ADVANCED FUNCTIONAL MATERIALS

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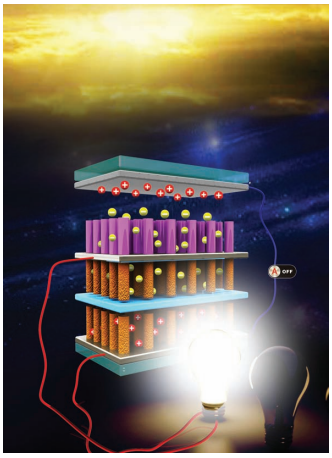
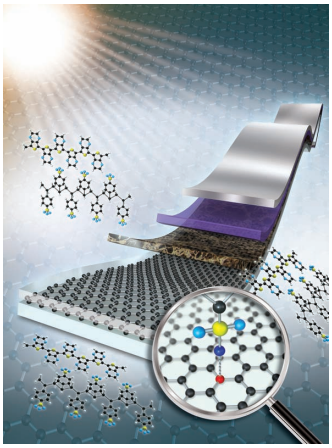
Porous Fibers

The luxury angora rabbit fiber stands out from other animal hair. Its porous structure combines exceptional insulation and comfortable wear. On page 1831, W. J. Stark and co-workers present a method by which a structurally equivalent protein filament can be synthesized in a continuous process. Raw material slaughterhouse waste-derived gelatin is utilized, adding value to this low-cost biopolymer.

Supercapacitors

Many attempts have been made to integrate energy conversion and storage devices into individual units for highly efficient, light-weight, portable devices. On page 1840, G. Shen, D. Li, and co-workers present a stack-integrated photo-supercapacitor thin-film device, which comprises a dye-sensitized solar cell and a supercapacitor (SC) built on bipolar TiO_2 nanotube arrays. In addition, selective plasma-assisted hydrogenation treatment of the SC electrodes delivers enhanced SC performance and overall photoelectric conversion and storage efficiency.





Organic Electronics

Y. H. Kahng, K. Lee, and co-workers demonstrate a high-performance, flexible, and transparent electrode for organic optoelectronic devices based on graphene. On page 1847, a popular conducting polymer (PEDOT:PSS) is used as a supporting layer during graphene transfer and as a stable doping layer in the applied devices. High performance, reproducibility, and an enhanced lifetime are demonstrated with the developed electrode in various organic optoelectronic devices.

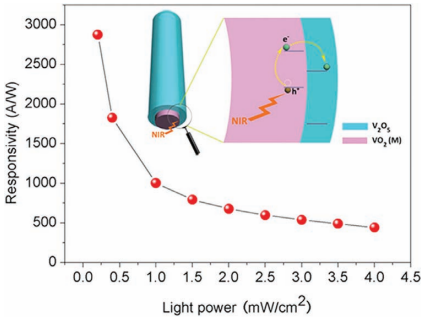
CONTENTS

FULL PAPERS

IR Detectors

Z. J. Li, Z. P. Hu, J. L. Peng, C. Z. Wu,*
Y. C. Yang, F. Feng, P. Gao, J. Yang,
Y. Xie* 1821–1830

Ultrahigh Infrared Photoresponse from Core–Shell Single-Domain-VO_2/V_2O_5 Heterostructure in Nanobeam

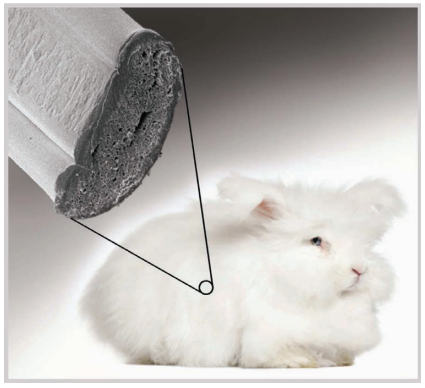


First oxide-catalogue photoconductive NIR detector built by the inner single-domain monoclinic VO_2 (M) core and outer V_2O_5 shell is put forward, which accomplished an ultrahigh responsivity (R_λ) of 2873.7 A W^{-1} and specific detectivity (D^*) of 9.23 × 10^{12} Jones at room temperature (at 990 nm; 0.2 mW cm^{-2}), recording the best performance compared with those reported IR detectors based on heavy-metal-free materials.

