ADVANCED FUNCTIONAL MATERIALS

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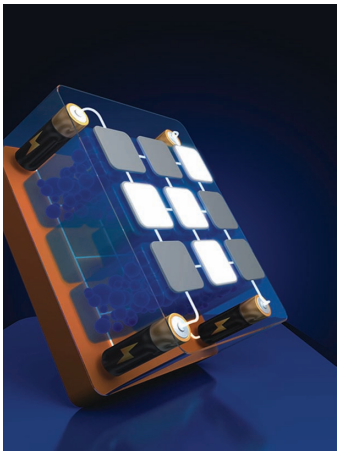
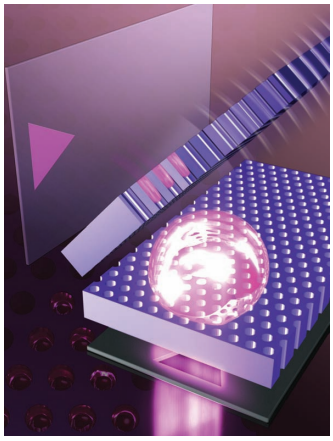


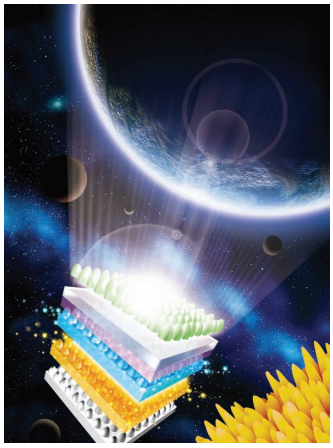
Electronic Phases

C. Song, F. Pan, and co-workers demonstrate reversible ferromagnetic phase transition in electrode-gated manganites on page 7233. The formation and annihilation of an insulating and magnetically hard phase in soft magnetic matrix, which randomly nucleates and grows across the film, is directly observed in manganite by ionic-liquid-gating. The realization of reversible metal-insulator transition in colossal-magnetoresistance materials would advance four-state memories.

Porous Films

On page 7241 L. P. Heng, L.-Z. Fan, B.-Z. Tang, and co-workers demonstrate photoelectric cooperative induced patterned wetting on a hydrophobic ordered polymeric honeycomb structure surface, which is prepared by the breath figure method; finally, photoelectric cooperative induced patterned wetting is used for liquid reprography.





Light-Emitting Diodes

A universal strategy for highly power-efficient white organic light-emitting diodes is developed by Y.-Q. Li, J.-X. Tang, and colleagues on page 7249 by combining deterministic aperiodic nanostructures for broadband quasi-omnidirectional light extraction and a multilayer energy cascade structure for energy-efficient photon generation. A record efficiency exceeding 120 lm W^{-1} is achieved with an extremely small roll-off in efficiency and superior angular color stability.

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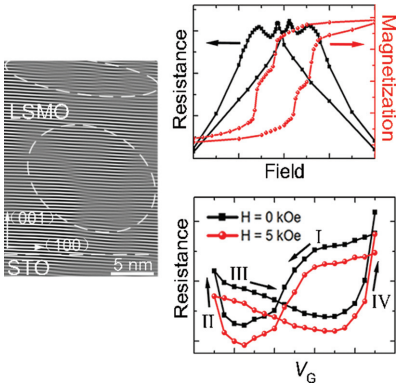
FULL PAPERS

Electronic Phases

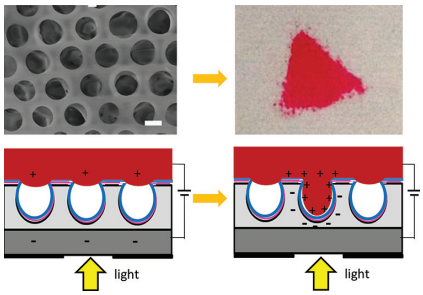
Reversible Ferromagnetic Phase Transition in Electrode-Gated Manganites



The formation and annihilation of an insulating and magnetically hard phase in the soft magnetic matrix, which randomly nucleates and grows across the film instead of spreading from the surface to the bottom, is directly observed in manganite through ionic liquid gating. The realization of reversible metal-insulator transition in colossal magnetoresistance materials can lead to the development of four-state memories.

