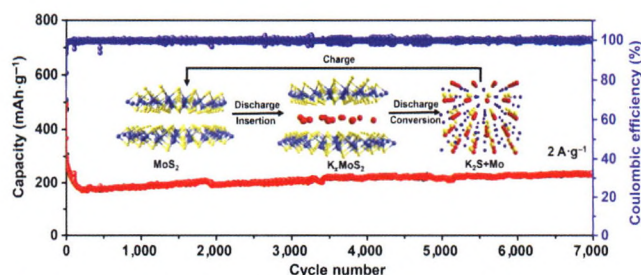
Guangyao Ma¹, Yanli Zhou^{2,*}, Yingying Wang³, Zhenyu Feng¹, and Jian Yang^{1,4,*}

¹ Shandong University, China

² Yantai University, China

³ Shandong Vocational College of Light Industry, China

⁴ Shenzhen Research Institute of Shandong University, China



The composite of N, P-codoped reduced graphene oxide supported few-layered MoS₂ nanosheets is successfully synthesized, which exhibits outstanding rate capability and ultra-long cycle life for K ion storage.

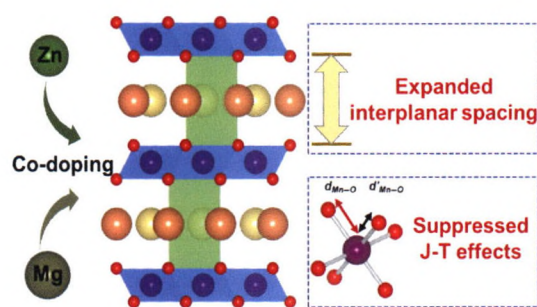
3523–3530

Fast and highly reversible Na⁺ intercalation/extraction in Zn/Mg dual-doped P2-Na_{0.67}MnO₂ cathode material for high-performance Na-ion batteries

Xiaoqin Huang^{1,2}, Deli Li^{1,2}, Haijian Huang^{1,2,*}, Xiao Jiang^{1,2}, Zeheng Yang^{1,2}, and Weixin Zhang^{1,2,*}

¹ Hefei University of Technology, China

² Anhui Key Laboratory of Controllable Chemical Reaction & Material Chemical Engineering, China



Zn/Mg dual-doping in P2-Na_{0.67}MnO₂ gives rise to simultaneous improvement of the Na-ion storage kinetics and the structural stability of the layered material during charge/discharge.

3531–3537

Large scale preparation of 20 cm × 20 cm graphene modified carbon felt for high performance vanadium redox flow battery

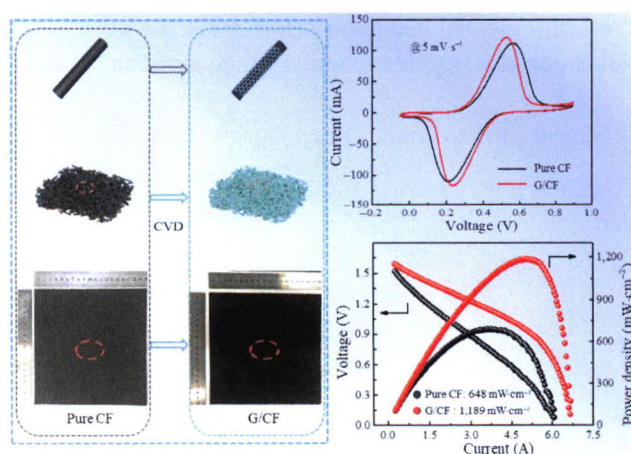
Ting Long¹, Yong Long¹, Mei Ding^{1,*}, Zhizhao Xu¹, Jian Xu¹, Yiqiong Zhang¹, Mingliang Bai², Qijun Sun^{3,4}, Gen Chen^{2,*}, and Chuankun Jia^{1,*}

¹ Changsha University of Science & Technology, China

² Central South University, China

³ Beijing Institute of Nanoenergy and Nanosystems, Chinese Academy of Sciences, China

⁴ University of Chinese Academy of Sciences, China



Large scale graphene modified carbon felt electrodes enable high performance vanadium redox flow battery.