Porous Fibers

P. R. Stoessel, R. N. Grass,
A. Sánchez-Ferrer, R. Fuhrer,
T. Schweizer, R. Mezzenga,
W. J. Stark* 1831–1839

Spinning Angora Rabbit Wool-Like Porous Fibers from a Non-Equilibrated Gelatin/Water/2-Propanol Mixture

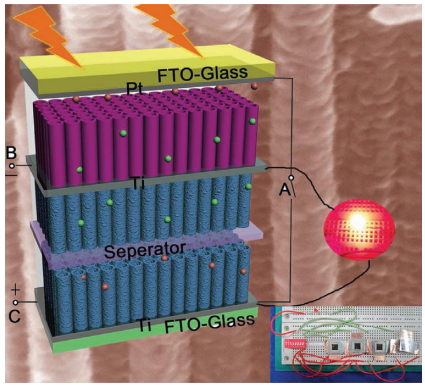


The continuous spinning of angora rabbit wool-like fibers from a non-equilibrated gelatin/water/2-propanol mixture using the presented process allows the production of protein fibers with simultaneous high porosity and promising mechanical properties.

Supercapacitors

J. Xu, H. Wu, L. Lu, S.-F. Leung,
D. Chen, X. Chen, Z. Fan, G. Shen,*
D. Li* 1840–1846

Integrated Photo-supercapacitor Based on Bi-polar TiO_2 Nanotube Arrays with Selective One-Side Plasma-Assisted Hydrogenation

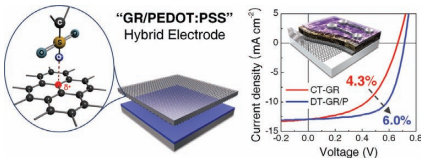


A novel stack-integrated photo-supercapacitor (PSC) thin-film device is composed of a dye-sensitized solar cell and a supercapacitor built on bi-polar anodic titanium oxide nanotube arrays. Improved supercapacitor performance is achieved through selective plasma-assisted hydrogenation treatment. A remarkable overall photoelectric conversion and storage efficiency up to 1.64% is achieved with a fast response and superior cycling capability.

Organic Electronics

B. H. Lee, J.-H. Lee, Y. H. Kahng,*
N. Kim, Y. J. Kim, J. Lee, T. Lee,
K. Lee* 1847–1856

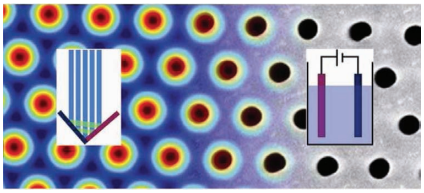
Graphene-Conducting Polymer Hybrid Transparent Electrodes for Efficient Organic Optoelectronic Devices



Graphene-conducting polymer hybrid electrode is demonstrated by employing a popular conducting polymer, poly(3,4-ethylenedioxythiophene):poly(styrenesulfonate) (PEDOT:PSS), as a new supporting and doping layer for the transfer of GR films. Because the transfer method simplifies the transfer process and solves the residue problem of conventional transfer methods, the new GR/PEDOT:PSS hybrid electrodes are fully functional in organic electronic devices, outperforming the conventionally transferred GR electrodes and indium tin oxide electrodes.

FULL PAPERS

Using the phenomenon of light interference, periodic patterns are easily created on the surface of aluminum. These can guide the pores nucleation during the porous anodization. The resulting membranes show the ideal hexagonal array of pores over a large area. By matching the parameters of the lithographic technique and the electrochemical oxidation, a broad window of interpore distances is feasible.

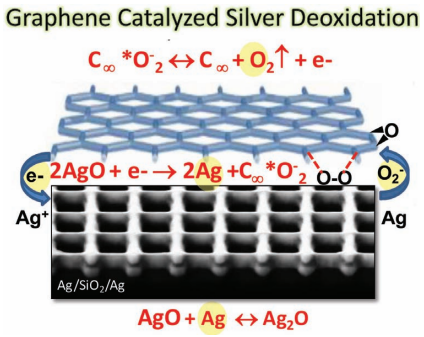


Nanoporous Materials

J. M. Montero Moreno,* M. Waleczek, S. Martens, R. Zierold, D. Görlitz, V. Vega Martínez, V. M. Prida, K. Nielsch.....1857–1863

Constrained Order in Nanoporous Alumina with High Aspect Ratio: Smart Combination of Interference Lithography and Hard Anodization

The role of graphene in enabling deoxidation of silver nanostructures, thereby contributing to enhance plasmonic properties and to improve the temporal stability of graphene/silver hybrids for both general plasmonic and metamaterials applications as well as for surface enhanced Raman scattering (SERS) substrates, is demonstrated.

