ADVANCED FUNCTIONAL MATERIALS

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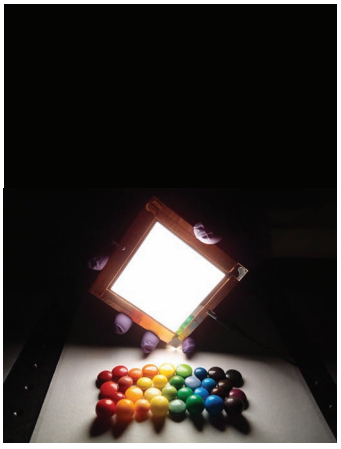
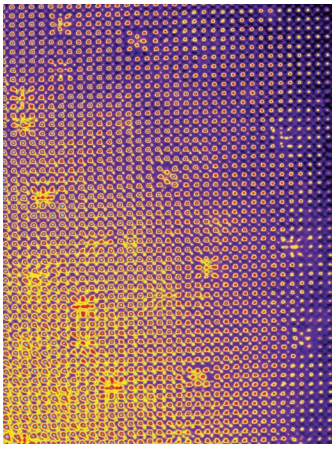


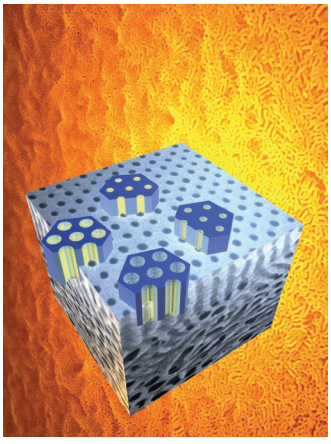
Light-Emitting Diodes

A novel all-phosphor, four-color, white organic light-emitting diode (WOLED) architecture is presented that utilizes molecular energy transfer or, specifically, triplet exciton down conversion within common organic layers in a cascaded emissive zone configuration. As reported by Yi-Lu Chang, Gregory D. Scholes, Zhenghong Lu, and co-workers on page 705, exceptional performance combinations of external quantum efficiency and color rendering index are achieved. This represents a significant step towards the realization of WOLEDs in solid-state lighting.

Nanorods

On page 683, Ian MacLaren and co-workers report the discovery of novel Nd-oxide nanorod precipitates in Nd/Ti co-doped bismuth ferrite. The 3D structure of these unique nanoscale objects is reconstructed using a combination of atomic resolution scanning transmission electron microscopy imaging and spectroscopy with density functional calculations, which also reveal novel electronic properties around the nanorods.





Stimuli-Responsive Materials

An isoporous integral asymmetric block copolymer membrane obtained by a non-solvent solvent exchange process is reported by Volker Abetz and co-workers on page 731. The surface pores can be reversibly closed and opened by changing the pH value. Postmodification of this membrane with a temperature-sensitive block leads to a double stimuli-responsive membrane, in which the pores can be reversibly opened and closed by both pH and temperature changes. Thorsten Wolff is acknowledged for the design of the back cover image.

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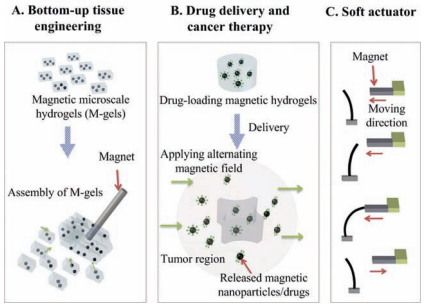
FEATURE ARTICLE

Hydrogels

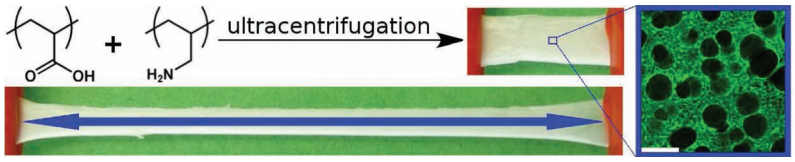


Magnetic hydrogels are emerging as a novel biocomposite for active response properties and extended applications. State-of-the-art methods for magnetic hydrogel fabrication are presented. The applications of magnetic hydrogels in biomedical engineering are also reviewed, including tissue engineering, drug delivery and enzyme immobilization, cancer therapy, and soft actuators. Concluding remarks and perspectives for the future development of magnetic hydrogels are addressed.

