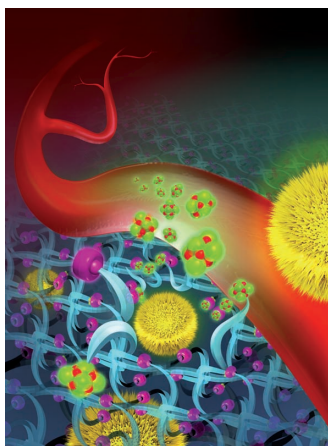


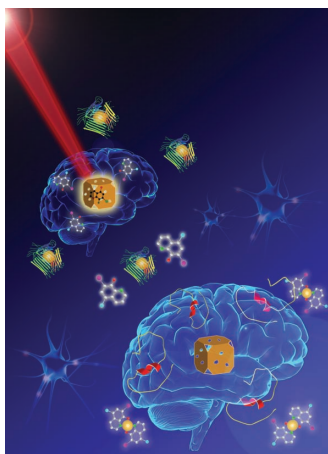
ADVANCED FUNCTIONAL MATERIALS

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Hydrogels

W. Weber and co-workers present a stimulus-responsive biohybrid material which allows the release of vaccines in a remote-controlled manner in vivo. The orally administered stimulus molecule fluorescein reaches the polyethylene glycol-based depot via the bloodstream, leading to its dissolution and the release of the incorporated vaccine particles. On page 5355, the applicability of this material is demonstrated in mice by the time-controlled release of the vaccine from the body finally resulting in successful immunoprotection. The cover image is courtesy of Olaf Baldini.

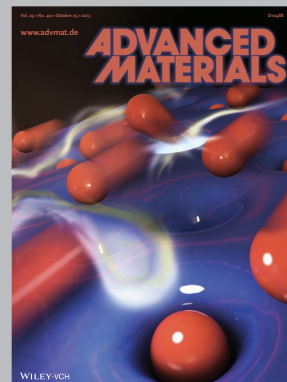
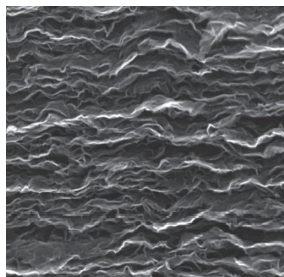


Drug Delivery

X. Qu and colleagues report a noninvasive, remote-controlled, drug-delivery system based on gold nanocages. This system, outlined on page 5412, realizes a dual-responsive enhanced metal-ion chelator release for Alzheimer's disease therapy. Through remote control with near infrared light, the new design allows spatial/temporal controlled release of the cargo molecules for higher therapeutic efficacy.

Flexible Electronics

A self-standing and flexible $\text{Li}_4\text{Ti}_5\text{O}_{12}$ electrode is assembled by F. Li, H.-M. Cheng, and co-workers via a vacuum filtration process. Normally, such materials need to be mixed with a binder and carbon black and pressed onto metal substrates, or deposited onto a conductive substrate, making lower-energy density batteries that are less flexible. On page 5429, the $\text{Li}_4\text{Ti}_5\text{O}_{12}$ nanosheets are simply coated with N-doped carbon, which is a simple and scalable process. This flexible electrode shows an excellent rate capability, a significantly improved cycling performance, and long life.



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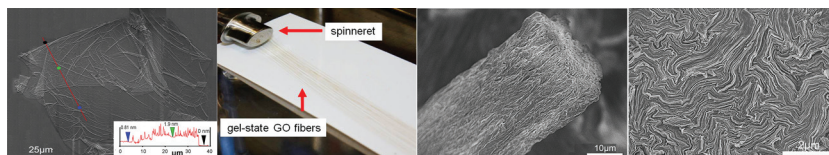
FULL PAPERS

Graphene Oxide

R. Jalili, S. H. Aboutalebi,
D. Esrafilzadeh, R. L. Shepherd,
J. Chen, S. Aminorroaya-Yamini,
K. Konstantinov, A. I. Minett,
J. M. Razal,* G. G. Wallace* ...5345–5354

Scalable One-Step Wet-Spinning of Graphene Fibers and Yarns from Liquid Crystalline Dispersions of Graphene Oxide: Towards Multifunctional Textiles

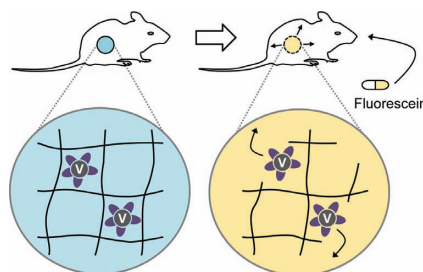
New insights are provided into the processing of liquid crystalline graphene oxide (GO) dispersion (containing large GO sheets) demonstrating a facile and scalable production of GO and reduced GO fibers and yarns with exciting properties such as high thermal conductivity. These results provide a universal platform for the development of solution-based processing methods, properties, and applications of liquid crystalline GO-based architectures.



