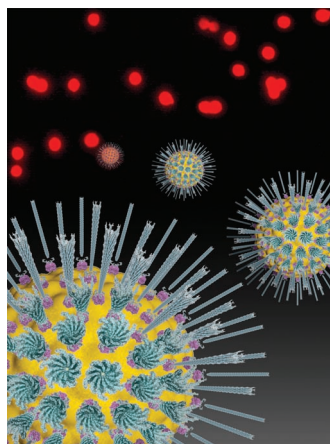


ADVANCED FUNCTIONAL MATERIALS

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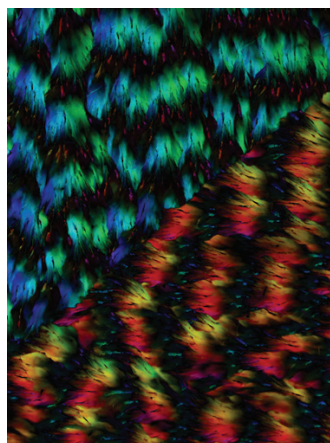
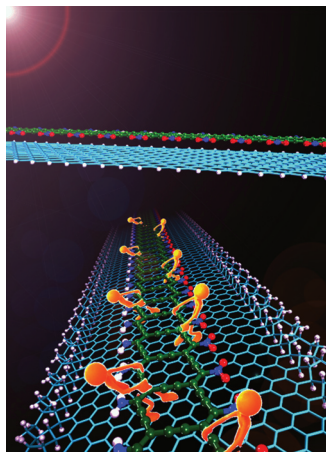


Biomimetics

Inspired by the cellular threadlike structures, virus-decorated gold microspheres with high surface to volume ratios are described by Chang Su Jeon, Inseong Hwang, and Taek Dong Chung on page 1484. The filamentous viral scaffold allows dense modification with antibodies, while the thin gold layer protects non-specific bindings from serum samples, resulting in a significant increase in sensitivity in the bead-based immunoassay.

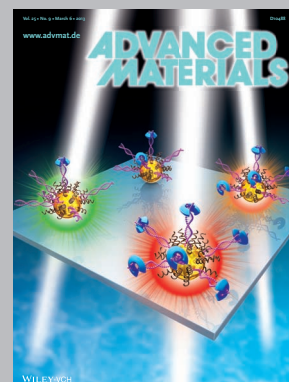
Graphene Nanoribbons

On page 1507, Guangtao Yu, Xuri Huang, Zhongfang Chen, and co-workers report that by attaching a floating induced dipole field via π - π interactions, spin gapless semiconducting (SGS)-half-metallic-metallic transitions can be achieved in zigzag graphene nanoribbons.



Thin Films

A simple evaporation method for the preparation of mosaic mesocrystal thin films is studied by Helmut Cölfen and co-workers. As reported on page 1547, the multistep process starts with the formation of a polymer-induced liquid-precursor phase, followed by the formation of spherulitic thin films and their recrystallization into mesocrystal thin films. The image shows a polarized light (Abrio) image of a mesocrystalline thin film of DL-lysine-HCl.



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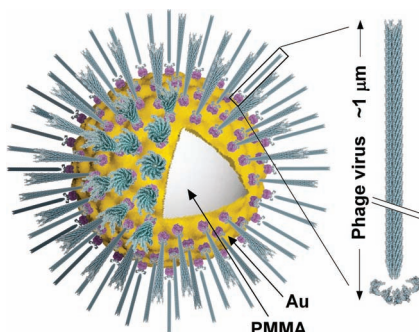
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FULL PAPERS

Biomimetics

C. S. Jeon, I. Hwang,*
T. D. Chung*1484–1489

Virus-Tethered Magnetic Gold Microspheres with Biomimetic Architectures for Enhanced Immunoassays

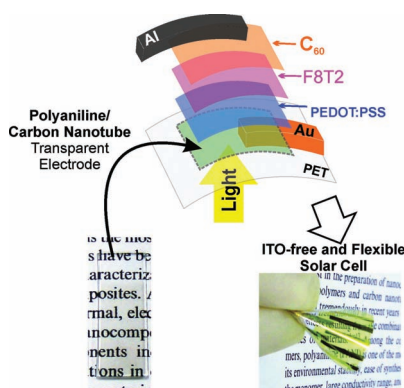


A thin gold layer on magnetic microspheres enables self-assembled monolayer formation that effectively prevents non-specific binding and accepts second layers of protein loading scaffolds such as filamentous virions. The merger of viruses and non-biological materials resembles biological architectures that enhance ligand–receptor interactions, resulting in enhanced immunoassays.

