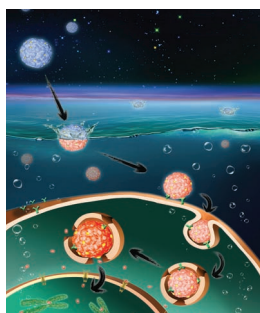


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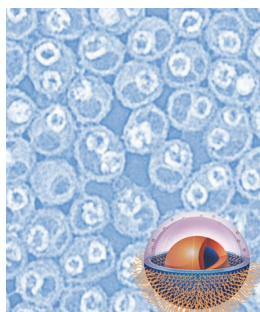


## Drug Delivery

X. Xu, Z. Gu, and co-workers show on page 5250 that dendritic lipopeptide-based mimics of viral architectures can serve as a versatile nanoplatfor for tumor-targeted drug delivery. The receptor-mediated targeting and sub-cellular targeting can greatly promote therapeutic index of antitumor drugs, reducing side effects and decreasing tumor metastasis after systemic administration.

## Direct Writing

On page 5261, P. M. Ferreira and co-workers demonstrate direct writing of silver nanoparticles in a solid-state superionic conductor,  $\text{AgIAgPO}_3$  superionic glass, using an electron beam. The transparent glass forms a blank canvas where localized electron irradiation causes subsurface silver precipitation, resulting in a wide and tunable range of colors. The optical image of a sunset-at-the-beach scene is written with an electron beam at 3 kV and 6 kV.

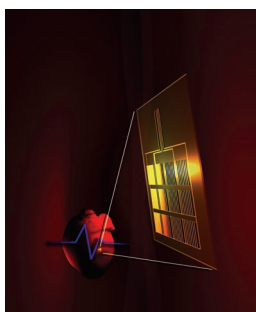


## Nanoreactors

A hybrid silica nanoreactor framework with poly(ethylene oxide) (PEO)-perforated silica walls is designed to prepare hollow  $\text{MnO}$  nanoparticles with different nanocomposite architectures under highly controlled conditions, by X. Li, J. Wang, and co-workers on page 5269. The resultant hollow nanoparticles are integrated within the hybrid nanoreactor, and are shown to demonstrate good contrast in magnetic resonance imaging for an optimal cluster on nanoparticles in the framework.

## Energy Harvesting

A lead zirconate titanate (PZT) mechanical energy harvester (MEH) enables high efficiency mechanical to electrical energy conversion from the natural contractile and relaxation motion of the heart. On page 5320, Y. Su, C. Dagdeviren, and co-workers show that the measured voltage of the MEH depends on the inner resistance of the voltmeter, which is contrary to the established knowledge that the measurement results are independent of the instruments used. Cover designed by Zhenhai Li.



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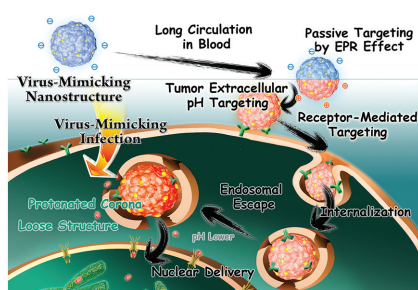
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## FULL PAPERS

**Dendritic lipopeptide-based mimics of viral architectures and infections** can serve as versatile nanoplatforms for tumor-specific targeting delivery. Virus-inspired mimics largely enhance the in vitro and in vivo tumor suppression of antitumor drugs, as well as hold great potential to reduce side effects and decrease tumor metastasis after systemic administration.

