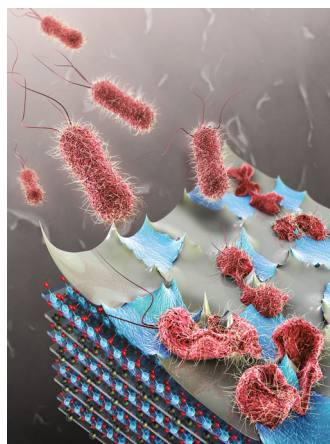


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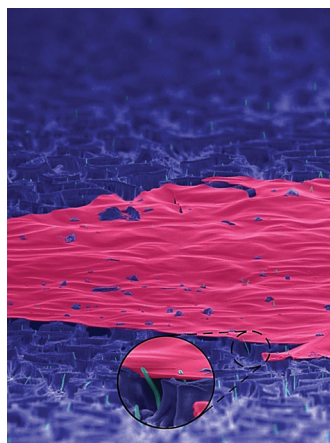


Hybrid Materials

S. Park, S.-J. Hwang, and co-workers report the fabrication of strongly coupled hybrid films of reduced graphene oxide-layered titanate with an unexpected high sterilization efficiency for *Escherichia coli*. On page 2288, *E. coli* cells exposed to the hybrid film are irreversibly destroyed by the edges of the nanosheets. The enhanced adhesion of bacteria on the rough surface of the hybrid films additionally contributes to their excellent antibacterial activity.

Drug Delivery

Sequential and site-specific co-delivery of two anticancer therapeutics in a programmed manner is demonstrated by J. Zhou, Z. Gu, and co-workers on page 2295. The delivery is triggered by the tumor microenvironment and cellular conditions. The gel-liposome based nanovehicle can transport and release an anticancer cytokine (TRAIL) and small-molecule drug (doxorubicin) to their distinct acting sites: the cellular membrane and nucleus, respectively.



Nanomembranes

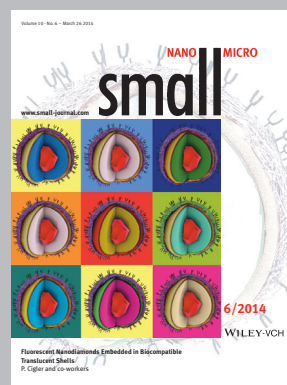
Through UV-assisted electroless chemical etching, single crystalline gallium nitride nanomembranes are exfoliated by B. S. Ooi and co-workers on page 2305, with the threading-dislocation cores selectively detached. This false-color scanning electron microscope image shows the nanomembrane lying on top of porous gallium nitride. The enlarged region reveals the gallium nitride nanowires (green), formed from threading-dislocation cores, protruding through the gallium nitride nanomembrane.



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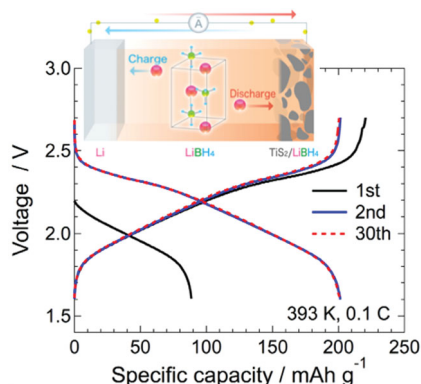
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FEATURE ARTICLE

Rechargeable Batteries

A. Unemoto, M. Matsuo,
S. Orimo* 2267–2279

Complex Hydrides for Electrochemical Energy Storage



Complex hydrides have energy conversion-related functions including fast Li-ionic conduction, typically in high-temperature phase of LiBH_4 . Bulk-type all-solid-state lithium rechargeable battery using LiBH_4 -based solid electrolytes allows noticeable charge–discharge cycles. In addition to the fast Li- and Na-ionic conductivities in the class of materials, future prospects on the next generation battery developments based on the complex hydrides are also summarized.