Organic Solar Cells

R. V. Salvatierra, C. E. Cava,
L. S. Roman,
A. J. G. Zarbin*1490–1499

ITO-Free and Flexible Organic Photovoltaic Device Based on High Transparent and Conductive Polyaniline/Carbon Nanotube Thin Films

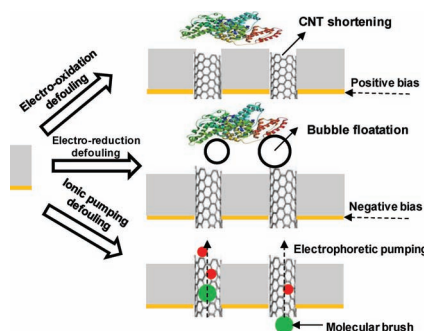


A flexible, transparent, and organic solar cell is developed using a carbon nanotube/polyaniline film obtained by a liquid-liquid interfacial route as a transparent electrode. The electrode and solar cell characterization is presented with the device showing high performance and stability.

Carbon Nanotubes

X. Sun, J. Wu, Z. Chen, X. Su,
B. J. Hinds*1500–1506

Fouling Characteristics and Electrochemical Recovery of Carbon Nanotube Membranes



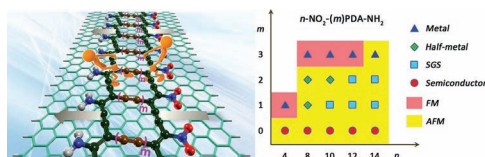
The fouling behavior of carbon nanotube (CNT) membranes is investigated for large protein biomolecules and a wide variety of small molecules. The CNT membranes are largely fouling resistant, even to untreated river water, due to size exclusion. Electrochemical oxidation, nanobubble generation, and ionic pumping are shown to recover CNT membrane performance.

Graphene

J. Guan, W. Chen, Y. Li, G. Yu,*
Z. Shi, X. Huang,* C. Sun,
Z. Chen*1507–1518

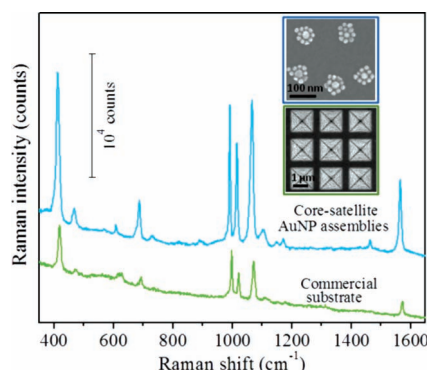
An Effective Approach to Achieve a Spin Gapless Semiconductor–Half-Metal–Metal Transition in Zigzag Graphene Nanoribbons: Attaching A Floating Induced Dipole Field via π – π Interactions

By depositing ladder-structure acceptor/donor-decorating polydiacetylene (PDA) derivatives on zigzag GNRs (zGNRs) via strong π – π interactions, abundant electronic and magnetic transformations can be achieved in zGNRs with perfect, 57-reconstructed, and partially hydrogenated edge patterns. This effective approach takes advantage of the versatile floating dipole field induced from the donor to the acceptor groups through the excellent delocalized π -conjugated backbone.



FULL PAPERS

A dense array of core-satellite gold nanostructures is fabricated as a low-cost surface enhanced Raman spectroscopy (SERS) substrate through a combined electrostatic and DNA-directed self-assembly. These core-satellite nanostructures show strong and highly reproducible SERS activity, superior to those of a commercial Klarite SERS substrate, and an ability to detect target analytes (e.g., benzenethiol), at concentrations down to 1×10^{-9} M.