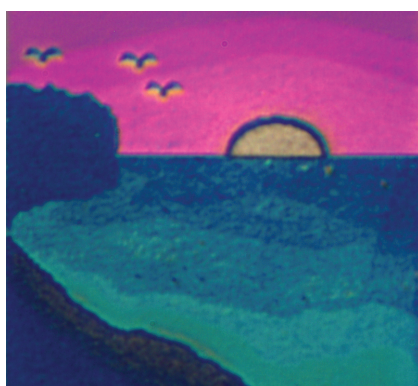


## Drug Delivery

Z. Zhang, X. Zhang, X. Xu,\* Y. Li, Y. Li, D. Zhong, Y. He, Z. Gu\* .....5250–5260

**Virus-Inspired Mimics Based on Dendritic Lipopeptides for Efficient Tumor-Specific Infection and Systemic Drug Delivery**

**Direct writing of silver nanoparticles in a solid-state superionic conductor** is performed using an electron beam. Smaller nanoparticles produced at low beam fluence interact plasmonically to produce vivid coloration to the otherwise transparent substrate. Increased beam fluence results in the extraction of bulk-like silver particles in the shape of the beam-irradiated region.

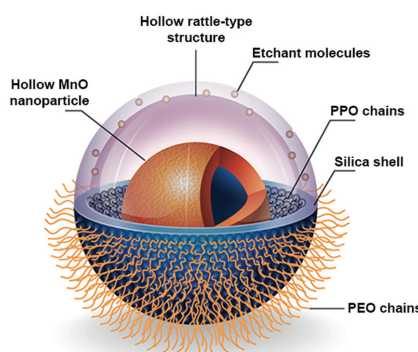


## Direct Writing

K. E. Jacobs, P. M. Ferreira\*...5261–5268

**Painting and Direct Writing of Silver Nanostructures on Phosphate Glass with Electron Beam Irradiation**

**A hybrid silica nanoreactor** is designed for preparing hollow manganese oxide nanoparticles (MONs) under highly controlled conditions. Well-defined hollow MONs exhibit high  $r_1$  relativity of up to  $2.58 \text{ mm}^{-1} \text{ s}^{-1}$  when multiple MONs are encapsulated within the framework. The formation of hollow MONs is due to surface stabilization by acetate ions, followed by acidic etching of the core in a sporadic manner.

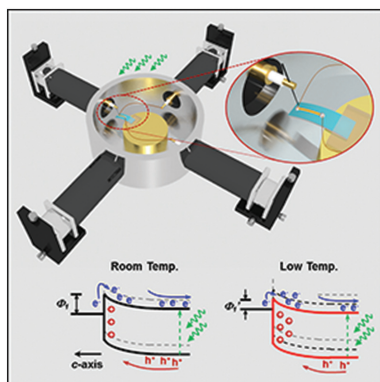


## Nanoreactors

B. Y. W. Hsu, M. Ng, Y. Zhang, S. Y. Wong, K. Bhakoo, X. Li,\* J. Wang\* .....5269–5276

**A Hybrid Silica Nanoreactor Framework for Encapsulation of Hollow Manganese Oxide Nanoparticles of Superior  $T_1$  Magnetic Resonance Relaxivity**

The **piezophototronic effect** is the use of piezoelectric polarization charges for tuning/controlling charge carrier generation, separation, recombination, and transport process. The piezophototronic effect is enhanced by over 550% under lower temperature due to the increased effective piezoelectric polarization surface/interface charges resulted from the reduced screening effect by decreased mobile charge carriers in CdS nanowires.



## Optoelectronics

R. Yu, X. Wang, W. Wu, C. Pan, Y. Bando, N. Fukata, Y. Hu, W. Peng, Y. Ding, Z. L. Wang\* .....5277–5284

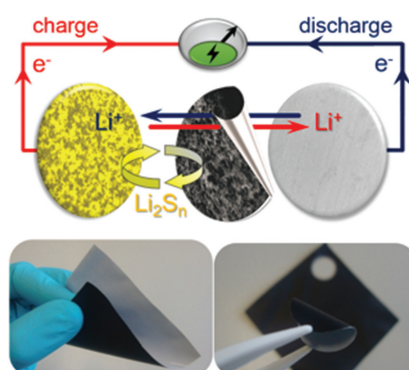
**Temperature Dependence of the Piezophototronic Effect in CdS Nanowires**