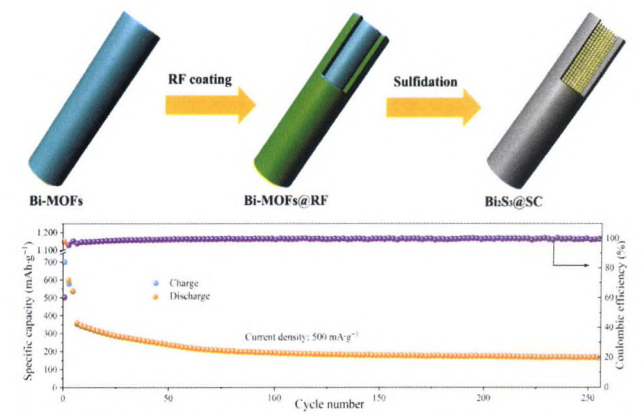
3538–3544

Structural engineering of sulfur-doped carbon encapsulated bismuth sulfide core-shell structure for enhanced potassium storage performance

Changlai Wang^{1,2}, Jian Lu², Huigang Tong², Shuilin Wu¹, Dongdong Wang⁴, Bin Liu⁵, Ling Cheng², Zhiyu Lin², Lin Hu³, Hui Wang³, Wenjun Zhang^{1,*}, and Qianwang Chen^{2,3,*}

- ¹ City University of Hong Kong, Hong Kong, China
- ² University of Science and Technology of China, China
- ³ Hefei Institutes of Physical Science, Chinese Academy of Sciences, China
- ⁴ Nanyang Technological University, Singapore
- ⁵ Beijing University of Chemical Technology, China

3545–3551



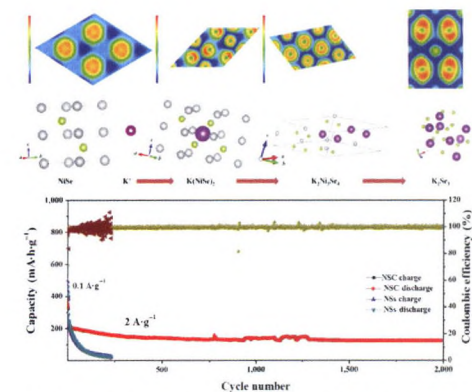
A unique core-shell structure with the inner Bi₂S₃ nanoparticles completely encapsulated by a sulfur-doped carbon shell (Bi₂S₃@SC) is designed as a promising anode material for the potassium-ion batteries (PIBs).

Construction and electrochemical mechanism investigation of hierarchical core-shell like composite as high performance anode for potassium ion batteries

Nadeem Hussain^{1,3}, Suyuan Zeng², Zhenyu Feng¹, Yanjun Zhai², Chunsheng Wang¹, Mingwen Zhao^{1,*}, Yitai Qian¹, and Liqiang Xu^{1,2,*}

- ¹ Shandong University, China
- ² Liaocheng University, China
- ³ Shenzhen University, China

3552–3561

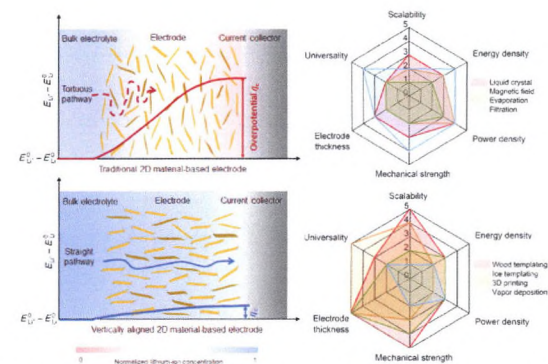


Uniform NiSe nanoparticles encapsulated in N-doped carbon (NiSe@NC) hierarchical core-shell like composite are synthesized by using a simple and cost effective strategy and used as a promising anode material for high performance potassium-ion batteries (PIBs) and sodium-ion batteries (SIBs). The obtained anode possesses greatly boosted capacity, rate performance, and cyclic stability. The electrochemical mechanism of potassiation/depotassiation is revealed by *in-situ* X-ray diffraction (XRD), *ex-situ* high-resolution transmission electron microscopy (HRTEM), selected area electron diffraction (SAED), and first principle calculations.