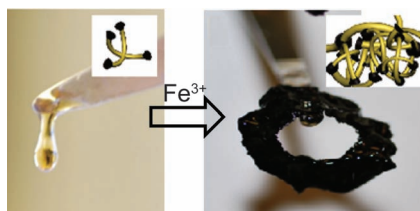


Sensors

Y. H. Zheng, T. Thai, P. Reineck, L. Qiu, Y. M. Guo, U. Bach* 1519–1526

DNA-Directed Self-Assembly of Core-Satellite Plasmonic Nanostructures: A Highly Sensitive and Reproducible Near-IR SERS Sensor

An injectable material is developed by reacting a water-free, liquid polymer with small amounts of ferric solution to yield a cross-linked elastomeric material via dopamine oxidation. This provides a range of elastic moduli and in vivo degradation rates and allows delivery of hydrophilic and hydrophobic drugs.

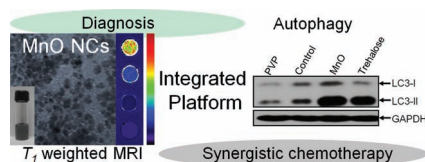


Drug Delivery

B. Mizrahi, S. A. Shankarappa, J. M. Hickey, J. C. Dohman, B. P. Timko, K. A. Whitehead, J.-J. Lee, R. Langer, D. G. Anderson, D. S. Kohane* 1527–1533

A Stiff Injectable Biodegradable Elastomer

Hydrophilic MnO nanocrystals can be prepared by a one-pot microwave-assisted synthesis in a polar solvent. In addition to serving as an outstanding T_1 -magnetic resonance (MR) contrast agent directly, the obtained MnO nanocrystals can induce genuine autophagy. This kind of MnO nanocrystal provides a new platform for combinatorial treatment of cancers via the synergistic effects of nanocrystals and doxorubicin in killing cancer cells.



Biomedical Applications

Y. Lu, L. Zhang, J. Li, Y.-D. Su, Y. Liu, Y.-J. Xu, L. Dong, H.-L. Gao, J. Lin, N. Man, P.-F. Wei, W.-P. Xu, S.-H. Yu,* L.-P. Wen* 1534–1546

MnO Nanocrystals: A Platform for Integration of MRI and Genuine Autophagy Induction for Chemotherapy

Hybrid thin films comprising DL-lysine-HCl and polyacrylic acid are prepared using a combination of a droplet deposition method and simple evaporation. The multistage process includes: 1) the formation of polymer-induced liquid-precursor droplets and evaporation of solvent; 2) fast formation of a spherulitic thin film; and 3) recrystallization into a mosaic thin film with mesocrystal microdomains and single-crystal properties.



Thin Films

Y. Jiang, H. Gong, M. Grzywa, D. Volkmer, L. Gower, H. Cölfen* 1547–1555

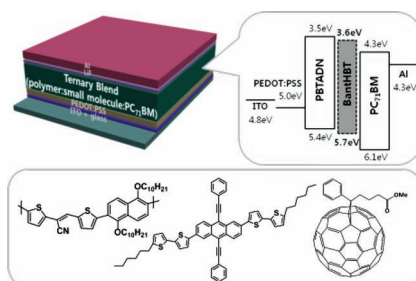
Microdomain Transformations in Mosaic Mesocrystal Thin Films

FULL PAPERS

Photovoltaics

H. Cha, D. S. Chung, S. Y. Bae,
M.-J. Lee, T. K. An, J. Hwang,
K. H. Kim, Y.-H. Kim,* D. H. Choi,*
C. E. Park*1556–1565

Complementary Absorbing Star-Shaped Small Molecules for the Preparation of Ternary Cascade Energy Structures in Organic Photovoltaic Cells

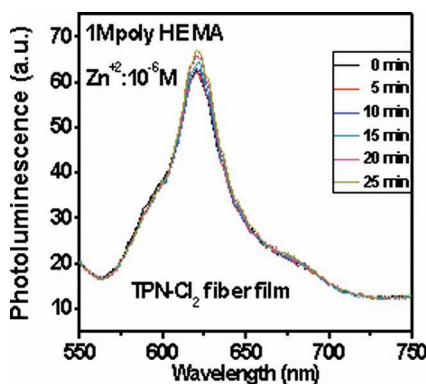


Two anthracene-based star-shaped conjugated small molecules, HBantHBT and BantHBT, are incorporated into organic photovoltaic cells prepared using a poly((5,5-E-alpha-((2-thienyl)methylene)-2-thiophene acetonitrile-alt-2,6-[(1,5-didecyloxy) naphthalene])): [6,6]-phenyl-C71-butyric acid methyl ester (PBTADN:PC₇₁BM) blend as an electron-cascade donor material. The small molecules penetrate the PBTADN:PC₇₁BM blend layer to yield complementary light absorption spectra, facilitate energy level alignment, and optimize the domain size required for charge carrier transfer.