Hydrogels

R. J. Gübeli, D. Hövermann, H. Seitz,
B. Rebmann, R. G. Schoenmakers,
M. Ehrbar, G. Charpin-El Hamri,
M. Daoud-El Baba, M. Werner,
M. Müller, W. Weber*5355–5362

Remote-Controlled Hydrogel Depots for Time-Scheduled Vaccination

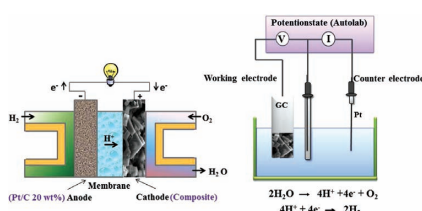


A pharmacologically controlled hydrogel depot is presented allowing for the scheduled induction of a medical response in vivo. The vaccine-loaded hydrogel depot is administered to mice. At the desired point in time, the vaccine can be released from the depot by the oral administration of the stimulus molecule fluorescein resulting in protective immunization.

Graphene Oxide

M. Jahan, Z. Liu, K. P. Loh* ... 5363–5372

A Graphene Oxide and Copper-Centered Metal Organic Framework Composite as a Tri-Functional Catalyst for HER, OER, and ORR

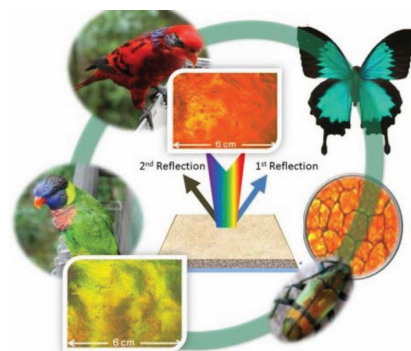


A graphene oxide and copper-centered metal organic framework composite shows good performance as a tri-functional catalyst for the hydrogen evolution reaction (HER), oxygen evolution reaction (OER), and oxygen reduction reaction (ORR).

Photonic Crystals

Y. Y. Diao, X. Y. Liu,* G. W. Toh, L. Shi,
J. Zi5373–5380

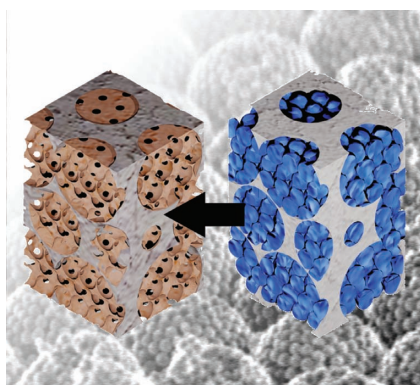
Multiple Structural Coloring of Silk-Fibroin Photonic Crystals and Humidity-Responsive Color Sensing



Structural coloration has attracted considerable attention in a variety of research areas. By exploring effective methods to mimic the unique properties of natural structural color, i.e., bistructural color reflection and responsive properties, the applications of structural color are expanded. A biomaterial (silk) is used to mimic structural color and can be adopted in the eco-dyeing industry.

FULL PAPERS

A versatile colloidal templating strategy to fabricate hierarchically structured inverse opals is investigated. Using sequential infiltration and pyrolysis steps allow to combine a range of materials such as SiO_2 , Al_2O_3 , or TiO_2 . The experimental results also document the feasibility of this method to access porous polymer films with a double periodic pore lattice.

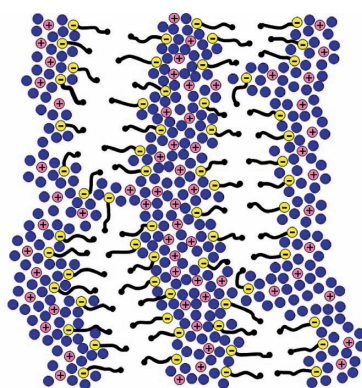


Hybrid Materials

M. Retsch,* U. Jonas*5381–5389

Hierarchically Structured, Double-Periodic Inverse Composite Opals

This revision of the nano-morphology of hydrated Nafion demonstrates that the recently published “parallel cylinder model” is most likely biased by a large uncertainty of the experimentally determined water content. The more extended data base presented here is consistent with locally flat and narrow water domains as illustrated in the cartoon. This structural motif is suggested to be a common feature of most ionomers and polyelectrolytes.