Vertically aligned two-dimensional materials-based thick electrodes for scalable energy storage systems

Zhengyu Ju, Xiao Zhang, Jingyi Wu, and Guihua Yu*

The University of Texas at Austin, USA



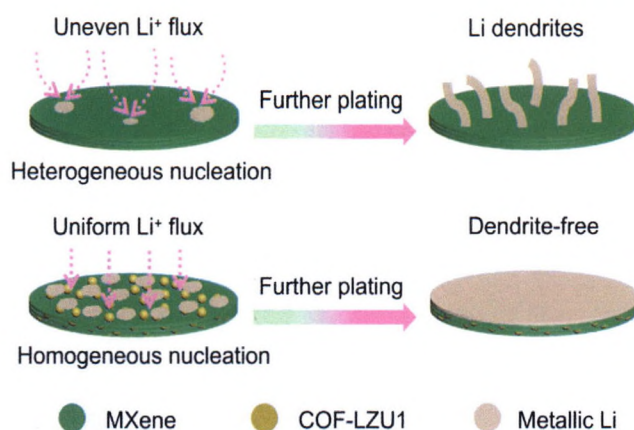
In thick two-dimensional (2D) materials-based electrodes, electrochemical limitation is the liquid diffusion due to tortuous pathways through the electrode thickness. To fully exploit the intrinsic advantages of 2D materials for energy storage devices, various strategies to fabricate vertically aligned 2D materials-based electrodes are discussed, ranging from assembly to template methods, with their advantages and challenges evaluated in terms of several key features of thick electrodes.

3562–3575

Flexible and stable 3D lithium metal anodes based on self-standing MXene/COF frameworks for high-performance lithium-sulfur batteries

Chuanliang Wei, Yusheng Wang, Yuchan Zhang, Liwen Tan, Yi Qian, Yuan Tao, Shenglin Xiong, and Jinkui Feng*

Shandong University, China



A flexible and freestanding MXene/COF framework was designed for stable and dendrite-free lithium metal anodes.

3576–3584

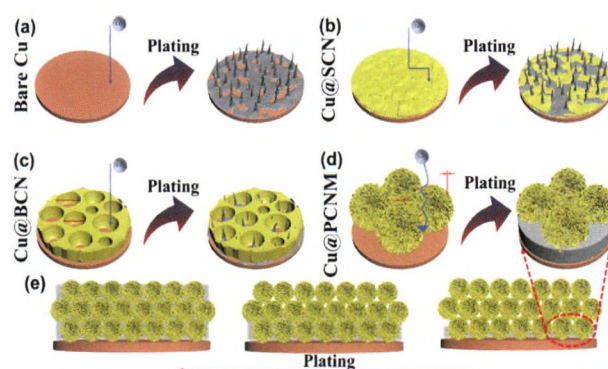
Nano-channel-based physical and chemical synergic regulation for dendrite-free lithium plating

Qiang Guo^{1,2}, Wei Deng¹, Shengjie Xia¹, Zibo Zhang¹, Fei Zhao¹, Binjie Hu², Sasa Zhang¹, Xufeng Zhou^{1,*}, George Zheng Chen^{3,*}, and Zhaoping Liu^{1,*}

¹ Ningbo Institute of Materials Technology and Engineering, Chinese Academy of Sciences (CAS), China

² University of Nottingham, China

³ University of Nottingham, UK



As a uniform lithiophilic coating layer having hybrid pores with both nanometer and micrometer scale on Cu/Li foil, porous carbon nitride microspheres (PCNMs) provide physical three-dimensional (3D) porous framework to absorb volume changes and guide Li growth, but also render suitable chemical interaction distance to effectively homogenize the lithium ions flux. Such physical-chemical synergic regulation strategy using PCNM can achieve dendrite-free Li plating, resulting in stable Li plating/stripping cycling performance in coin cells and pouch cells.

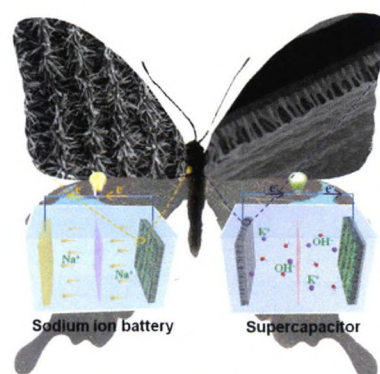
3585–3597

Zephyranthes-like Co_2NiSe_4 arrays grown on 3D porous carbon frame-work as electrodes for advanced supercapacitors and sodium-ion batteries

Yanchun Xue¹, Xingmei Guo¹, Mengrong Wu¹, Jiale Chen¹, Mengting Duan¹, Jing Shi¹, Junhao Zhang^{1,*}, Fu Cao¹, Yuanjun Liu¹, and Qinghong Kong²

