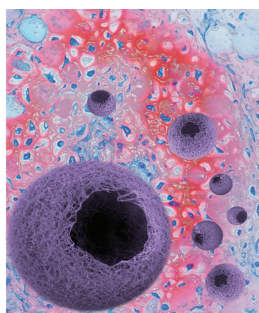


ADVANCED FUNCTIONAL MATERIALS

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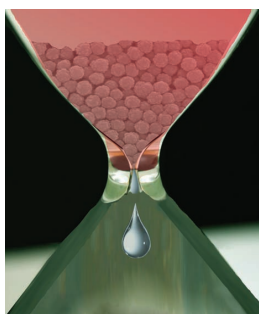


Stem Cells

P. X. Ma and colleagues report the novel functional nanofibrous hollow microspheres (FNF-HMS) for tissue regeneration on page 350. Peptide decorated FNF-HMS are shown to directly guide stem cells to form cartilage and bone, respectively, circumventing the use of the expensive and unstable growth factors. FNF-HMS can therefore serve as an advanced injectable carrier platform for various therapeutic applications.

Organic Electronics

Coffee and milk creates rich flavor benefited from both ingredients. The same thing happens in the exciplex system which has great potential to realize highly efficient OLED by forming an exciplex between two different molecules. K.-T. Wong, J.-J. Kim, and co-workers demonstrate on page 361 a novel exciplex forming co-host system composed of *N,N'*-dicarbazolyl-3,5-benzene (mCP) and PO-T2T, resulting in an unprecedented high performance blue phosphorescent OLED.

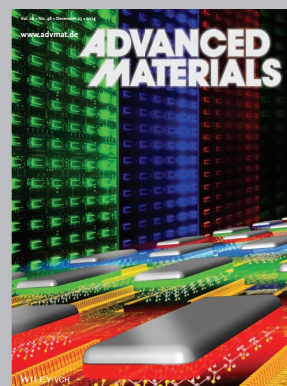
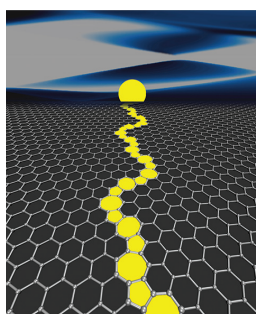


Semiconductors

Zero-dimensional ZnS/CdS nanocomposites (NCs) are designed based on the controlled growth of ZnS nanoparticles by X. S. Fang and team on page 445. The as-obtained NCs are functionally versatile and offer great optoelectronic properties. For example, the photo-degradation rate of ZnS/CdS NCs towards organic dyes under UV light is three times as much as that of pure ZnS nanoparticles, due to the effective charge separation and increased specific surface area.

Graphene

A simulated grain boundary stitching two graphene domains tilted at a 28° angle exhibits a well-defined sinuous shape, which is revealed to be energetically preferred. Such sinuous grain boundary, appeared to be a curved river on land, are highlighted by B. I. Yakobson and co-workers on page 367 as a new channel to explore novel electronic behavior in graphene and to reach the as yet unexplored flatlands of two-dimensional materials.



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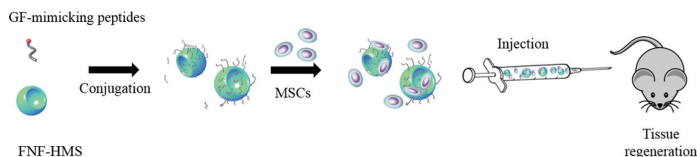
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FULL PAPERS

Functional nano-fibrous hollow microspheres (FNF-HMS) are developed to deliver growth factor mimics to stem cells with enhanced efficacy. When a TGF- β 1 mimicking peptide is conjugated, FNF-HMS can serve as injectable stem cell carriers and induce chondrogenesis and cartilage formation. FNF-HMS can also deliver BMP-2 mimicking peptide to induce stem cell osteogenesis and bone formation.

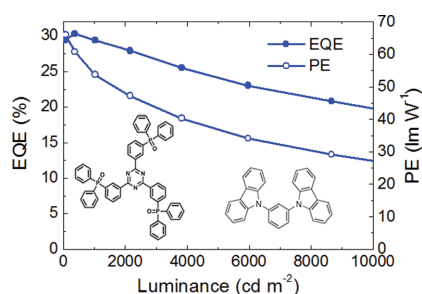


Stem Cells

Z. Zhang, M. J. Gupte, X. Jin,
P. X. Ma* 350–360

Injectable Peptide Decorated Functional Nanofibrous Hollow Microspheres to Direct Stem Cell Differentiation and Tissue Regeneration

A novel exciplex forming host, composed of mCP and PO-T2T, is realized. Using the host and efficient energy transfer to Flrpic, unprecedented high performance blue phosphorescent OLED is demonstrated, showing a maximum EQE of 30.3%, power efficiency of 66 lm W⁻¹, and extremely low operating voltages of 2.75 at 100 cd m⁻², and 4.65 V at 10 000 cd m⁻².