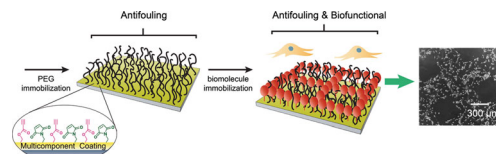
FULL PAPERS

Antifouling

M.-Y. Tsai, Y.-C. Chen, T.-J. Lin, Y.-C. Hsu,
C.-Y. Lin, R.-H. Yuan, J. Yu, M.-S. Teng,
M. Hirtz, M. H.-C. Chen, C.-H. Chang,*
H.-Y. Chen* 2281–2287

Vapor-Based Multicomponent Coatings for Antifouling and Biofunctional Synergic Modifications

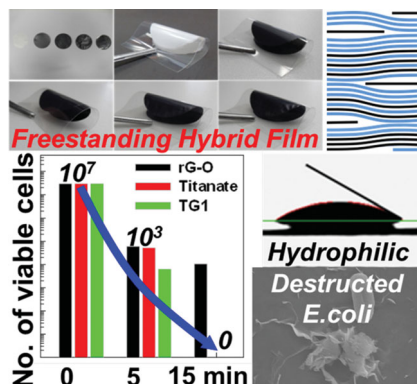
A multicomponent coating containing a distinct electron-deficient alkyne and unsaturated maleimide anchoring sites is synthesized using a straightforward process involving chemical vapor deposition copolymerization. The coating is utilized to design a biofunctionally active surface that resists fouling. The antifouling properties suppress protein adsorption and cell adhesion; the biofunctional surface precisely controls manipulated cell attachments synergically.



Hybrid Materials

I. Y. Kim, S. Park, H. Kim, S. Park,*
R. S. Ruoff, S.-J. Hwang* 2288–2294

Strongly-Coupled Freestanding Hybrid Films of Graphene and Layered Titanate Nanosheets: An Effective Way to Tailor the Physicochemical and Antibacterial Properties of Graphene Film

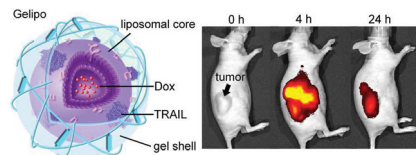


The strongly coupled freestanding hybrid films of graphene and layered metal oxide exhibit tunable physicochemical properties such as mechanical strength, chemical stability, surface roughness, and hydrophilicity. These hybrid films of graphene-oxide-layered titanate show complete sterilization of *E. coli* in 15 min, underscoring the beneficial effect of the layered metal oxide nanosheets in improving the functionality of graphene film.

Drug Delivery

T. Jiang, R. Mo, A. Bellotti, J. Zhou,*
Z. Gu* 2295–2304

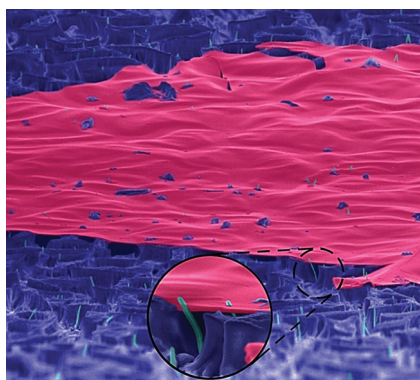
Gel-Liposome-Mediated Co-Delivery of Anticancer Membrane-Associated Proteins and Small-Molecule Drugs for Enhanced Therapeutic Efficacy



A core–shell based “nanodepot” consisting of a liposomal core and a crosslinked-gel shell (Gelipo) is developed for the sequential and site-specific delivery (SSSD) of dual anticancer therapeutics. The programmed Gelipo can release the protein and small-molecule drug successively and transport them to their distinct targets, the plasma membrane and the nucleus, for enhanced synergistic anticancer activity.

FULL PAPERS

Chemical exfoliation of gallium nitride nanomembranes that are completely threading dislocation-free, single-crystalline, ultrathin, and unstrained is demonstrated using UV-assisted electroless chemical etching. These novel nanomembranes, once transferred to other substrates, present a unique and technologically attractive path towards integrating high-efficiency gallium nitride optical components along with silicon electronics.

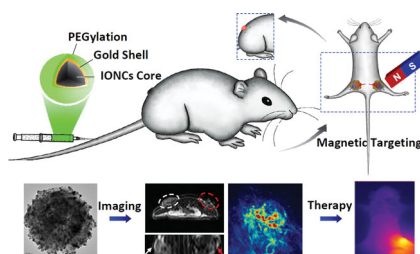


Nanomembranes

R. T. ElAfandy, M. A. Majid, T. K. Ng, L. Zhao, D. Cha, B. S. Ooi*2305–2311

Exfoliation of Threading Dislocation-Free, Single-Crystalline, Ultrathin Gallium Nitride Nanomembranes

A multifunctional magnetic-plasmonic nano-agent for magnetic resonance/photoacoustic multimodal imaging guided photothermal therapy of cancer is developed. Such a magnetic targeting-enhanced cancer theranostic strategy could potentially enable highly effective tumor ablation therapy, which could be carefully planned before treatment, precisely controlled during treatment, and with accurate prognosis after treatment.