## FULL PAPERS

## Batteries

J. Balach,\* T. Jaumann, M. Klose,  
S. Oswald, J. Eckert,  
L. Giebeler ..... 5285–5291

**Functional Mesoporous Carbon-Coated Separator for Long-Life, High-Energy Lithium–Sulfur Batteries**

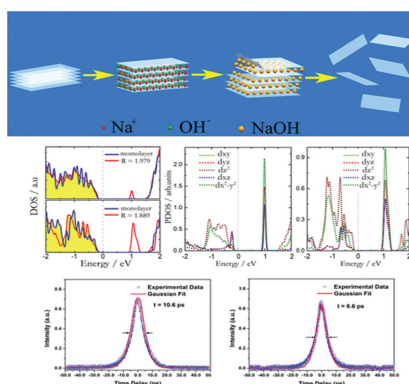


A functional mesoporous carbon-coated separator is developed for lithium–sulfur batteries, which exhibit significant enhancements in their performance: high capacities, long cycle life, and low capacity fading at different current rates. These improvements highlight the importance of the rational design of modified separators with mesoporous carbon structures and this proof of concept will bring reliability for advanced high-performance lithium–sulfur batteries.

## Exfoliation

G. Zhao, S. Han, A. Wang,  
Y. Wu, M. Zhao,\* Z. Wang,\*  
X. Hao\* ..... 5292–5299

**“Chemical Weathering” Exfoliation of Atom-Thick Transition Metal Dichalcogenides and Their Ultrafast Saturable Absorption Properties**



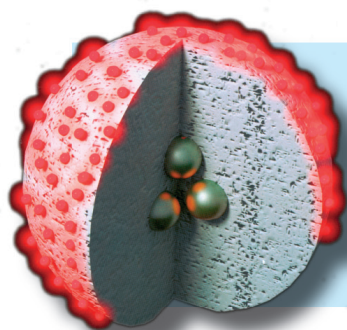
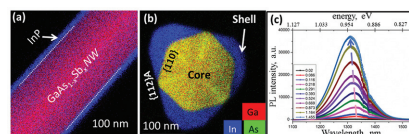
Inspired by the natural weathering exfoliation of seaside rocks, a “chemical weathering” concept is proposed for fabricating atom-thick 2D materials from their bulk counterparts. Chemical weathering-assisted exfoliation is a simple and efficient method of preparing atom-thick MoS<sub>2</sub> and WS<sub>2</sub> monolayers. The as-prepared monolayers exhibit excellent saturable absorption and mode-locking properties in all-solid-state lasers because of intermediate states resulting from S-vacancy defects.

## Nanowires

X. Yuan,\* P. Caroff,\* F. Wang, Y. Guo,  
Y. Wang, H. E. Jackson, L. M. Smith,  
H. H. Tan, C. Jagadish ..... 5300–5308

**Antimony Induced {112}A Faceted Triangular GaAs<sub>1–x</sub>Sb<sub>x</sub>/InP Core/Shell Nanowires and Their Enhanced Optical Quality**

GaAs<sub>1–x</sub>Sb<sub>x</sub>/InP core/shell nanowires are grown coherently with perfectly twin-free zinc blende crystal structure. An unusual triangular InP shell with predominantly {112}A facets is observed.



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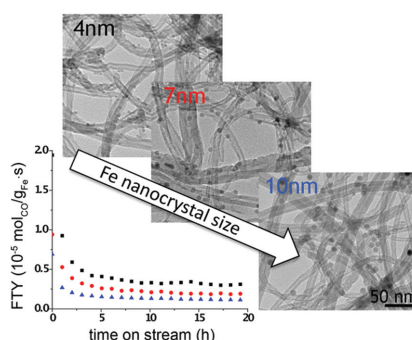
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## FULL PAPERS

**Colloidal iron oxide nanocrystals assembled on carbon nanotube supports** are fabricated as model heterogeneous catalysts for the direct conversion of synthesis gas into lower olefins. The catalyst structure is optimized to achieve tunable metal nanocrystal size and metal loading, homogeneous nanocrystal dispersion throughout the support, leading to stable and active catalysts with controllable catalytic properties.