Sensors

J.-H. Syu, Y.-K. Cheng, W.-Y. Hong,
H.-P. Wang, Y.-C. Lin, H.-F. Meng,*
H.-W. Zan, S.-F. Horng, G.-F. Chang,
C.-H. Hung,* Y.-C. Chiu, W.-C. Chen,*
M.-J. Tsai, H. Cheng1566–1574

Electrospun Fibers as a Solid-State Real-Time Zinc Ion Sensor with High Sensitivity and Cell Medium Compatibility

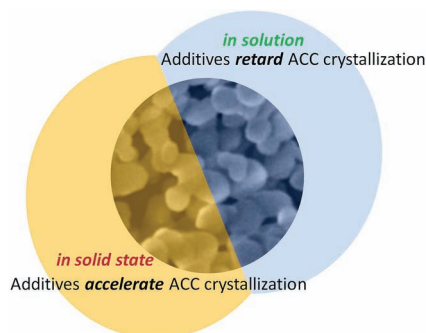


A solid-state sensing film is developed to detect the zinc II ions within physiological concentration range in complex liquid medium. In the medium, such films respond to zinc ions with concentrations as low as 10^{-6} M with time resolution of 5 min. The sensitivity and response speed of the film allow for a non-invasive and real-time study.

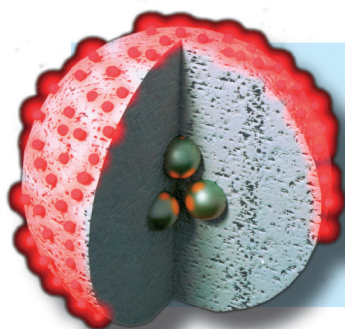
Biomaterialization

J. Ihli, Y.-Y. Kim, E. H. Noel,
F. C. Meldrum*1575–1585

The Effect of Additives on Amorphous Calcium Carbonate (ACC): Janus Behavior in Solution and the Solid State



Investigation of the crystallization, in solution and in the solid state, of amorphous calcium carbonate (ACC) samples, precipitated in the presence of contrasting additives shows that high-molecular-weight additives can retard the crystallization of ACC in solution, yet accelerate this process in the solid state. In contrast, the small molecules studied retard crystallization in both solution and the solid state.



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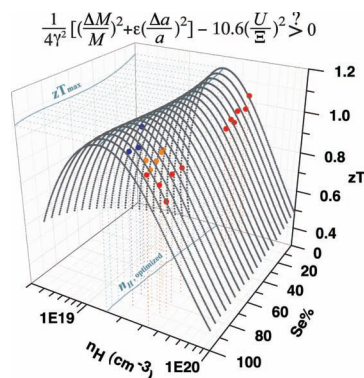
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FULL PAPERS

The potential for achieving higher figure of merit, zT , by forming a solid solution can be evaluated using simple criteria containing transport parameters. Alloying is shown to be most effective in materials where the zT may not be high in their unalloyed form.

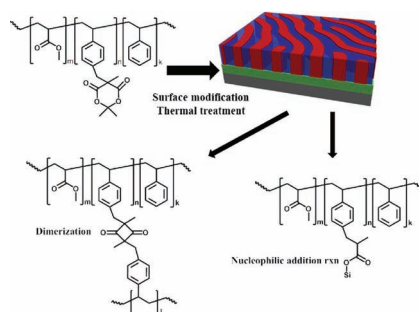


Thermoelectrics

H. Wang, A. D. LaLonde, Y. Pei,*
G. J. Snyder*1586–1596

The Criteria for Beneficial Disorder in Thermoelectric Solid Solutions

Efficient surface neutralization and enhanced substrate adhesion for block copolymer lithography is achieved via ketene mediated crosslinking and functionalization. Processing times of seconds, low defect density, simple synthetic procedures, and good substrate adhesion make these materials attractive as robust block copolymer neutralization layers.



Lithography

H. Jung, F. A. Leibfarth, S. Woo,
S. Lee, M. Kang, B. Moon,
C. J. Hawker,* J. Bang*1597–1602

Efficient Surface Neutralization and Enhanced Substrate Adhesion through Ketene Mediated Crosslinking and Functionalization