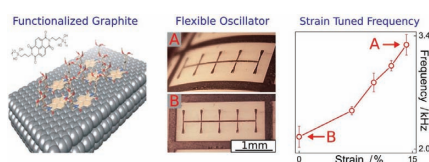


Ionomers

K.-D. Kreuer,*
G. Portale5390–5397

A Critical Revision of the Nano-Morphology of Proton Conducting Ionomers and Polyelectrolytes for Fuel Cell Applications

A flexible yet electronically active composite that mimics mechanoreceptor neurons in the human skin is synthesized, generating voltage oscillations whose frequency increases with pressure. By encoding pressure into frequency, the sensor achieves a high pressure sensitivity (<10 Pa). The ability to sense pressure and to amplify signals arises from the robust negative differential resistance of functionalized graphitic flakes in silicone.

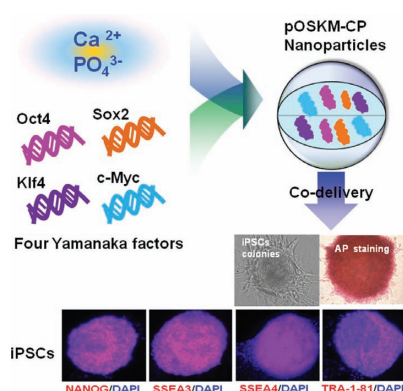


Flexible Electronics

S. Littlejohn, A. Nogaret,* G. M. Prentice,
G. D. Santos5398–5402

Pressure Sensing and Electronic Amplification with Functionalized Graphite–Silicone Composite

Calcium phosphate nanoparticles are used as the nonviral vector for the generation of virus-free iPSCs from human umbilical cord mesenchymal stem cells (HUMSCs) via co-delivery of the four Yamanaka factors (Oct4, Sox2, Klf4, and c-Myc). The embryonic stem cell-like iPSCs are competent to express pluripotent markers and differentiate into three germ layers both in vitro and in vivo.



Stem Cells

X. Cao, W. Deng, R. Qu, Q. Yu,
J. Li, Y. Yang, Y. Cao, X. Gao, X. Xu,*
J. Yu*5403–5411

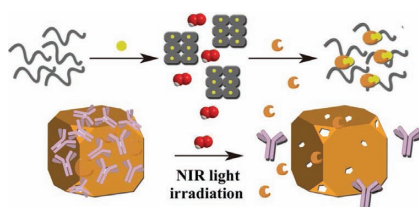
Non-Viral Co-Delivery of the Four Yamanaka Factors for Generation of Human Induced Pluripotent Stem Cells via Calcium Phosphate Nanocomposite Particles

FULL PAPERS

Drug Delivery

P. Shi, M. Li, J. Ren, X. Qu* ...5412–5419

Gold Nanocage-Based Dual Responsive “Caged Metal Chelator” Release System: Noninvasive Remote Control with Near Infrared for Potential Treatment of Alzheimer’s Disease

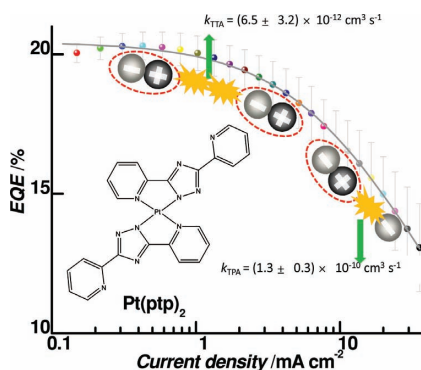


A noninvasive remote controlled drug delivery system based on gold nanocage to realize the dual-responsive enhanced metal-ion chelator release for Alzheimer’s disease therapy is reported. Through remote control with near IR light, the new design allows spatial/temporal controlled release of the cargo molecules for higher therapeutic efficacy.