¹ Jiangsu University of Science and Technology, China

² Jiangsu University, China

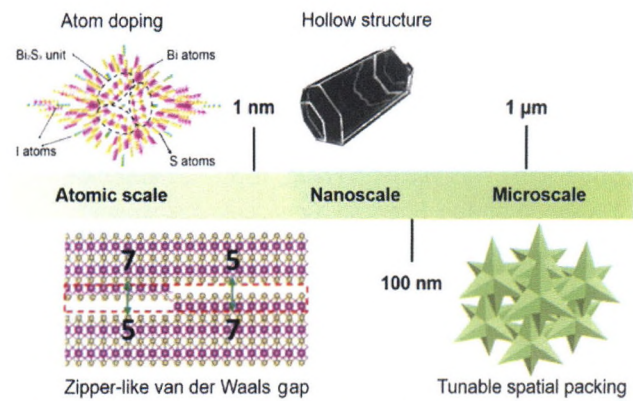


Inspired by farmers plowing farmland, the zephyranthes-like Co_2NiSe_4 on three-dimensional (3D) hierarchical porous carbon (Z- Co_2NiSe_4 /BWC) was designed and prepared, exhibiting high supercapacitor and Na storage performances, which originates from the multicomponent of bimetallic selenides and N-doped carbon, as well as advantageous hybrid structure of zephyranthes-like structure and 3D hierarchical porous structure.

3598–3607

Constructing of highly porous thermoelectric structures with improved thermoelectric performance

Peilei He and Yue Wu*
Iowa State University, USA

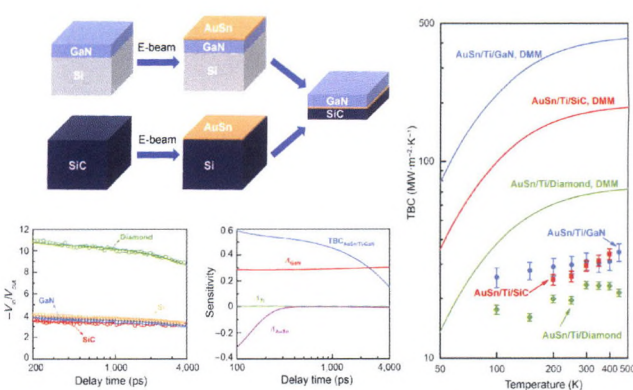


Through creating porosity at different scales in the thermoelectrics, lower thermal conductivity can be obtained, finally leading to a high figure of merit.

3608–3615

Reduced thermal boundary conductance in GaN-based electronic devices introduced by metal bonding layer

Susu Yang¹, Houfu Song², Yan Peng³, Lu Zhao², Yuzhen Tong¹, Feiyu Kang², Mingsheng Xu^{3,*}, Bo Sun^{2,*}, and Xinqiang Wang^{1,*}
¹ Peking University, China
² Tsinghua University, China
³ Shandong University, China

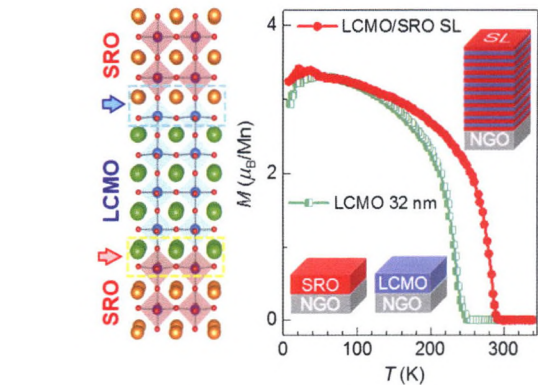


Thermal boundary conductance at interface between GaN and thermal conductive substrate (Si, SiC, and diamond) is measured, providing a guideline for designing interface between GaN-based electronic devices from a thermal management point of view.