Porous Films

Ordered Honeycomb Structure Surface Generated by Breath Figures for Liquid Reprography

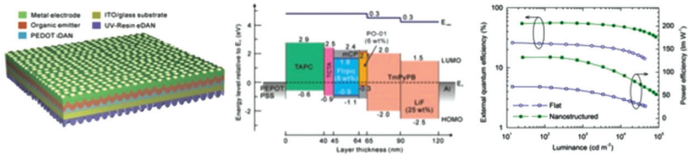


Photoelectric cooperative induced patterned wetting is demonstrated on a hydrophobic ordered polymeric honeycomb structure surface, which is prepared by BF method; finally, photoelectric cooperative induced patterned wetting is used for liquid reprography.

Light-Emitting Diodes

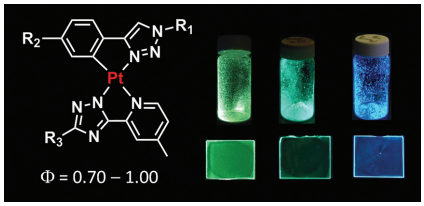
Extremely Efficient White Organic Light-Emitting Diodes for General Lighting

Highly efficient, white, organic light-emitting diodes are achieved by combining deterministic aperiodic nanostructures for broadband light extraction with a multilayer energy cascade structure for energy-efficient photon generation. This results in light-emitting diodes with a record power efficiency of 123.4 lm W^{-1} at 1000 cd m^{-2} with superior color stability and extremely small efficiency roll-off.



Organic Electronics

Highly Efficient and Robust Blue Phosphorescent Pt(II) Compounds with a Phenyl-1,2,3-triazolyl and a Pyridyl-1,2,4-triazolyl Chelate Core

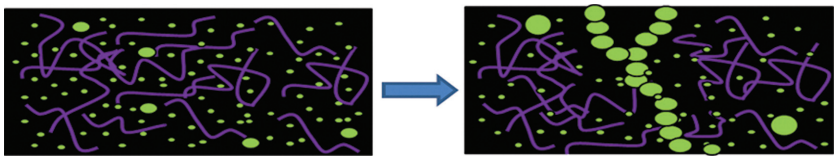


Bright blue and green phosphorescent Pt(II) complexes with an N^C chelate 1,2,3-triazolyl ligand and an N^N chelate 1,2,4-trizolyl ligand, near unity quantum efficiencies and high thermal stability are achieved. Steric blocking and the rigidity enhancement around the Pt(II) core by large substituent groups at the *para*-position are found to be critical in the bright phosphorescence of this new class of compounds.

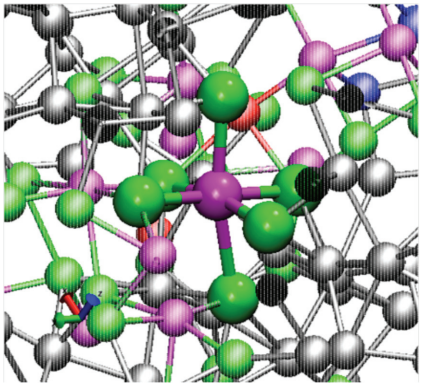
FULL PAPERS

Light-powered delivery of silver nanowires can offer a rapid, noninvasive, repetitive, and on-demand healing of a wearable electrical conductor. To develop the concept, combined studies on materials, integrations, and light-powering strategy for recovering a damaged wearable electrical conductor are carried out in this work.

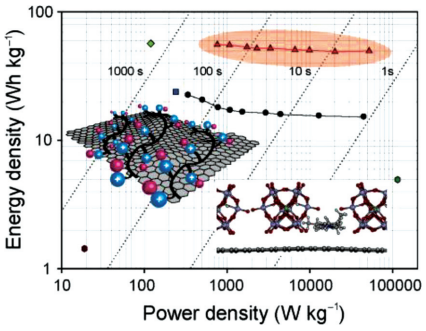
The morphology of low band gap polymer:ICBA mixtures is efficiently controlled during film deposition by adding a co-solvent. A morphology with ICBA phase separation is formed without a change in polymer ordering when a co-solvent in which ICBA is selectively soluble is used. The resultant morphology improves power conversion efficiency by up to 246%.



First-principles atomistic modelling reveals how doping with Bi changes the crystallization dynamics and electrical properties of chalcogenide phase-change materials. In this work, a comprehensive molecular-dynamics study of Bi-doped $Ge_2Sb_2Te_5$ is presented, investigating the microscopic origin of the experimentally reported enhancement in crystallization speed, and reversal of the charge-carrier sign from p- to n-type, on doping.

