ADVANCED FUNCTIONAL MATERIALS

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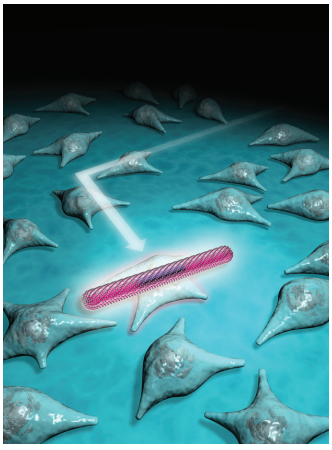
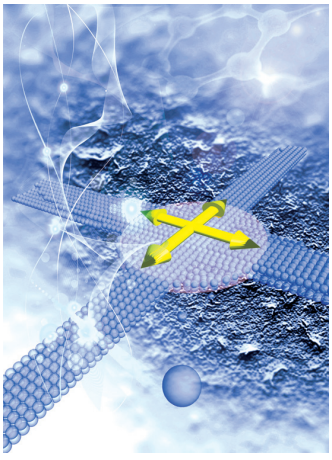


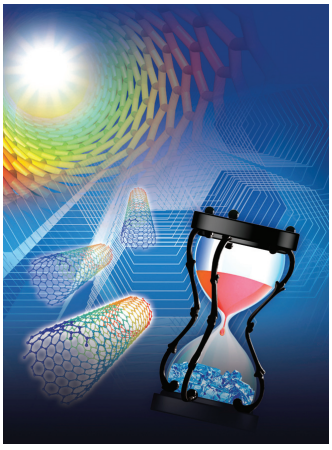
Plasmonics

Unique near-field enhanced plasmonic-magnetic bifunctional nanotubes are fabricated by D. L. Fan and co-workers. Their plasmonic properties are investigated on page 4332 through both experimentation and theoretical modeling. By leveraging the bifunctionality, a nanotube can be precisely transported to a single living Chinese hamster ovary cell amidst many and reveal its membrane chemistry (lipid and protein) with SERS spectroscopy.

Batteries

Y. Zhang, X.-B. Zhang, and co-workers report on page 4345 an electrostatic-induced spread-growth method to homogeneously coat CoO on graphene. Binder-free electrode with excellent structural stability can then be easily prepared by layer-by-layer stacking. As an anode for Li-ion batteries, the as-prepared electrode exhibits a high rate capability and excellent cycle stability up to 5000 cycles. This opens up a promising strategy to develop high-performance anodes for next-generation LIBs.



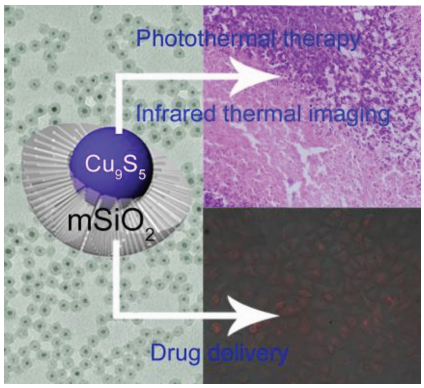


Thermal Energy Storage

On page 4354, B. Tang and co-workers introduce SWNT/PCM composites which can effectively capture visible and NIR light, convert it to thermal energy, and store heat energy via phase transitions. The composites also have high strength, flexibility, and thermal conductivity. This opens up the design and development of materials with efficient visible light harvesting, photothermal conversion, and thermal storage abilities under solar radiation, which would be useful in many areas of energy production and smart clothing.

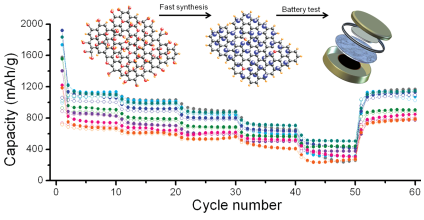
FULL PAPERS

Nanocomposites



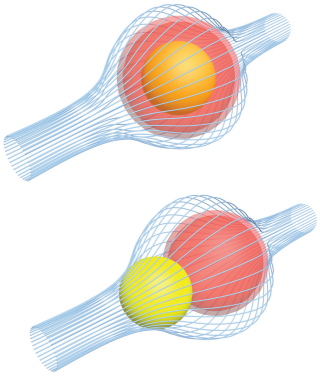
A multifunctional nanoplatform based on the Cu_9S_5@$mSiO_2$-PEG core-shell nanocomposites demonstrates an excellent biocompatibility and can be used for combining photothermal- and chemotherapies with infrared thermal imaging of cancer treatment.

Li-Ion Batteries



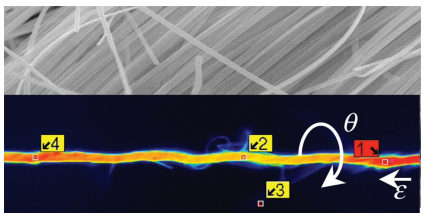
A series of iron oxide/reduced graphene oxide composites are synthesized in one-step by a simple microwave-assisted non-aqueous sol-gel route in just few minutes. The precise characterization and comparison between the sample studied allow elucidation of structure–property relationships and the improvement of electrochemical performance targeting Li-Ion battery applications.