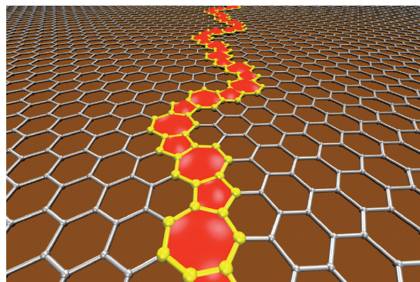


Organic Electronics

J.-H. Lee, S.-H. Cheng, S.-J. Yoo, H. Shin,
J.-H. Chang, C.-I. Wu, K.-T. Wong,*
J.-J. Kim* 361–366

An Exciplex Forming Host for Highly Efficient Blue Organic Light Emitting Diodes with Low Driving Voltage

Grain boundaries are intrinsic to polycrystalline graphene and often exhibit diversely sinuous structures. Here, it is revealed that the sinuous grain boundaries are energetically preferred over the straight forms when the grain division is asymmetric, and their well-defined configurations agree well with experimental observations. Importantly, such grain boundaries show improved strength as well as uniformly semiconducting electronic transport behavior.

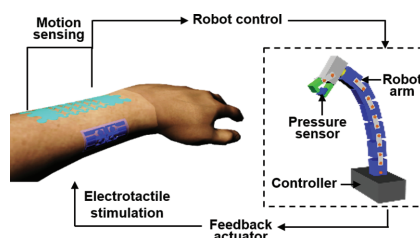


Graphene

Z. Zhang, Y. Yang, F. Xu, L. Wang,
B. I. Yakobson* 367–373

Unraveling the Sinuous Grain Boundaries in Graphene

A transparent and stretchable interactive human machine interface (iHMI) based on patterned graphene (GP) heterostructures is developed. The conductive/piezoelectric GP heterostructures enable the iHMI to have high transparency, excellent performance, low power consumption, and superb mechanical deformability. The control of a robot arm for various motions and feedback stimulation upon successful executions of commands are demonstrated using the wearable iHMI system.



Wearable Electronics

S. Lim, D. Son, J. Kim, Y. B. Lee,
J.-K. Song, S. Choi, D. J. Lee,
J. H. Kim, M. Lee, T. Hyeon,
D.-H. Kim* 375–383

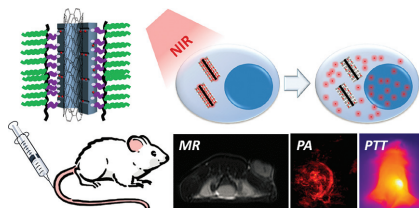
Transparent and Stretchable Interactive Human Machine Interface Based on Patterned Graphene Heterostructures

FULL PAPERS

Cancer Treatment

J. J. Liu, C. Wang, X. J. Wang, X. Wang,
L. Cheng, Y. G. Li, Z. Liu* 384–392

Mesoporous Silica Coated Single-Walled Carbon Nanotubes as a Multifunctional Light-Responsive Platform for Cancer Combination Therapy

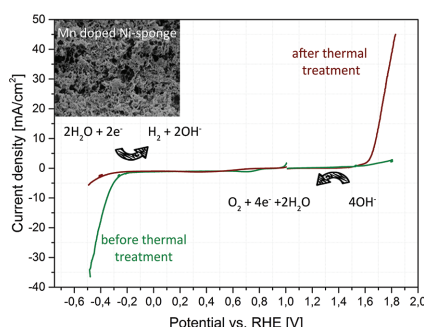


Mesoporous silica coated single-wall carbon nanotubes with polyethylene glycol functionalization and anti-cancer drug loading are developed as a multifunctional theranostic platform. Upon systemic administration of such nano-agent, combined photothermal and chemotherapy, which is under the guidance of multimodal magnetic resonance and photoacoustic imaging, is conducted on an animal tumor model, achieving a great synergistic therapeutic effect.