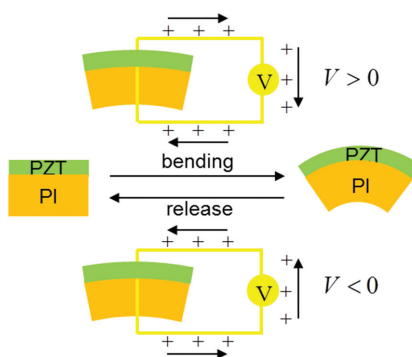


## Colloidal Nanocrystals

M. Casavola,\* J. Hermannsdörfer,  
N. de Jonge, A. I. Dugulan,  
K. P. de Jong\* .....5309–5319

### Fabrication of Fischer–Tropsch Catalysts by Deposition of Iron Nanocrystals on Carbon Nanotubes

Experimental studies find that the measured voltages for piezoelectric devices depend on the resistance of the voltmeter, which is contrary to the established knowledge that the measurement results are independent of the instruments used. A theoretical model considering the finite value of the resistance is established and reveals the mechanism and physics of this phenomenon.

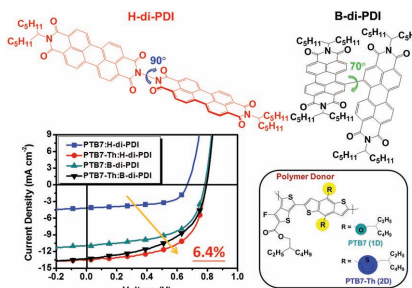


## Energy Harvesting

Y. Su,\* C. Dagdeviren,\* R. Li..5320–5325

### Measured Output Voltages of Piezoelectric Devices Depend on the Resistance of Voltmeter

**Suitable selection of perylene diimide dimer (di-PDI)-based acceptors and polymer donors** is essential to optimize the bulk heterojunction morphology. When blended with the 2D polymer, PTB7-Th, the rigidly hydrazine-linked di-PDI affords the recorded power conversion efficiency of 6.4% due to excellent miscibility for efficient exciton dissociation and appropriate percolation pathways for charge transport.

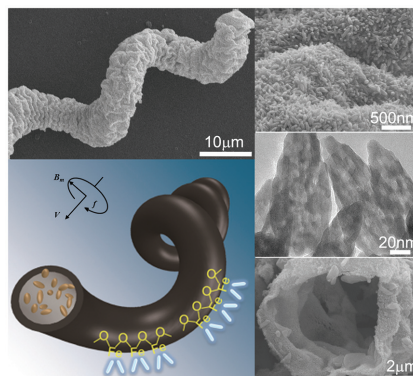


## 2D Polymers

C.-H. Wu, C.-C. Chueh, Y.-Y. Xi,  
H.-L. Zhong, G.-P. Gao, Z.-H. Wang,  
L. D. Pozzo, T.-C. Wen,  
A. K.-Y. Jen\* .....5326–5332

### Influence of Molecular Geometry of Perylene Diimide Dimers and Polymers on Bulk Heterojunction Morphology Toward High-Performance Nonfullerene Polymer Solar Cells

**Porous hollow helical microswimmers composed of spindle-like magnetite nanoparticles** are developed using a new method of fabrication based on biotemplated synthesis. Due to the unique micro-/nanostructures, the as-fabricated microswimmers are characterized with multiple properties desired by targeted diagnosis and therapy, thus suggesting a novel microrobotic tool for potential biomedical applications.