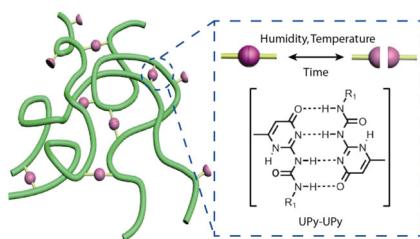


Cancer Theranostics

Z. W. Li, S. N. Yin, L. Cheng, K. Yang, Y. G. Li, Z. Liu* 2312–2321

Magnetic Targeting Enhanced Theranostic Strategy Based on Multimodal Imaging for Selective Ablation of Cancer

The surface properties and adhesion mechanism of a self-healing polymer containing a quadruple hydrogen bonding group called “2-ureido-4[1H]-pyrimidinone” (UPy) are investigated under different environmental conditions. The results provide new insights into the fundamental understanding of the adhesive mechanisms of multiple hydrogen-bonded polymers, and the development of novel self-healing and stimuli-responsive materials.

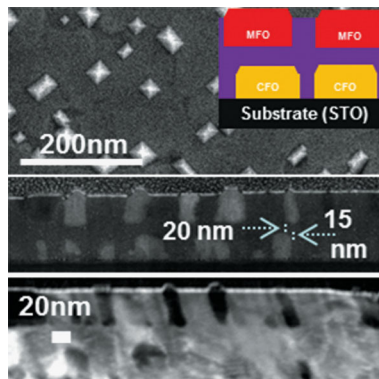


Self-Healing Polymers

A. Faghihnejad, K. E. Feldman, J. Yu, M. V. Tirrell, J. N. Israelachvili, C. J. Hawker, E. J. Kramer, H. Zeng*2322–2333

Adhesion and Surface Interactions of a Self-Healing Polymer with Multiple Hydrogen-Bonding Groups

Nanocomposites consisting of magnetic spinel pillars (CoFe_2O_4 , NiFe_2O_4 , or MgFe_2O_4) in a ferroelectric perovskite matrix (BiFeO_3) are made in which the pillars are deposited in layers, enabling an out-of-plane modulation in the pillar composition and tailoring of the magnetic properties.



Nanocomposite Films

D. H. Kim, N. M. Aimon, X. Sun, C. A. Ross* 2334–2342

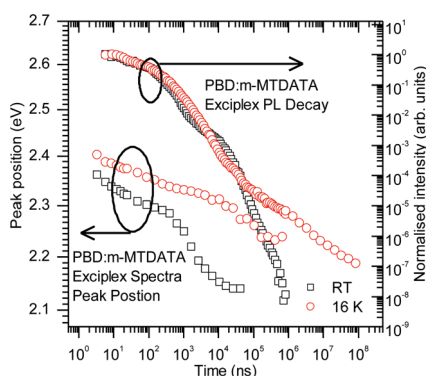
Compositionally Modulated Magnetic Epitaxial Spinel/Perovskite Nanocomposite Thin Films

FULL PAPERS

Organic LEDs

D. Graves, V. Jankus,* F. B. Dias,
A. Monkman 2343–2351

**Photophysical Investigation of the
Thermally Activated Delayed Emission
from Films of m-MTDATA:PBD Exciplex**

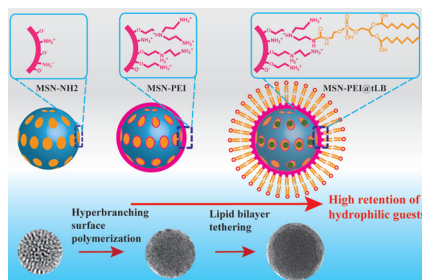


Extra singlet production via thermally activated delayed fluorescence in the exciplex formed between m-MTDATA and PBD is investigated. The exciplex singlet-triplet splitting is estimated to be very small at ≈ 5 meV, leading to a multiple cycling between the resonant singlet and triplet manifolds of exciplex before eventually being emitted from a singlet state.