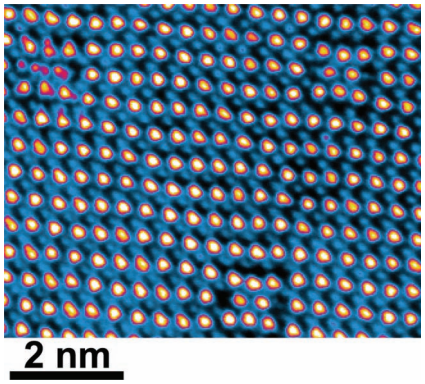
FULL PAPERS

Porous Materials

Mechanical resistant compact saloplastic polyelectrolyte complexes of poly(allylamine hydrochloride) and poly(acrylic acid sodium salt) with tunable porosity can be obtained by controlling the kinetics of complexation and subsequent ultracentrifugation.

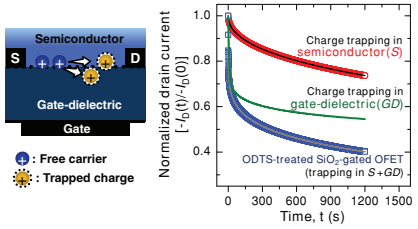


Nanorods



Novel self-assembled nanorods with a neodymium-rich core are discovered in neodymium and titanium codoped bismuth ferrite. The three-dimensional atomic structure and chemistry of these nanorods is determined using a combination of scanning transmission electron microscopy and density functional calculations. The theoretical studies show that these may function as one-dimensional semiconducting channels through the ceramic.

Organic Transistors



Double stretched-exponential formula enables the bias-stress-induced charge trapping in semiconductor and gate-dielectric layers in organic field-effect transistors to be separately described. The gate-dielectric layer is found to play a more critical role than the semiconductor layer in the bias-stress effects, possibly because the distribution of the activation energy for charge trapping in the gate-dielectric layer is wider than the semiconductor.

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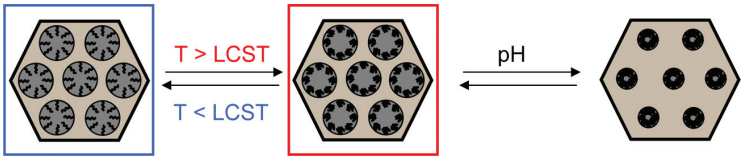
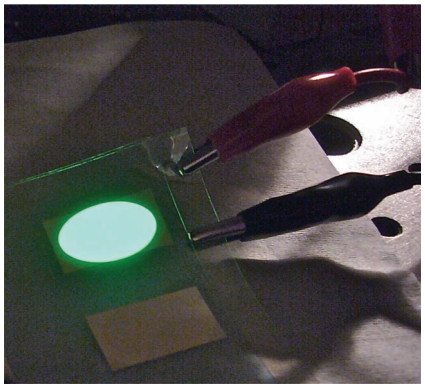
Functional Coatings

Double stimuli-responsive membranes are prepared by modification of pH-sensitive integral asymmetric polystyrene-*b*-poly(4-vinylpyridine) (PS-*b*-P4VP) diblock copolymer membranes with temperature-responsive poly(*N*-isopropylacrylamide) (pNIPAM). PS-*b*-P4VP membranes are first functionalized with a mussel-inspired polydopamine coating and then reacted with amine-terminated pNIPAM. The pH- and thermo-double sensitivities of the modified membranes are proven by determining the water flux under different temperature and pH conditions.