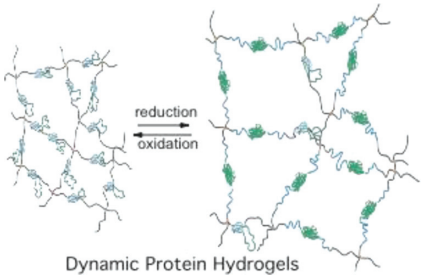


A new type of polyoxometalate-coupled graphene through polymeric ionic liquid linker is synthesized as electrode materials for high-performance supercapacitors that can combine high power and energy densities, cycling stability, and high rate capability.



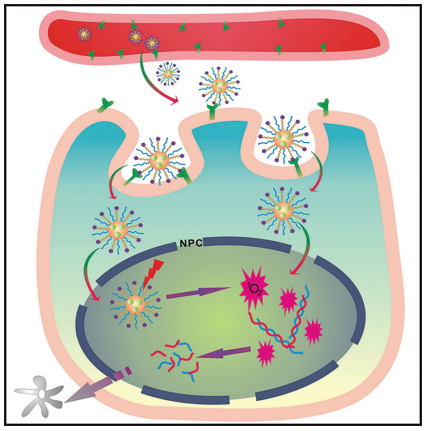
FULL PAPERS

Protein Engineering



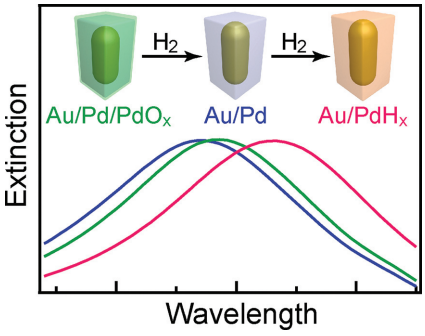
Translating molecular events into macroscopic tunable mechanical properties: Protein-based dynamic hydrogels are engineered using a redox potential-controlled protein switch as a building block. Upon redox potential-controlled protein folding-unfolding, these novel protein hydrogels exhibit dynamically tunable mechanical properties and can switch between a compliant state and a stiff yet resilient state.

Photodynamic Therapy

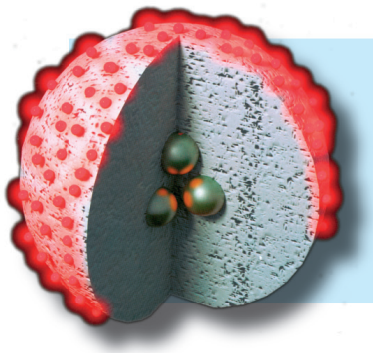


A nuclear-targeted photosensitizer delivery system is designed and fabricated by using TAT and RGD peptides co-conjugated mesoporous silica nanoparticles (MSNs). It features direct intranuclear photosensitizer delivery, with excellent photocytotoxicity under extremely weak light irradiation for fighting deep-seated tumors.

Hydrogen Sensors



The plasmonic response of bimetallic Au/Pd nanostructures to hydrogen is systematically investigated. Red plasmon shifts larger than 50 nm are observed when Au/Pd nanostructure monolayers are exposed to hydrogen at the volume concentration below the explosion limit. The facile measurements and ultrasensitive plasmonic response make the bimetallic nanostructures very promising for the development of practical optical hydrogen sensors.



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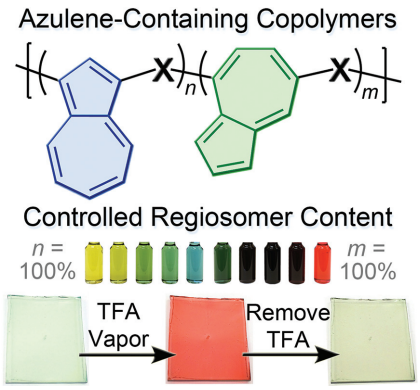
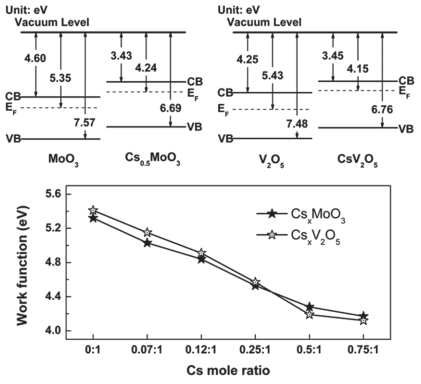
FULL PAPERS

Tuning the percentage of azulene regioisomers in conjugated polymers leads to systematic variation in optoelectronic properties. A new design strategy in which the properties of conjugated polymers can be modulated by simply varying the regiochemistry of the building blocks along the polymer chain is demonstrated. Significantly, these materials exhibit stimuli-responsive behavior in the solid state with thin films undergoing rapid and reversible color switching.