Invisibility



Closed dc cloaks can render a conducting object invisible to external detection and distortions of probing currents due to the embedded object can be limited to inside the cloak. Using negative conductivities, exterior dc cloaks that make a nearby object invisible to the outside detectors can be realized.

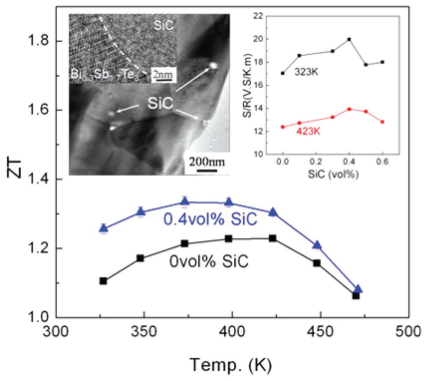
Nanowires



Niobium nanowires are twisted to form strong (0.4 to 1.1 GPa) and highly conductive (3×10^6 S m^{-1}) yarns. Impregnation with paraffin wax produces linear and large torsional actuation in response to heating and cooling.

FULL PAPERS

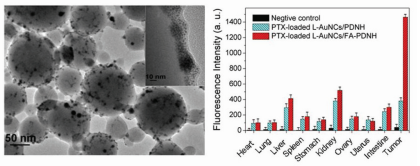
A high figure of merit (*ZT*) up to 1.33 at 373 K is achieved by incorporating a tiny number of SiC particles to a traditional $Bi_{0.3}Sb_{1.7}Te_3$ thermoelectric material. The existence of SiC nanoinclusions in the p-type $Bi_{0.3}Sb_{1.7}Te_3$ thermoelectric matrix reduces the electrical resistivity and increases the Seebeck coefficient, which leads to the remarkable *ZT* enhancement.



Nanocomposites

BiSbTe-Based Nanocomposites with High *ZT*: The Effect of SiC Nanodispersion on Thermoelectric Properties

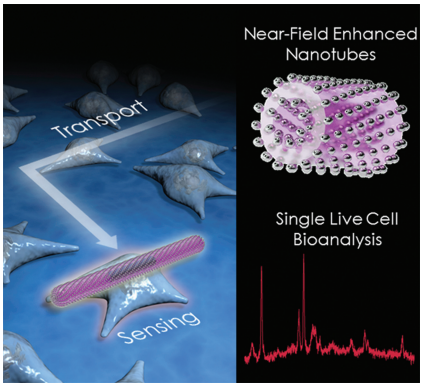
A facile self-assembly method is used to integrate orange luminescent gold nanoclusters (*L*-AuNCs), which are cancer cell targeting agents, a hydrophobic cancer drug, and a pH-responsive amphiphilic polymer into a nanocomposite theranostic system. The nanocomposite can selectively target the affected cells and unload the cancer drug via a controlled release mechanism. The release of the drug can be continuously monitored by the luminescence of the co-delivered imaging probes (*L*-AuNCs).



Biomedical Applications

Amphiphilic Polymeric Nanocarriers with Luminescent Gold Nanoclusters for Concurrent Bioimaging and Controlled Drug Release

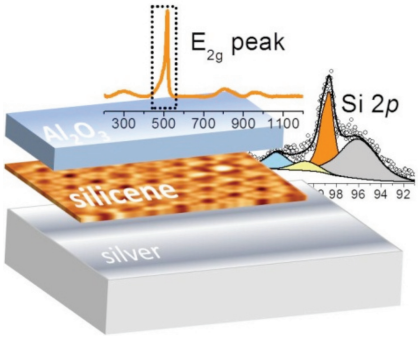
Unique near-field enhanced plasmonic-magnetic bifunctional nanotubes are fabricated and their plasmonic properties are investigated by both experimentation and theoretical modeling. By leveraging the bifunctionality, a nanotube can be precisely transported to a single living Chinese hamster ovary (CHO) cell amidst many and its membrane chemistry (lipid and protein) is revealed with surface-enhanced Raman scattering (SERS) spectroscopy.



Plasmonics

Near-Field Enhanced Plasmonic-Magnetic Bifunctional Nanotubes for Single Cell Bioanalysis

The chemical stability of epitaxial silicene results in a low reactivity with O_2 when dosing up to 1000 L and in a progressive oxidation under ambient conditions. Non-destructive Al- and Al_2O_3-based encapsulation approaches that can be exploited for ex situ characterization of silicene and for gated silicene devices (irrespective of the support substrate) are engineered.



