ADVANCED FUNCTIONAL MATERIALS

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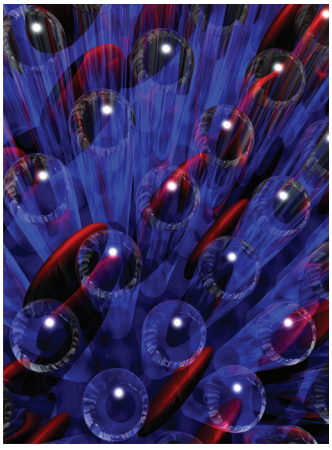
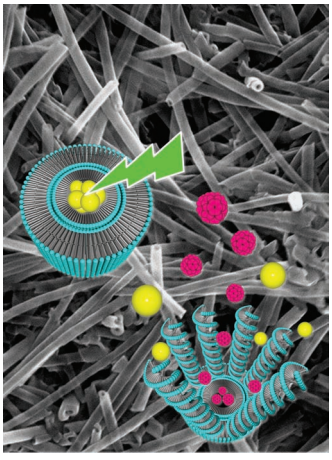


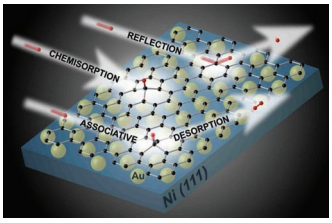
Plasmonic Nanostructures

On page 1655 Angel Barranco, Agustín R. Gonzalez-Elipe, and co-workers report the synthesis of asymmetric gold plasmonic nanostructures along the tilted intercolumnar space of SiO_2 thin films prepared at glancing deposition angles. The film dichroism, evidenced by changing the light polarization and/or sample orientation, can be lithographically removed using a nanosecond laser for the development of advanced optical encryption patterns at micro-macroscales.

Stimuli-Responsive Materials

Glycolipid-based soft nanotubes with a hydrophilic outer surface and hydrophobic nanochannel encapsulating C60 are reported by Naohiro Kameta and co-workers on page 1677. It is found that the photothermal effect of gold nanoparticles hybridized with the nanotube induces an unfolding of the tubular morphology and leads to compulsive release of C60 in bulk water.





Functionalized Graphene

Hydrogen and deuterium atoms interact with a graphene monolayer on a Ni/Au substrate. The atoms are either adsorbed on the surface or reflected, or they can force a previously chemisorbed atom to leave the graphene in the form of a gas molecule. On page 1628, Yin Wang, Stephan Irle, Alexander Grüneis, and co-workers report the use of time-dependent X-ray photoelectron spectroscopy to investigate the kinetic isotope effect.

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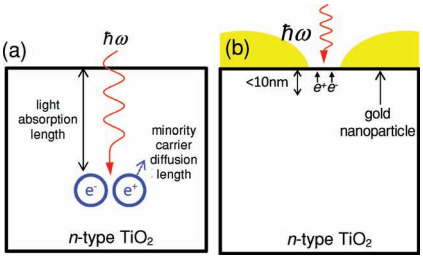
FEATURE ARTICLE

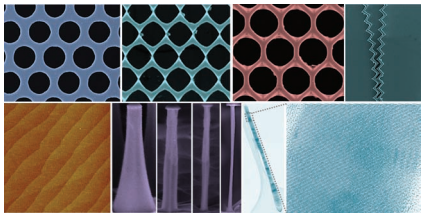
Photocatalysis



In n-type TiO_2, a relatively thick film is needed to absorb a majority of the incident light, while the minority carriers (holes) recombine rapidly with the majority carriers (electrons) over a much shorter length scale. Localized plasmonic fields provide a way to mitigate this problem by coupling light very effectively from the far-field to the near-field at the metal oxide/electrolyte interface.

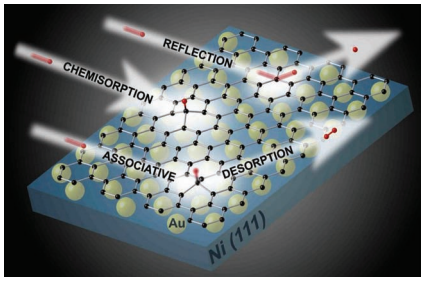
FULL PAPERS

Semiconductor Nanostructures



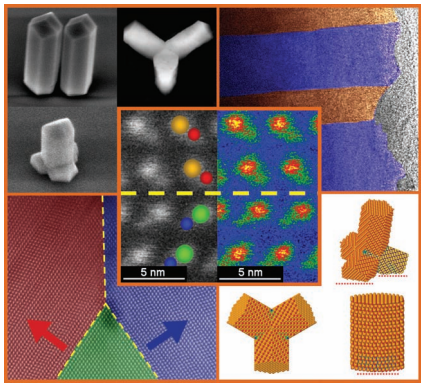
A novel post etch chemical process is developed to etch III–V materials with monolayer precision in an inverse epitaxial manner. The process, which also simultaneously passivates the surface, is applied to push the limits of top-down fabrication. InP-based high-optical quality nanowire arrays with aspect ratios more than 50 and nanostructures with new topologies are demonstrated.