Water Splitting

M. Ledendecker, G. Clavel,
M. Antonietti, M. Shalom* 393–399

Highly Porous Materials as Tunable Electrocatalysts for the Hydrogen and Oxygen Evolution Reaction

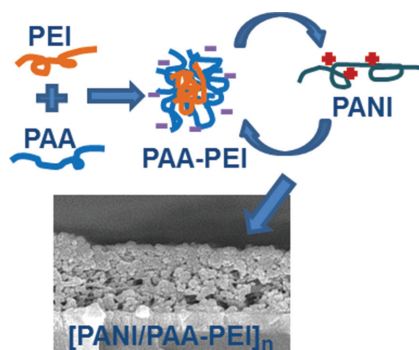


A facile synthesis of highly porous manganese doped sponge-like nickel materials embedded in a carbon and nitrogen matrix is presented. The new materials demonstrate high electrocatalytic activity towards the water splitting reaction both in the hydrogen and oxygen evolution reaction. The use of these materials for both reactions results in a 70% voltage efficiency in the overall water splitting reaction.

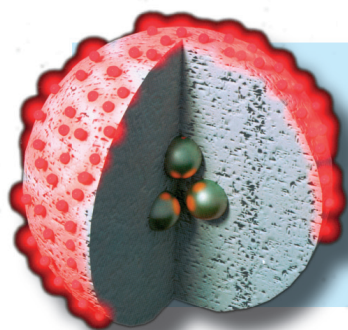
Electrochromic Materials

M. Cui, W. S. Ng, X. Wang,
P. Darmawan, P. S. Lee* 401–408

Enhanced Electrochromism with Rapid Growth Layer-by-Layer Assembly of Polyelectrolyte Complexes



A fast growing film is fabricated via layer-by-layer (LbL) deposition by using polyelectrolyte complexes PAA-PEI and PANI as building blocks. The film exhibits porous structure and enhanced electrochromism compared to PAA/PANI films under the same condition. The use of polyelectrolyte complexes is demonstrated to be beneficial for high performance electrochemically active LbL films.



How to contact us:

Editorial Office:

Phone: (+49) 6201-606-286/531
Fax: (+49) 6201-606-500
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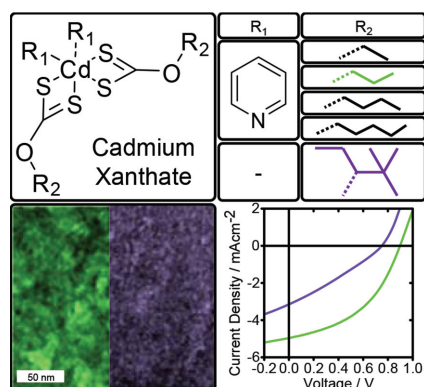
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FULL PAPERS

Molecular tuning of metal xanthate precursors is shown to be a valuable tool to optimize absorber layer morphologies in ligand-free prepared polymer/nanoparticle hybrid solar cells. Additionally to investigating the formation of the different nanomorphologies, their influences on optoelectronic properties are studied by transient absorption spectroscopy and a remarkable effect on device performance is revealed.

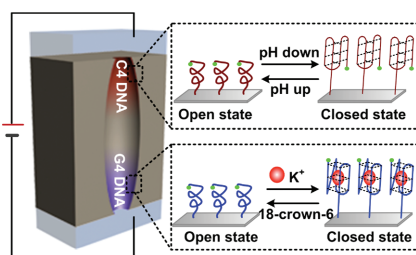


Solar Cells

A. J. MacLachlan, T. Rath,* U. B. Cappel, S. A. Dowland, H. Amenitsch, A.-C. Knall, C. Buchmaier, G. Trimmel, J. Nelson, S. A. Haque*409–420

Polymer/Nanocrystal Hybrid Solar Cells: Influence of Molecular Precursor Design on Film Nanomorphology, Charge Generation and Device Performance

A dual-responsive double-gated nano-channel: A bio-inspired potassium and pH responsive double-gated nano-system is developed by immobilizing C-quadruplex and G-quadruplex DNA molecules onto the top and bottom tip side of a cigar-shaped nanochannel, respectively. This system, as the first example, may open up a new way to build diverse functional double-gated nanochannel with dual-response to meet the real-world application.

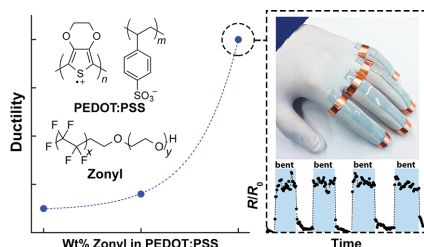


Nanosystems

M. Liu, H. Zhang, K. Li, L. Heng, S. Wang, Y. Tian,* L. Jiang*421–426

A Bio-inspired Potassium and pH Responsive Double-gated Nanochannel

This study describes the effects of **common additives on the mechanical properties** (stiffness and ductility) of the transparent conductive polymer, PEDOT:PSS. In particular, 10% Zonyl fluorosurfactant decreases the tensile modulus by a factor of 100. Plasticized films are used for wearable sensors of human motion and have the potential to increase the mechanical robustness of organic solar cells.