Drug Delivery

J. Zhang, D. Desai,
J. M. Rosenholm* 2352–2360

**Tethered Lipid Bilayer Gates: Toward
Extended Retention of Hydrophilic Cargo
in Porous Nanocarriers**

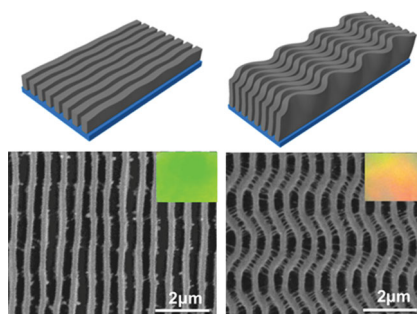


Gating ensured by cushioning: Hyperbranched polyethylenimine (PEI) on the surface of mesoporous silica nanoparticles is used, for the first time, to covalently tether defect-free phospholipid bilayers (LB), providing an unprecedented high retention of hydrophilic guest molecules. A surface charge conversion behavior is observed, opening the possibility of controlling their intracellular trafficking.

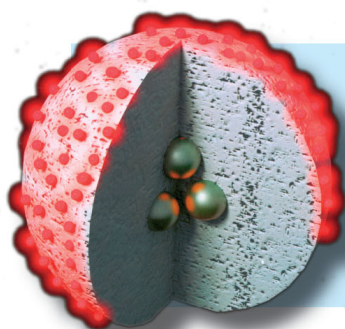
Nanowaves

J. Li, Y. Cho, I.-S. Choi,
S. Yang* 2361–2366

**Transforming One-Dimensional
Nanowalls to Long-Range Ordered Two-
Dimensional Nanowaves: Exploiting
Buckling Instability and Nanofibers
Effect in Holographic Lithography**



Two-dimensional nanowaves with long-range order are transformed from one-dimensional nanowalls by exploiting constraint swelling-induced buckling and effect of nanofibers formed between the nanowalls during holographic lithography. The degree of lateral undulation can be controlled by tuning the pattern aspect ratio and exposure dosage. The film with nanowaves show weaker reflecting color and lower transmittance compared to the straight nanowalls.



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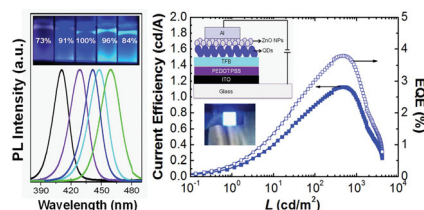
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FULL PAPERS

Violet-blue $\text{Zn}_x\text{Cd}_{1-x}\text{S}/\text{ZnS}$ core/shell quantum dots (QDs) with quantum yields near to 100% are successfully synthesized using a high temperature shell growth method. High bright and efficient deep-blue QD-LED show a maximum luminance up to 4100 cd m^{-2} , and peak external quantum efficiency of 3.8% which can be comparable with state-of-the-art OLED technology.

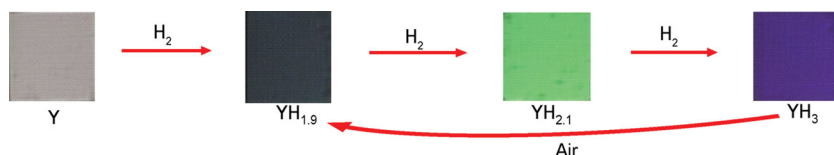


Inorganic Quantum Dots

H. Shen, X. Bai, A. Wang, H. Wang, L. Qian, Y. Yang, A. Titov, J. Hyvonen, Y. Zheng,* L. S. Li*2367–2373

High-Efficient Deep-Blue Light-Emitting Diodes by Using High Quality $\text{Zn}_x\text{Cd}_{1-x}\text{S}/\text{ZnS}$ Core/Shell Quantum Dots

Reversible change in the optical properties of Y thin film in the presence of H_2 is combined with interference effects to create a novel, low-cost, and highly sensitive H_2 detector which indicates the presence of H_2 merely by an eye-readable, reversible, and tunable color change. Its high selectivity in H_2O and O_2 makes it potentially suitable for biochemical/biomedical H_2 sensing applications.