Organic Light-Emitting Diodes

Q. Wang, I. W. H. Oswald, M. R. Perez, H. Jia, B. E. Gnade,*
M. A. Omary*5420–5428

Exciton and Polaron Quenching in Doping-Free Phosphorescent Organic Light-Emitting Diodes from a Pt(II)-Based Fast Phosphor

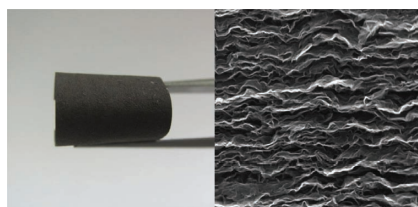


A Pt(II)-based doping-free phosphorescent organic light-emitting diode with an external quantum efficiency of 20.3% and power efficiency of 63.0 lm W⁻¹ is demonstrated. The device efficiency roll-off at high current densities is assessed quantitatively by deriving the triplet-triplet annihilation and triplet-polaron quenching rate constants. The contributions from loss of charge balance and field-induced exciton dissociation are essentially excluded in this device.

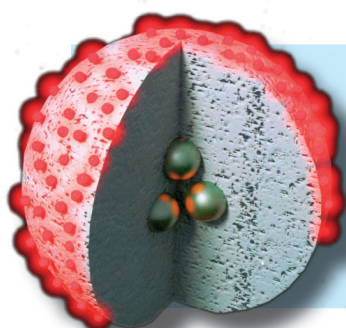
Flexible Electronics

N. Li, G. Zhou, F. Li,* L. Wen,
H.-M. Cheng*5429–5435

A Self-Standing and Flexible Electrode of Li₄Ti₅O₁₂ Nanosheets with a N-Doped Carbon Coating for High Rate Lithium Ion Batteries



A self-standing and flexible Li₄Ti₅O₁₂ electrode is assembled via a vacuum filtration process of Li₄Ti₅O₁₂ nanosheets with N-doped carbon coating. This flexible electrode shows an excellent rate capability and a significantly improved cycling performance.



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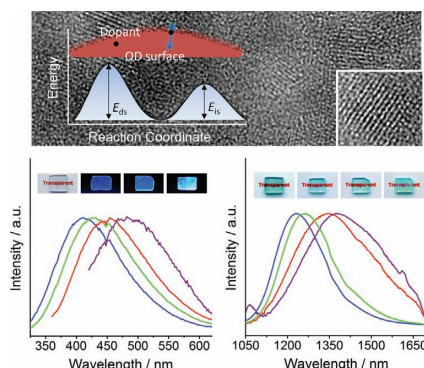
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FULL PAPERS

An in situ approach to activate semiconductor nanocrystals (SNCs) mediated by self-limited nanocrystallization of the glassy phase is proposed. The protocol is highly effective for intentionally introducing various cation/anion dopants or their combinations into Ga_2O_3 SNCs. It offers the possibility of precisely manipulating the photon emission of SNCs to cover the ultraviolet, visible and even near-infrared spectral ranges by simply tuning inert co-dopants.

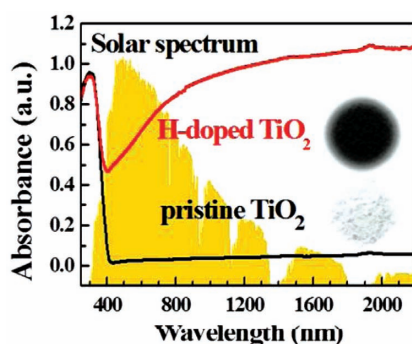


Optically Active Materials

S. F. Zhou, C. Y. Li, G. Yang, G. Bi,
B. B. Xu, Z. L. Hong, K. Miura,
K. Hirao, J. R. Qiu*5436–5443

Self-Limited Nanocrystallization-Mediated Activation of Semiconductor Nanocrystal in an Amorphous Solid

H-doped black titania with a crystalline core/amorphous shell structure ($\text{TiO}_2@ \text{TiO}_{2-x}\text{H}_x$) is synthesized by hydrogen plasma. Solar absorption is enhanced due to localized surface plasmon resonance. H doping reduces oxygen vacancies and eliminates the recombination of light-excited electrons and holes. These behaviors enable the black titania to be excellent for water splitting.



Photocatalysts

Z. Wang, C. Yang, T. Lin, H. Yin,
P. Chen, D. Wan, F. Xu,* F. Huang,*
J. Lin, X. Xie, M. Jiang5444–5450

H-Doped Black Titania with Very High Solar Absorption and Excellent Photocatalysis Enhanced by Localized Surface Plasmon Resonance