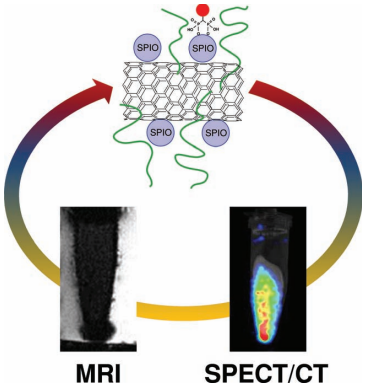


Nanostructures

M. Losurdo* I. Bergmair, B. Dastmalchi, T.-H. Kim, M. M. Giangregorio, W. Jiao, G. V. Bianco, A. S. Brown, K. Hingerl, G. Bruno.....1864–1878

Graphene as an Electron Shuttle for Silver Deoxidation: Removing a Key Barrier to Plasmonics and Metamaterials for SERS in the Visible

Dual single photon emission computed tomography (SPECT) and magnetic resonance (MR) imaging of superparamagnetic iron oxide nanoparticle (SPION)–multiwalled carbon nanotube (MWNT) hybrid phantoms. Fe_2O_3–MWNT hybrids are dispersed in 1% Pluronic F-127 solution and imaged by MR or SPECT/CT.

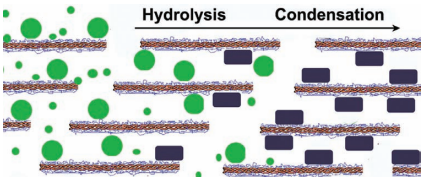


Contrast Agents

J. T.-W. Wang, L. Cabana, M. Bourgognon, H. Kafa, A. Protti, K. Venner, A. M. Shah, J. K. Sosabowski, S. J. Mather, A. Roig, X. Ke, G. Van Tendeloo, R. T. M. de Rosales, G. Tobias,* K. T. Al-Jamal*.....1880–1894

Magnetically Decorated Multiwalled Carbon Nanotubes as Dual MRI and SPECT Contrast Agents

Acac-stablized yttria-stabilized zirconia (YSZ) nano-sized precursors infuse into the fibril and coalesce in the presence of the PAH-crosslinked collagen molecules to form larger-sized precursor droplets. These precursor droplets further condense in the presence of water available within the intrafibrillar compartments of the collagen fibril into amorphous YSZ nanoparticles.



Biomimetics

B. Zhou, L.-n. Niu,* W. Shi, W. Zhang, D. D. Arola, L. Breschi, J. Mao, J.-h. Chen,* D. H. Pashley, F. R. Tay*.....1895–1903

Adopting the Principles of Collagen Biomineralization for Intrafibrillar Infiltration of Yttria-Stabilized Zirconia into Three-Dimensional Collagen Scaffolds

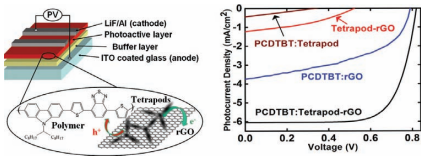
CONTENTS

FULL PAPERS

Solar Cells

S. W. Tong, N. Mishra, C. L. Su, V. Nalla, W. Wu, W. Ji, J. Zhang, Y. Chan,* K. P. Loh* 1904–1910

High-Performance Hybrid Solar Cell Made from CdSe/CdTe Nanocrystals Supported on Reduced Graphene Oxide and PCDTBT

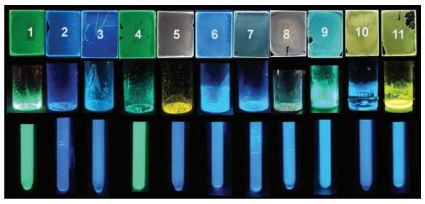


A chemically mediated way of controlling nanoscale morphologies in a composite is demonstrated by immobilizing CdSe/CdTe nanocrystals on oleylamine-functionalized reduced graphene oxide (rGO) sheets. The tetrapod-rGO can be homogeneously mixed with an organic dye (PCDTBT) to form donor–acceptor dispersed heterojunctions and exhibit a high power-conversion efficiency of ~3.3% in a solar cell device.