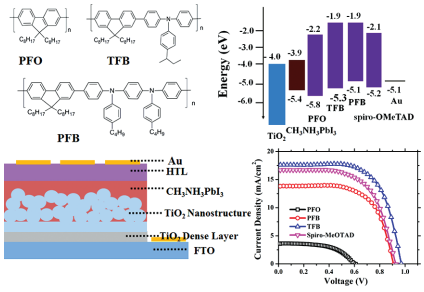
Stimuli-Responsive Materials

Cesium intercalated metal oxides with continuously large workfunction tuning ability function as both electron and hole transport layers in organic optoelectronic devices. This approach has the features of room temperature, water free and solution process. Analyses indicate that energy band structures of metal oxides can be modified to adjust electron and hole transport properties by the Cs intercalation process.



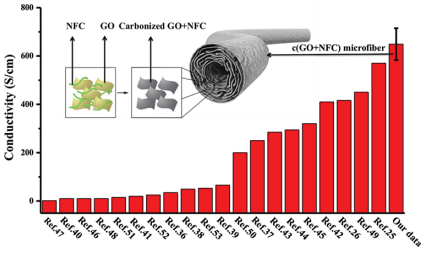
Optoelectronics

Polyfluorene derivatives are applied for inorganic–organic hybrid perovskite solar cells, and indeed can rival or outperform spiro-OMeTAD as efficient hole-conducting materials for perovskite solar cells. In particular, with the one-step deposition method, TFB achieves a 10.92% power conversion efficiency, which is considerably higher than that with spiro-OMeTAD (9.78%).



Photovoltaics

Highly conductive microfibers are designed and fabricated with graphene oxide (GO) and nanofibrillated cellulose (NFC). The alignment of GO flakes and the templated carbonization of NFC leads to high electrical conductivity of ca. 650 S/cm.



Conductive Microfibers

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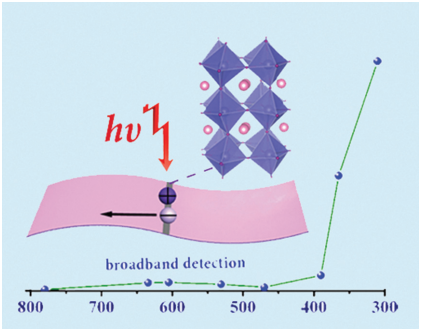
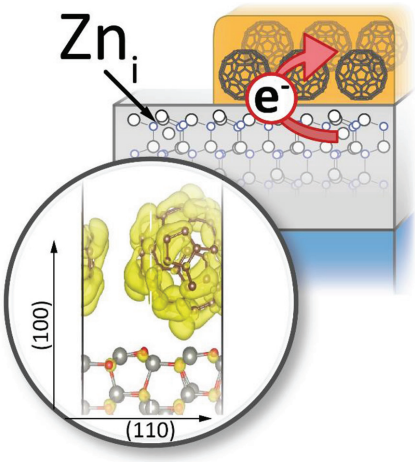
Perovskites



Organometal halide perovskites have shown tremendous potential as incident light absorbers for optoelectronic applications. In this work, a broadband photodetecotor is demonstrated based on the $CH_3NH_3PbI_3$ film, showing a photo-responsivity of 3.49 A W^{-1}, 0.0367 A W^{-1}, an external quantum efficiency of 1.19×10^3 %, 5.84% at 365 and 780 nm, respectively. These results provide new opportunities for the development of high-efficiency photodetectors.

Surface Modification



Controlling the defect composition of the oxide surface allows the barriers to be changed for charge transfer at the ZnO/Fullerene interface. Direct and inverse electron spectroscopy is used to demonstrate the control over the transfer barrier by tracking electronic alignment and interface state formation. This is predicted by DFT and leads to observable alterations in charge injection in our devices.