Nanostructures

Hindering the Oxidation of Silicene with Non-Reactive Encapsulation

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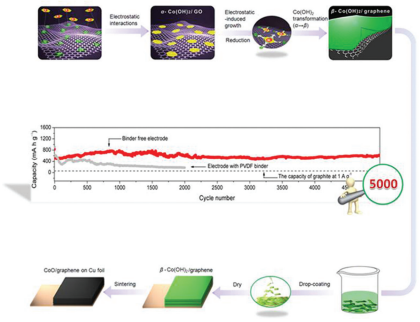
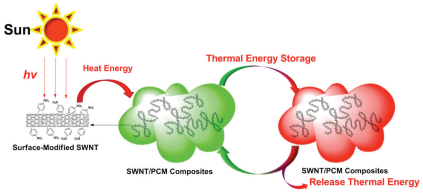
Batteries



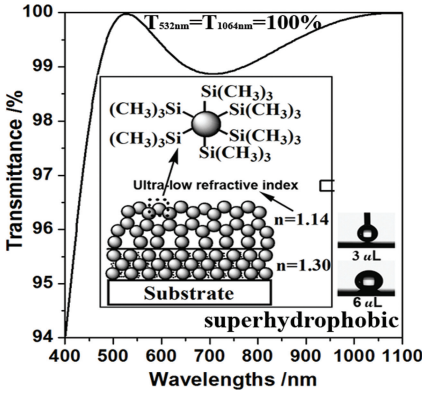
Homogeneous β-Co(OH)$_2$ on graphene is synthesized using a simple and effective electrostatic induced spread growth method, which ensures the facile fabrication of a binder-free and mechanically robust CoO/graphene electrode by means of a layer-by-layer stacking process. When employed as an anode in Li-ion batteries, a high rate capability and excellent cycle stability up to 5000 cycles are successfully obtained.

Thermal Energy Storage

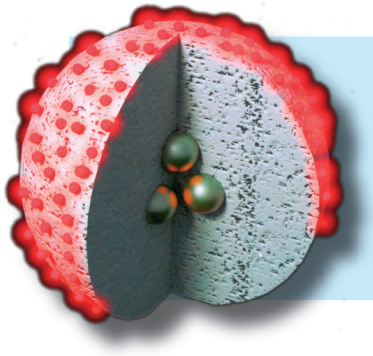


Novel single-walled carbon nanotube/phase change material (SWNT/PCM) composites have UV-vis sunlight harvesting, light-thermal conversion, thermal energy storage, and form-stable effects. Upon UV-vis light irradiation, the light-to-heat conversion and thermal storage efficiency (η) of the obtained SWNT/PCM composites is over 0.84 using the photothermal calculation method.

Optical Coatings



A double-layer double wavelength antireflective (AR) coating that has 100% transmittance at both 1064 nm and 532 nm is designed with the assistance of a computer. This coating consists of top and bottom layers with refractive indices of 1.14 and 1.30. A template-free sol-gel method for the preparation of the superhydrophobic silica thin film with an ultralow refractive index is proposed.



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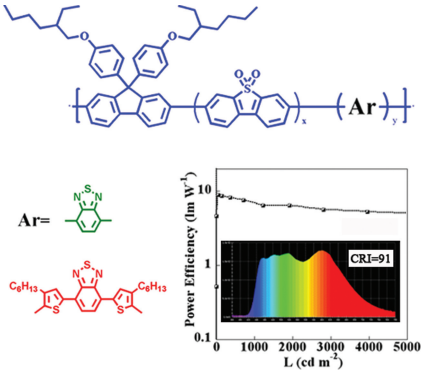
FULL PAPERS

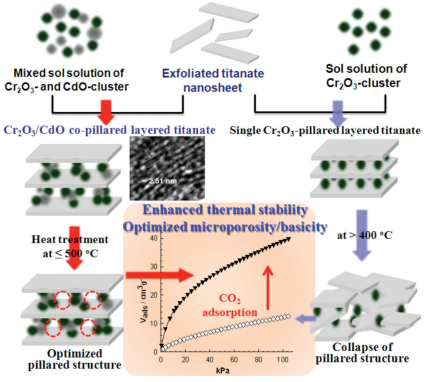
White polymer light-emitting diodes with an attractive power efficiency-color rendering index (CRI)-color stability trade-off are successfully realized by blending red-green-blue (RGB) light-emitting polymers based on 9,9-bis(4-(2-ethyl-hexyloxy)phenyl)fluorene copolymerized with dibenzothiophene-*S*,*S*-dioxide (PPF-SO, blue), and benzothiadiazole (PPF-SO-BT, green) or dithienylbenzothiadiazole (PPF-SO-DHTBT, red) units.



Light-Emitting Diodes

Red, Green, and Blue Light-Emitting Polyfluorenes Containing a Dibenzothiophene-*S*,*S*-Dioxide Unit and Efficient High-Color-Rendering-Index White-Light-Emitting Diodes Made Therefrom

An effective way to synthesize efficient CO_2 adsorbents from pillared materials is developed on the basis of an electrostatically derived self-assembly between exfoliated 2D nanosheets and two kinds of guest nanoclusters. The co-pillaring of basic CdO with Cr_2O_3 makes it possible to improve the microporosity and basicity of the resulting pore structure and to enhance the CO_2 adsorption function and thermal stability of pillared materials.



Porous Materials

A New Type of Efficient CO_2 Adsorbent with Improved Thermal Stability: Self-Assembled Nanohybrids with Optimized Microporosity and Gas Adsorption Functions