3616–3620

Asymmetric interfaces and high- T_C ferromagnetic phase in $\text{La}_{0.67}\text{Ca}_{0.33}\text{MnO}_3/\text{SrRuO}_3$ superlattices

Lili Qu¹, Da Lan¹, Liang Si², Chao Ma³, Shasha Wang⁴, Liqiang Xu⁵, Kexuan Zhang¹, Feng Jin¹, Zixun Zhang¹, Enda Hua¹, Binbin Chen¹, Guanyin Gao¹, Feng Chen⁴, Haifeng Du⁴, Karsten Held², Lingfei Wang^{1,*}, and Wenbin Wu^{1,*}
¹ University of Science and Technology of China, China
² Institut für Festkörperphysik, Austria
³ Hunan University, China
⁴ High Magnetic Field Laboratory and Hefei Science Center, Chinese Academy of Sciences, China
⁵ Anhui University, China



Asymmetric interfaces and ferroelectric-like polar distortion cooperatively trigger the high- T_C ferromagnetic phase in atomically thin superlattices.

3621–3628

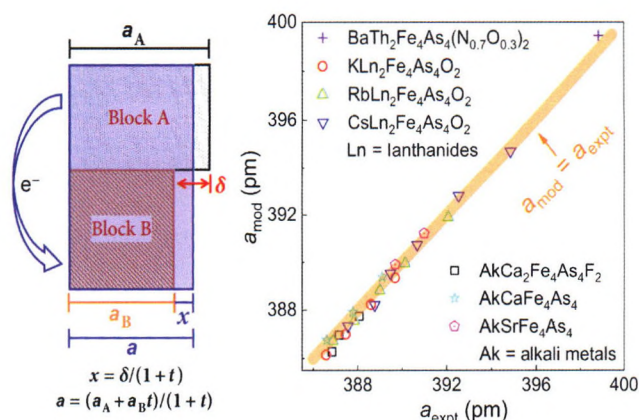
Block-layer model for intergrowth structures

Zhicheng Wang^{1,†}, Siqi Wu¹, Liangwen Ji¹, and Guanghan Cao^{1,2,*}

¹ Zhejiang University, China

² Nanjing University, China

[†] Present address: Boston College, USA



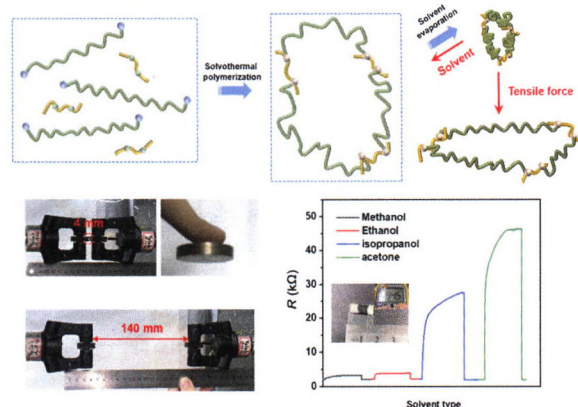
A block-layer model rationalizes the essential roles of lattice match and charge transfer in the formation of intergrowth structures, which precisely reproduces the lattice parameters of complex iron-based superconductors.

3629–3635

Highly stretchable, soft and sticky PDMS elastomer by solvothermal polymerization process

Jin Huang, Yuchun Cai, Chengyuan Xue, Jin Ge, Haoyu Zhao, and Shu-Hong Yu*

University of Science and Technology of China, China



On the premise of not changing the chemical composition of siloxane, we propose a facile solvothermal polymerization process to change the structure of polydimethylsiloxane elastomer (PDMS) cross-linking networks, which realized PDMS with maximum elongation of more than 3,000% and tensile modulus lower than 0.15 MPa. An organic solvent sensor based on this solvothermal cured PDMS with high sensitivity in distinguishing solvents of varied polarity has also been demonstrated.

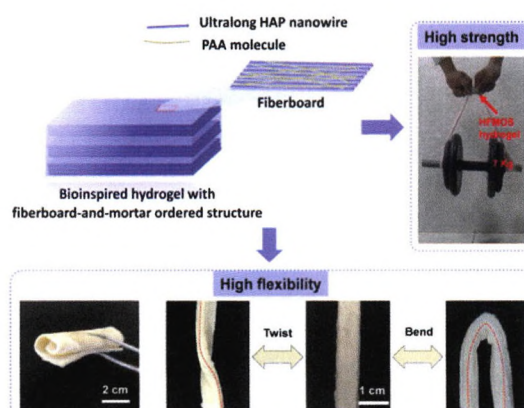
3636–3642

Bioinspired flexible, high-strength, and versatile hydrogel with the fiberboard-and-mortar hierarchically ordered structure