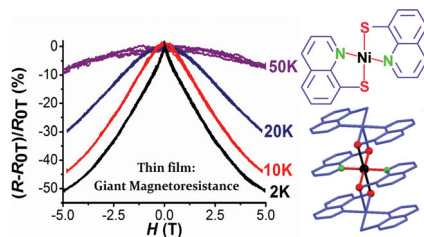


Optical Sensors

P. Ngene,* T. Radeva, M. Slaman, R. J. Westerwaal, H. Schreuders, B. Dam*2374–2382

Seeing Hydrogen in Colors: Low-Cost and Highly Sensitive Eye Readable Hydrogen Detectors

Devices based on paramagnetic $[\text{Ni}(\text{quinoline-8-thiolate})_2]$ show giant negative magnetoresistance above 50% at 2 K in single crystals and also in evaporated multicrystalline thin films, which is unique for a molecular material. A weaker effect is still observed at 200 K. The GMR is interpreted through a double exchange mechanism with the shape of the curve determined by the magnetic anisotropy.

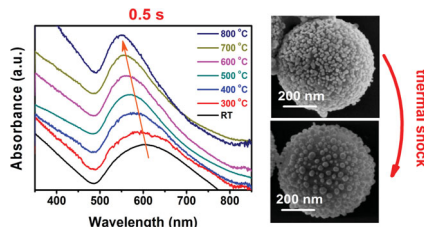


Organic Electronics

L. Pilia, M. Serri, M. M. Matsushita,* K. Awaga, S. Heutz,* N. Robertson*2383–2388

Giant Magnetoresistance in a Molecular Thin Film as an Intrinsic Property

A nanothermometer based on a silica-gold core-shell design enables temperature sensing from 300 to 800 °C with a sub-second response. The mechanism is based on the thermally induced morphological self-reorganization and characteristic surface plasmon (SP) absorption of the metal shell. The morphological self reorganization and variation of the SP absorption are irreversible, behaving as characteristic “fingerprints” for temperature recording permanently and allowing the retrieval of thermal history ex-situ.



Nanothermometers

H. T. Sun, X. Sun, M. P. Yu, A. K. Mishra, L. P. Huang, J. Lian*2389–2395

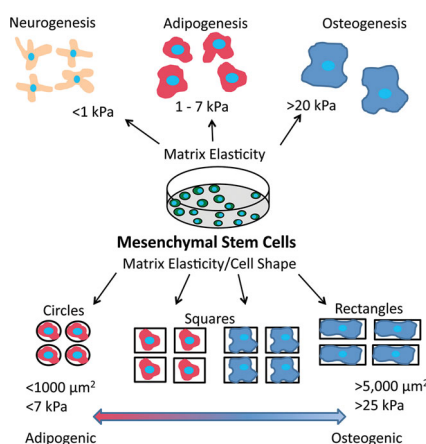
Silica-Gold Core-Shell Nanosphere for Ultrafast Dynamic Nanothermometer

FULL PAPERS

Stem Cells

G. M. Harris, M. E. Piroli,
E. Jabbarzadeh*2396–2403

Deconstructing the Effects of Matrix Elasticity and Geometry in Mesenchymal Stem Cell Lineage Commitment

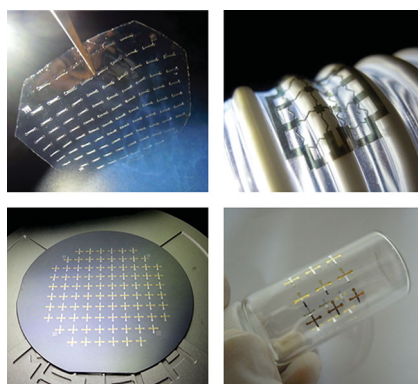


Micropatterned hydrogels capable of parsing the effects of matrix elasticity, cell shape, and cell size are used to explore the relationship between physical factors in mesenchymal stem cell lineage commitment. Cells on 1000 μm^2 circles, squares, and rectangles are primarily adipogenic lineage, while cells cultured on 2500 and 5000 μm^2 shapes heavily depend on shape and elasticity for lineage specification.

Flexible Electronics

J.-H. Kim, S. H. Hong, K.-d. Seong,
S. Seo*2404–2408

Fabrication of Organic Thin-Film Transistors on Three-Dimensional Substrates Using Free-Standing Polymeric Masks Based on Soft Lithography



A novel fabrication technique for integrated organic devices on complex-structured substrates using free-standing polymeric masks with flexibility and adhesive properties is presented. The free-standing polymeric masks are easily patterned and applicable for various film-deposition methods. Thus, the free-standing polymeric masks facilitate the fabrication of devices integrated on complex-structured substrates, and show promise as an easy process for large-area electronics.