## Helical Microswimmers

X. Yan, Q. Zhou, J. Yu, T. Xu, Y. Deng,  
T. Tang, Q. Feng, L. Bian, Y. Zhang,  
A. Ferreira, L. Zhang\* .....5333–5342

### Magnetite Nanostructured Porous Hollow Helical Microswimmers for Targeted Delivery

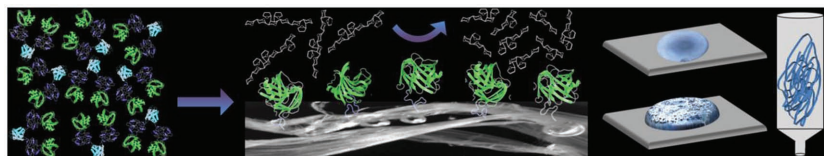
## FULL PAPERS

## Gene Fusion

R. Jansson, C. M. Courtin, M. Sandgren,\*  
M. Hedhammar\* ..... 5343–5352

### Rational Design of Spider Silk Materials Genetically Fused with an Enzyme

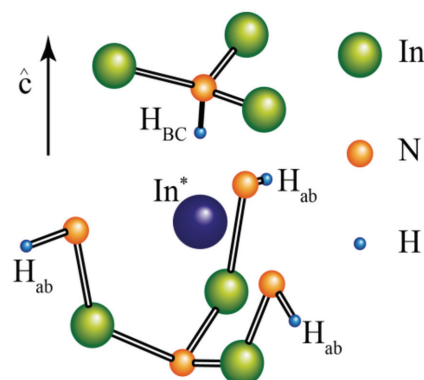
Two recombinant spider silk modules, 4RepCT and CT, are genetically fused to the enzyme xylanase and produced as soluble enzyme-silk fusion proteins. Self-assembly is used to make enzyme-silk materials in the form of fibers, 2D surface coatings and 3D foams, which all show retained enzymatic activity from the added xylanase domain. Activity is shown for batch and continuous enzymatic reactions.



## Hydrogen Effects

G. Pettinari,\* F. Filippone,\*  
A. Polimeni, G. Mattioli, A. Patanè,  
V. Lebedev, M. Capizzi,  
A. Amore Bonapasta ..... 5353–5359

### Genesis of “Solitary Cations” Induced by Atomic Hydrogen

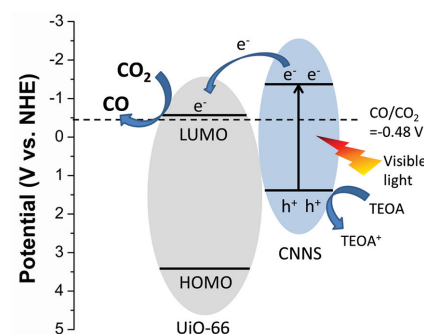


Fundamental properties of nitrides are changed through deep modifications of the chemistry of their constituent atoms induced by atomic hydrogen. In InN, for example, an In cation is isolated from its crystalline environment by the cooperative action of four hydrogen atoms that locally screen the crystal potential, thus generating a “solitary cation” (In\*) that remarkably increases the InN fundamental band-gap energy.

## Photocatalysis

L. Shi, T. Wang, H. Zhang, K. Chang,  
J. Ye\* ..... 5360–5367

### Electrostatic Self-Assembly of Nanosized Carbon Nitride Nanosheet onto a Zirconium Metal–Organic Framework for Enhanced Photocatalytic CO<sub>2</sub> Reduction

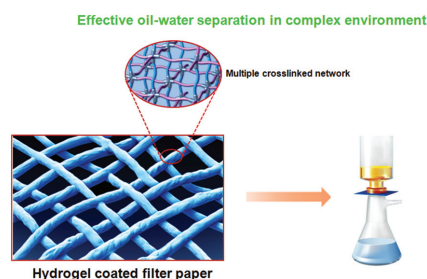


A novel carbon nitride nanosheet heterogeneous photocatalyst is fabricated via a facile electrostatic self-assembly method. Electrons from the photoexcited carbon nitride nanosheets can transfer to UiO-66, which can substantially suppress electron–hole pair recombination in the carbon nitride nanosheet, as well as supply long-lived electrons for the reduction of CO<sub>2</sub> molecules adsorbed in UiO-66.