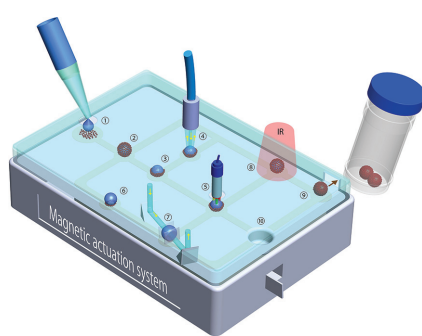


Stretchable Electronics

S. Savagatrup, E. Chan, S. M. Renteria-Garcia, A. D. Printz, A. V. Zaretski, T. F. O'Connor, D. Rodriguez, E. Valle, D. J. Lipomi*427–436

Plasticization of PEDOT:PSS by Common Additives for Mechanically Robust Organic Solar Cells and Wearable Sensors

“On-line” quantitative detection of liquid ingredients and biological assays is demonstrated in magnetic liquid marbles using electrochemical and optical approaches. The particle shell of magnetic liquid marbles can be hardened to preserve the samples/reagents when a low melting-point material is present in the powder shell. These novel features, with the actuation and microreactor characteristics, make magnetic liquid marbles a promising candidate for “lab in a droplet”.



Microfluidics

Y. Zhao, Z. Xu, H. Niu, X. Wang, T. Lin*437–444

Magnetic Liquid Marbles: Toward “Lab in a Droplet”

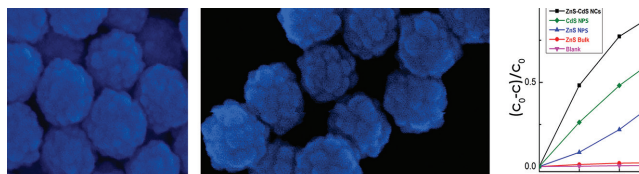
FULL PAPERS

Semiconductors

X. J. Xu, L. F. Hu, N. Gao, S. X. Liu,
S. Wageh, A. A. Al-Ghamdi, A. Alshahrie,
X. S. Fang* 445–454

Controlled Growth from ZnS Nanoparticles to ZnS–CdS Nanoparticle Hybrids with Enhanced Photoactivity

Chalcogenide nanostructure has attracted world-wide attention due to the great potential of applications in photocatalysis and optoelectronics. Well-defined heterostructures, which often exhibit superior properties, are of extreme importance. In this paper, a facile method to synthesize monodisperse ZnS nanoparticles (NPs) and ZnS–CdS nanocomposites (NCs) is proposed. The ZnS–CdS heterostructure not only shows obvious advantage in photoactivities, but also offers exciting opportunities for the development of new dual-semiconductor nanostructures.

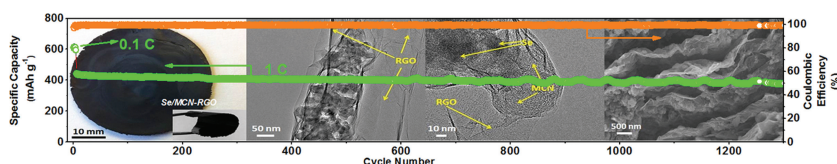


Batteries

K. Han,* Z. Liu, J. Shen, Y. Lin,
F. Dai,* H. Ye 455–463

A Free-Standing and Ultralong-Life Lithium-Selenium Battery Cathode Enabled by 3D Mesoporous Carbon/Graphene Hierarchical Architecture

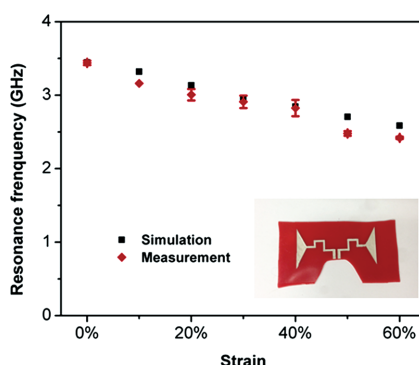
Free-standing selenium cathode for lithium-selenium batteries are developed by embedding selenium-impregnated mesoporous carbon nanoparticles in graphene sheets (Se/MCN-RGO). The 3D hierarchical architecture provides excellent electrical and ionic conductivity, and also suppresses polyselenides shuttling and accommodates volume change. The Se/MCN-RGO exhibits ultra-long cycle life with capacity retention of 89% after 1300 cycles at 1 C.