OLEDs

X. Wang, Y.-L. Chang, J.-S. Lu, T. Zhang, Z.-H. Lu, S. Wang* 1911–1927

Bright Blue and White Electrophosphorescent Triarylboryl-Functionalized C^N-Chelate Pt(II) Compounds: Impact of Intramolecular Hydrogen Bonds and Ancillary Ligands

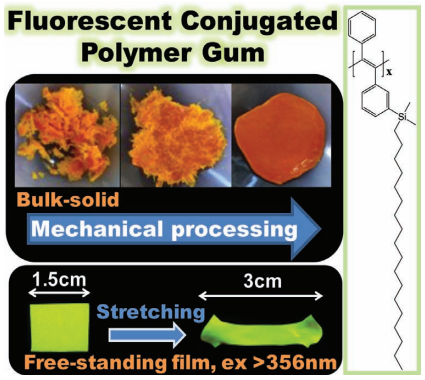


Bright blue and white phosphorescent dimesitylboryl-functionalized phenyl-1,2,3-triazolyl C^N-chelate Pt(II) compounds with phosphorescent quantum yield as high as 0.97 are achieved. Intramolecular hydrogen bonds, substituents, and ancillary ligands are found to greatly influence phosphorescence efficiency and excimer emission. Single-dopant white light electrophosphorescent devices with external quantum efficiency = 15.6% are fabricated.

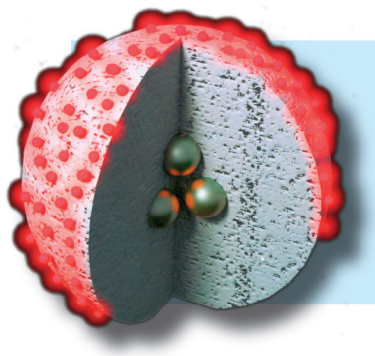
Fluorescent Polymers

Y.-J. Jin, J.-E. Bae, K.-S. Cho,* W.-E. Lee, D.-Y. Hwang, G. Kwak* 1928–1937

Room Temperature Fluorescent Conjugated Polymer Gums



Long alkyl chain-coupled PDPA derivatives provide quite soft and sticky gums at room temperature to produce films with very smooth surfaces after manual kneading and pressing. The fluorescence emission is quite intense in both the film and solution. The elastomer-supported film accommodates the large strain without cracking and delamination, after stretching and relaxing several hundred times.



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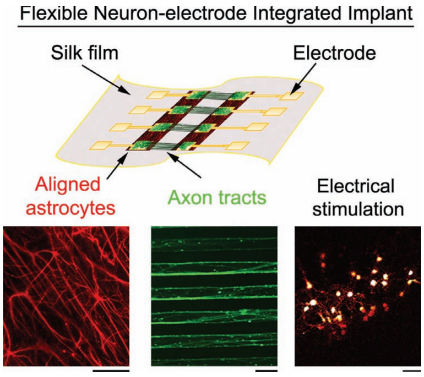
FULL PAPERS

Neuron–electrode interfaces are developed on thin silk films as brain implants. Silk films can use surface topography to induce astrocyte alignment, and microfluidic systems to generate patterned axon tracts. With built-in wire connections in the film, cortical neurons produce robust calcium responses upon electrical stimulation. These brain-compatible implants could potentially provide sustained functional neuron–electrode interfaces for the brain.

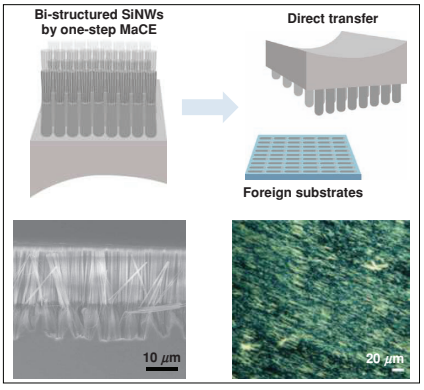


Neural Engineering

M. D. Tang-Schomer, X. Hu, M. Hronik-Tupaj, L. W. Tien, M. J. Whalen, F. G. Omenetto, D. L. Kaplan* 1938–1948

Film-Based Implants for Supporting Neuron–Electrode Integrated Interfaces for The Brain

A facile method is demonstrated to produce bilayer Si nanowire structures with horizontal cracks during metal-assisted chemical etching, allowing the efficient transfer of Si nanowire arrays on diverse substrates. A mass-transport model is developed to explain the natural bilayer structure formation mechanism. Repeated etch and transfer from a single Si wafer is demonstrated for large-scale Si-nanowire device fabrication.



Flexible Electronics

T. Moon, L. Chen, S. Choi, C. Kim, W. Lu*.....1949–1955

Efficient Si Nanowire Array Transfer via Bi-Layer Structure Formation Through Metal-Assisted Chemical Etching