## Hydrogel Coatings

J. B. Fan, Y. Song, S. Wang, J. Meng,  
G. Yang, X. Guo, L. Feng,\*  
L. Jiang\* ..... 5368–5375

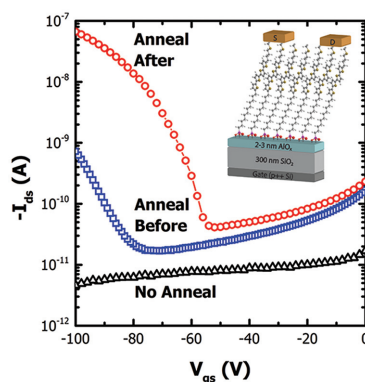
### Directly Coating Hydrogel on Filter Paper for Effective Oil–Water Separation in Highly Acidic, Alkaline, and Salty Environment



A exceedingly simple strategy for fabricating hydrogel coated filter paper having the capacity to resist highly acidic, alkaline and salty environment is demonstrated. The resulting multiple crosslinked networks enable the hydrogel coated filter paper to separate various oil–water mixtures in a range of highly acidic, alkaline and salty environment with high separation efficiency.

## FULL PAPERS

**High-performance self-assembled monolayer field-effect transistors (SAMFETs)** are fabricated based on heated assembly, thermal annealing, and the addition of a functional terminal group to the self-assembled monolayer molecular design. Optimized conditions are then utilized to fabricate low-voltage SAMFETs on a  $\text{HfO}_2$  dielectric to enable hole mobility of up to  $0.015 \text{ cm}^2 \text{ V}^{-1} \text{ s}^{-1}$

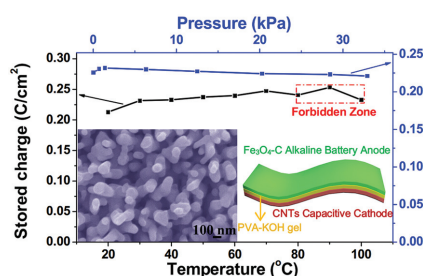


### Hafnium Oxide

N. Cernetic, T. Weidner, J. E. Baio, H. Lu, H. Ma,\* A. K.-Y. Jen\* ...5376–5383

**Enhanced Performance of Self-Assembled Monolayer Field-Effect Transistors with Top-Contact Geometry through Molecular Tailoring, Heated Assembly, and Thermal Annealing**

**A carbon-protected ferroferric oxide nanorod array** exhibits remarkably enhanced cycleability in alkaline electrolyte, and is then further assembled with a carbon nanotube cathode into a flexible solid-state rechargeable alkaline battery-supercapacitor hybrid device. The device demonstrates high environmental suitability in terms of substantially bending, high mechanical pressure and elevated temperature.

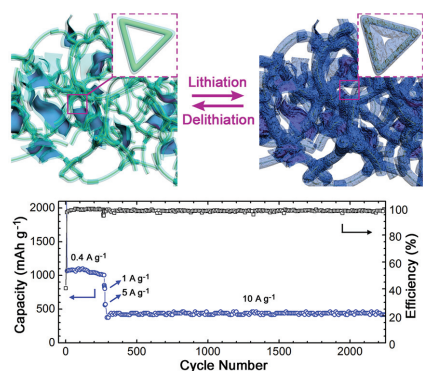


### Nanorod Arrays

R. Li, Y. Wang, C. Zhou, C. Wang, X. Ba, Y. Li, X. Huang, J. Liu\* .....5384–5394

**Carbon-Stabilized High-Capacity Ferroferric Oxide Nanorod Array for Flexible Solid-State Alkaline Battery–Supercapacitor Hybrid Device with High Environmental Suitability**

**The design of a 3D silicon loaded graphene/CNTs aerogels (Si/CAs) architecture** with ideal Si/C face-to-face contact interface and balanced open void is demonstrated with new insights. The as-obtained Si/CAs nanohybrids are highly stable anode materials for lithium-ion batteries (no obvious capacity decline even after 2000 cycles at  $10\,000 \text{ mA g}^{-1}$ ) with a high reversible discharge capacity and excellent rate capability.



### Lithium-Ion Batteries

S. Jing, H. Jiang,\* Y. Hu, J. Shen, C. Li\* .....5395–5401

**Face-to-Face Contact and Open-Void Coinvolved Si/C Nanohybrids Lithium-Ion Battery Anodes with Extremely Long Cycle Life**