Han-Ping Yu^{1,2} and Ying-Jie Zhu^{1,2,*}

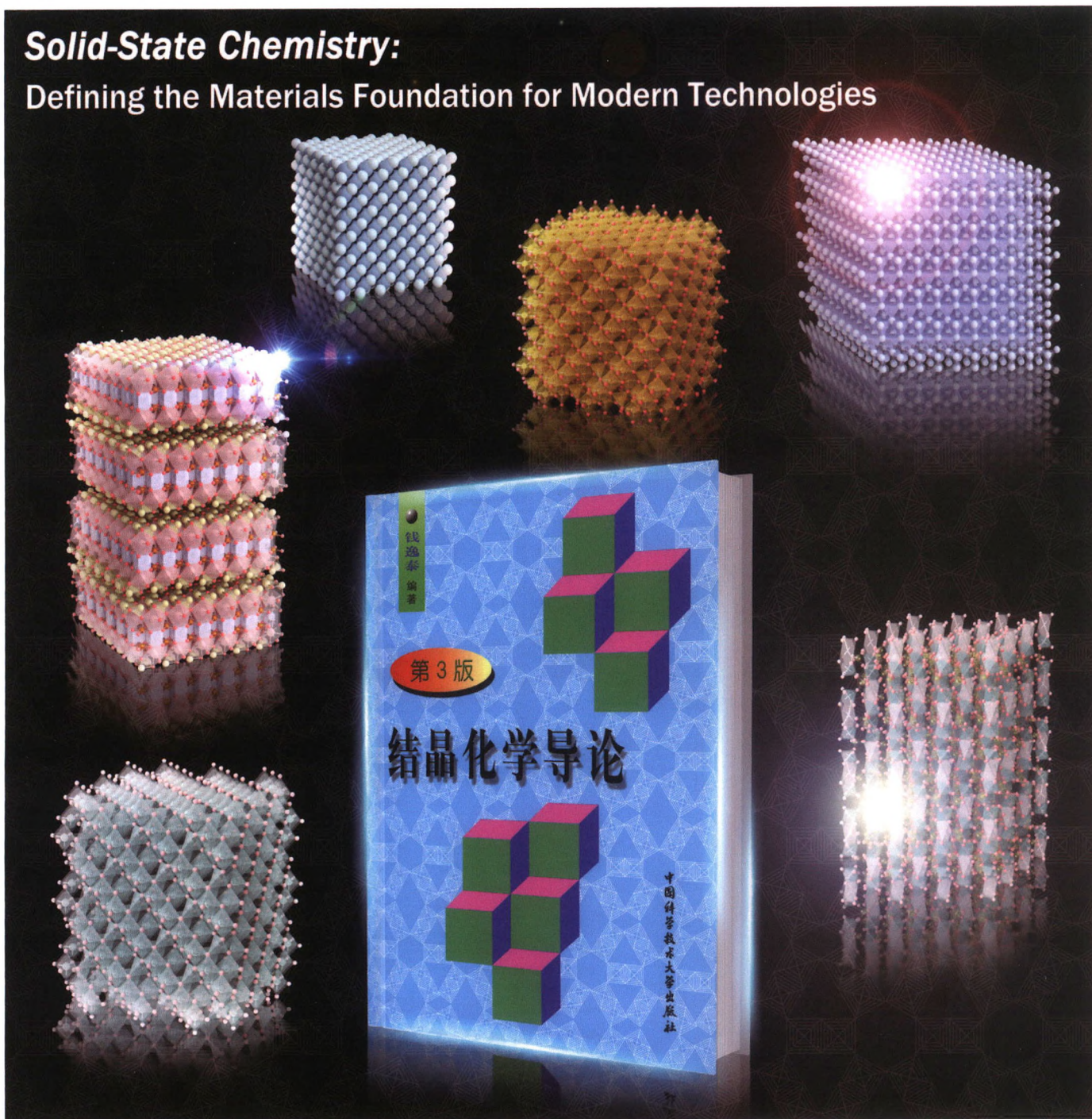
¹ Shanghai Institute of Ceramics, Chinese Academy of Sciences, China

² University of Chinese Academy of Sciences, China



Inspired by the natural biological soft tissues, a flexible, high-strength, and versatile hydrogel with the fiberboard-and-mortar hierarchically ordered structure is developed based on ultralong hydroxyapatite nanowires and polyacrylic acid.

3643–3652



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