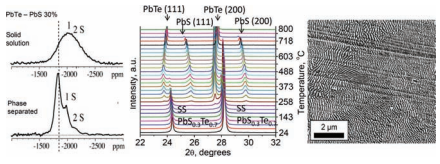
Organic Light Emitting Diodes

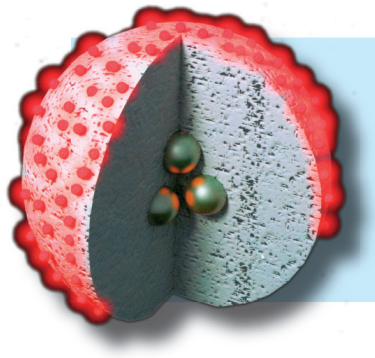


A new family of anthracene core emitters where the lowest triplet state has less than half the energy of the next highest triplet level is developed. The triplet fusion becomes highly efficient, resulting in fluorescent organic light emitting diode (OLED) devices of very simple structure, that far exceed the 25% external quantum efficiency limit due to the efficient singlet generation from triplet fusion in the device.

Thermoelectric Materials

In addition to microstructural analysis, adherence to Vegard's law of alloys has long been the standard toward assessing thermoelectric materials as solid solutions as opposed to nano-phase separated. Using infrared reflectivity and nuclear magnetic resonance spectroscopy, incipient phase separation may be observed for certain quenched "alloys" of $PbTe_{1-x}S_x$ that obey Vegard's law by in situ powder synchrotron X-ray diffraction, demonstrating that careful chemical analysis is required to adequately demonstrate whether a thermoelectric material is truly phase homogeneous.





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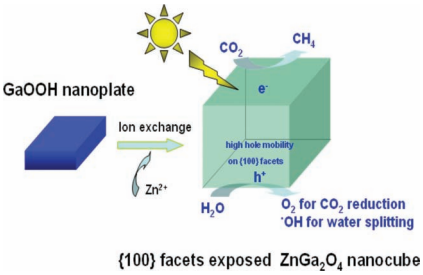
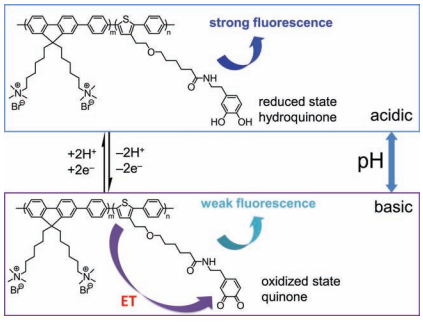
FULL PAPER

$ZnGa_2O_4$ nanocubes with exposed {100} facets are synthesized by a hydrothermal ion-exchange reaction using GaOOH precursor nanoplates via a single-crystal to single-crystal phase transformation. The high hole mobility on the {100} facets of the $ZnGa_2O_4$ nanocube promotes the water oxidation process, thus improving the performance in CO_2 photoreduction to CH_4.



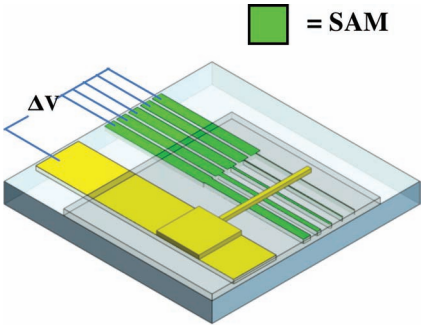
Photocatalysis

A dopamine-modified conjugated polymer, PFPDA is synthesized for pH sensing. At low pH, dopamine exists in its hydroquinone form and lacks the ability to quench fluorescence. At high pH, the quinone from dopamine autooxidation quenches the fluorescence of PFPDA through efficient intramolecular electron transfer. PFPDA exhibits a fluorescence "turn-on" response at low pH, and can be used for autophagy imaging of HeLa cells with good selectivity.



Conjugated Polymers

Symmetric large-area metal-molecular monolayer-metal junctions are fabricated in high yield and electrically characterized. The device structure employs embedded ultra-smooth (template-stripped) metal bottom electrodes, combined with a soft deposition method of ultra-smooth top electrodes embedded in cellulose acetate butyrate from water. Alkanethiol chain length-dependent *J–V* measurements confirm the suitability of the method to fabricate molecular monolayer junctions.



Molecular Electronics