Stretchable Electronics

Z. Li, T. Le, Z. Wu, Y. Yao, L. Li,
M. Tentzeris, K.-S. Moon,*
C. P. Wong* 464–470

Rational Design of a Printable, Highly Conductive Silicone-based Electrically Conductive Adhesive for Stretchable Radio-Frequency Antennas

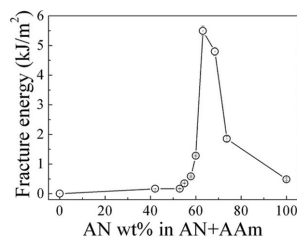


Silicone-based electrically conductive adhesives (silo-ECAs) with an electrical conductivity of $1.51 \times 10^4 \text{ S cm}^{-1}$ at static state and $1.11 \times 10^3 \text{ S cm}^{-1}$ at a large strain of 240% is developed. By using the stretchable silo-ECAs as the conductor and pure silicone elastomers as the substrate, stretchable antennas can be fabricated by stencil printing or soft-lithography.

Polymer Gels

Y. Zhang, Y. Li, W. Liu* 471–480

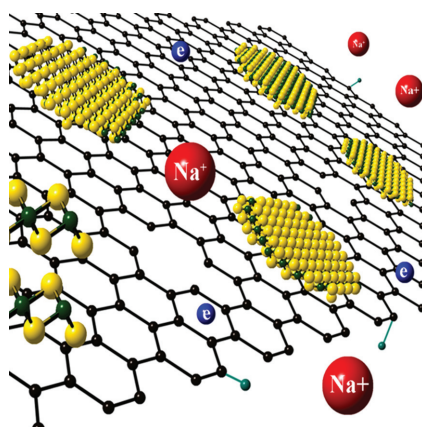
Dipole–Dipole and H-Bonding Interactions Significantly Enhance the Multifaceted Mechanical Properties of Thermoresponsive Shape Memory Hydrogels



Combining dipole–dipole and hydrogen bonding interactions in one single network enhances the tensile/compressive strengths and toughness of hydrogels significantly. The rapid destruction and reconstruction of dual physical interactions contribute to the reversible mechanical properties and thermoresponsive shape memory effect. This dipole–dipole and H-bonding reinforcement strategy offers a universal approach to design high performance hydrogels for practical load-bearing applications.

FULL PAPERS

A SnS_2/rGO hybrid with a plate-on-sheet architecture exhibits a high capacity, superior cycling stability and excellent rate capability. The hybrid delivers an initial capacity of 469 mAh g^{-1} at 800 mA g^{-1} and keeps at 61% after 1000 cycles. At 12.8 A g^{-1} (28 C), it still yields a charge capacity of 337 mAh g^{-1} .

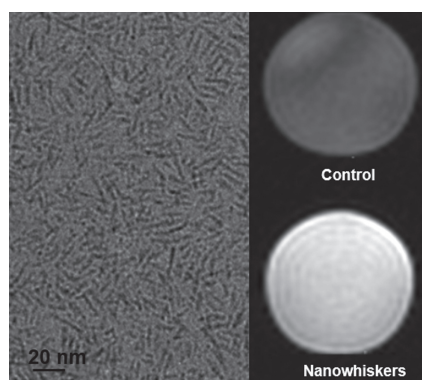


Energy Storage

Y. D. Zhang, P. Zhu, L. Huang,
J. Xie,* S. C. Zhang, G. S. Cao,
X. B. Zhao481–489

**Few-Layered SnS_2 on Few-Layered
Reduced Graphene Oxide as Na-Ion
Battery Anode with Ultralong Cycle Life
and Superior Rate Capability**

A new type of positive (T_1) contrast agent for magnetic resonance imaging (MRI) is reported based on ultrathin iron oxide nanowhiskers. The key innovation is to alter the magnetic properties of nanoparticles through shape control. The positive MRI contrast enhancement of these nanowhiskers is demonstrated using the T_1 -weighted image scans.



Imaging

T. Macher, J. Totenhagen, J. Sherwood,
Y. Qin, D. Gurler, M. S. Bolding,*
Y. Bao*490–494

**Ultrathin Iron Oxide Nanowhiskers as
Positive Contrast Agents for Magnetic
Resonance Imaging**