Graphene



Hydrogen and deuterium atoms interact with a graphene monolayer on a Ni/Au substrate. The atoms are either adsorbed on the surface, or reflected, or they can force a previously chemisorbed atom to leave graphene in the form of a gas molecule. The kinetic isotope effect is investigated by time-dependent X-ray photoelectron spectroscopy.

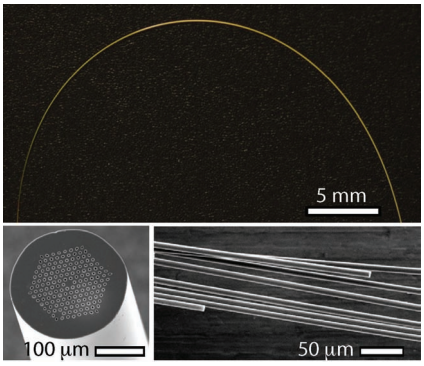
Crystal Growth



Twinning and polytypism are shown to influence the morphology of van der Waals epitaxial nanostructures. Consequently, the growth of vertically aligned nanorods and epitaxial branched crystals (tripods and tetrapods) from ZnTe can be achieved using only a single type of substrate. Crystalline characterization of the various structures is performed with extensive electron microscopy technqiues and corroborated with atomic models.

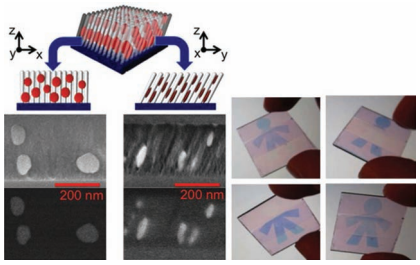
FULL PAPERS

High pressure chemical vapor deposition can deposit conformal films of II–VI semiconductors such as ZnSe, ZnS, and ZnO into very high aspect ratio pores. This process allows for II–VI semiconductors, which cannot be processed into optical fibers with conventional techniques, to be fabricated into step index and microstructured optical fibers.



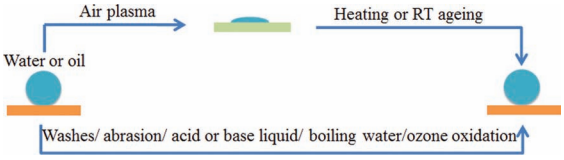
Optical Fibers

SiO_2 thin films prepared at glancing geometries are used as templates to grow gold nanoparticles that depict optical dichroism around the azimuthal and polar axis of the films and yield unprecedented possibilities for the encryption of optical information.



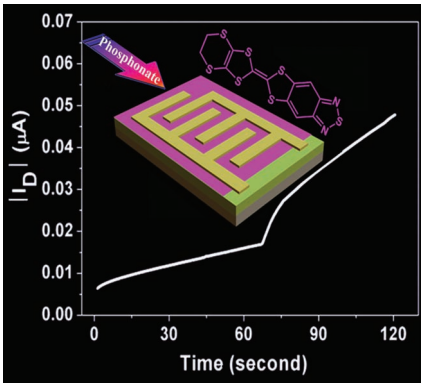
Thin Films

A superamphiphobic fabric with self-healing ability to autorepair against chemical damage is prepared with a two-step wet-chemistry coating technique using a readily available material system. The coating withstands repeated washing and severe abrasion, as well as strong acid/base, ozone, and boiling treatments.



Self-Healing Materials

Organic field-effect transistors based on thin-films of benzothiadiazole-fused-tetrathiafulvalene show fast and sensitive response to chemical vapors of DECP (diethyl chlorophosphate) and $POCl_3$ with the off-current as the output signal.



Sensors

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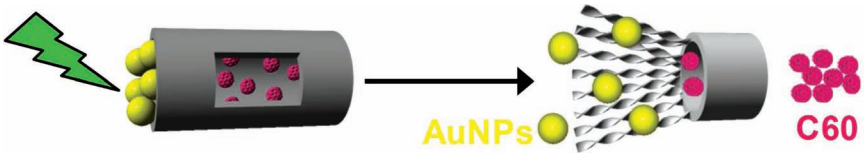
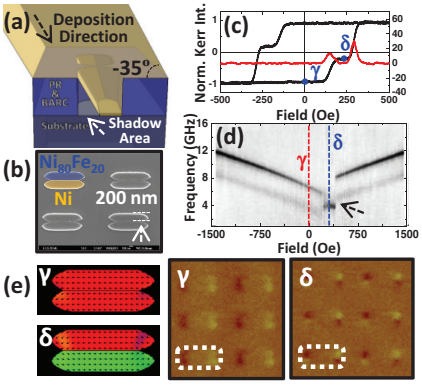
Stimuli-Responsive Materials

Self-assembly of simple glycolipids in alcohols, followed by heat treatment with water produces nanotubes that have a hydrophilic outer surface and hydrophobic nanochannel. The nanotubes are able to encapsulate C60 and evenly disperse it in water. The photothermal effect of the AuNPs hybridized with the nanotube induces an unfolding of the tubular morphology, leading to compulsive release and aggregation of C60 in bulk water.



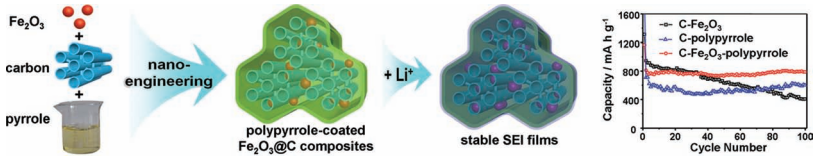
Ferromagnetic Materials

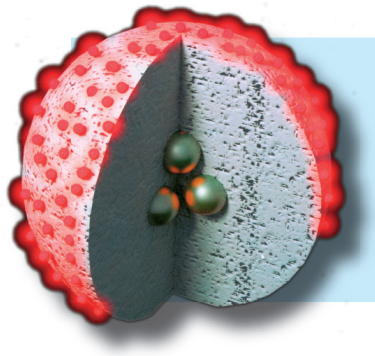


The fabrication of large area binary magnetic nanostructures made from one or two ferromagnetic materials (Ni and $Ni_{80}Fe_{20}$) is reported using a self-aligned shadow deposition technique. Tunable magnetization switching and an adjustable dynamic response is observed for the binary structures. The results are validated by direct domain imaging using magnetic force microscopy and micromagnetic simulations.

Composite Materials

Novel multifunctional composites composed of highly dispersed nanosized Fe_2O_3 particles, a tubular mesoporous carbon host, and a conductive polypyrrole sealing layer are hierarchically assembled according to the different functions of each component, which are nanoengineered to improve the reversible capacity and cycle stability of Fe_2O_3-based anodes.





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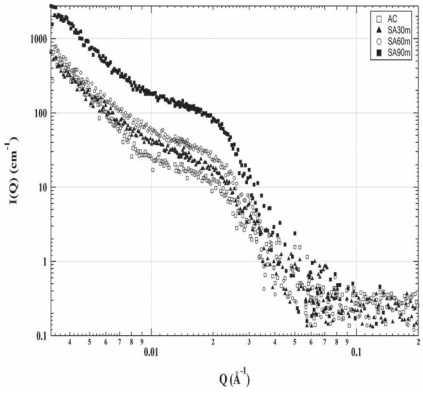
FULL PAPERS

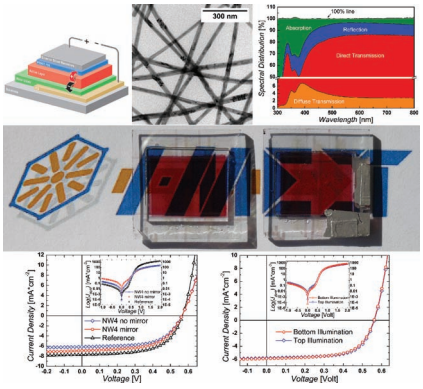
Photovoltaic Devices

The impact of controlled solvent vapor exposure on the morphology, structural evolution, and function of solvent-processed poly(3-hexylthiophene):[6,6]-phenyl-C_{61}-butyric acid methyl ester (P3HT:PCBM) bilayers is presented. Scattering intensity increases when a sample is exposed to solvent annealing (SA) for the final 30 min, which is associated with the phase separation of PCBM.



Solar Cells

Silver nanowires (Ag NWs) are introduced as a viable alternative to thermally evaporated silver metal top electrodes. Solution-processable Ag NWs are spray-deposited as highly conductive and transparent electrode layers in semi-transparent poly(3-hexylthiophene-2,5-diyl):[6,6]-phenyl-C61-butyric acid methyl ester (P3HT:PCBM) solar cell devices. Their optical properties in semitransparent organic photovoltaic devices are presented and they show comparable performance to reference devices.



Semiconductors

UV-ozone treated indium tin oxide (ITO) is used extensively in organic electronics. It is shown that UV-ozone treatment can cause potential threats leading to degradation of organic materials. In accelerated degradation tests, rubrene formed on an ITO-free region always shows stronger photoluminescence (PL) emission than a region with an ITO coating. The degradation mechanism for UV-ozone treated ITO is discussed based on the photoemission analysis and device studies.