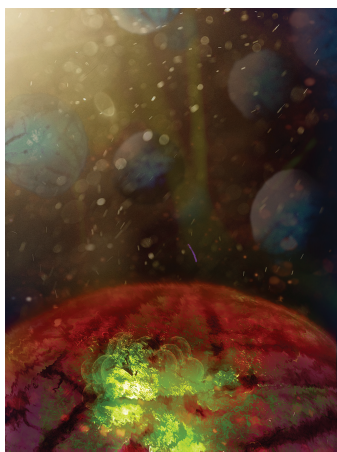


ADVANCED FUNCTIONAL MATERIALS

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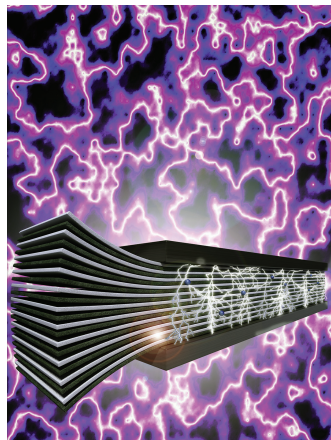
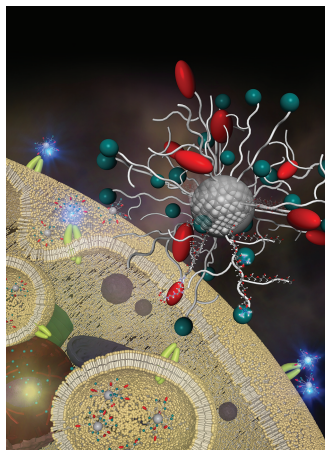


Synthetic Biology

Elastin-like polypeptides can be expressed in eukaryotic cells in fusion with functional proteins. When heated, they assemble organelle-sized microdomains that sequester target complexes. On page 5340, J. A. MacKay and team demonstrate that, by fusion to clathrin-light chain, these microdomains co-localize and sequester clathrin heavy chain, which is necessary for clathrin-mediated endocytosis. Assembly rapidly and reversibly blocks internalization of G-protein coupled receptors. Image created by Isaac Mora.

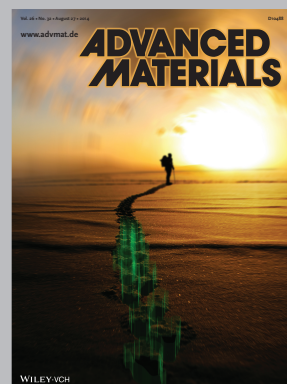
Targeted Chemotherapy

On page 5348, N. Komatsu, X. Chen, and colleagues demonstrate multifunctional anti-cancer prodrug consisting of nanodiamond core, polyglycerol coating, targeting peptide and platinum-based drugs. The resulting good aqueous solubility, stealth nature, and targeting property enable the nanodiamond-based prodrug to be taken up selectively by cancer cells overexpressing $\alpha\beta3$ integrin and to cause the selective cell death through acid-responsive drug release.



Conductivity

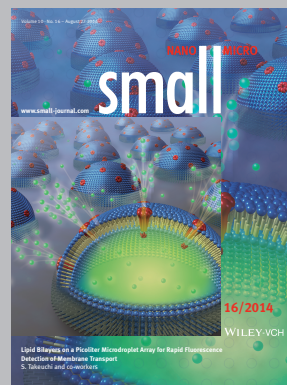
A multilayer stack of P-type/N-type organic semiconductors is demonstrated by T. W. Ng, C.-S. Lee, and co-workers to have an electrical conductivity three orders of magnitude higher than that of the corresponding bilayer of the same total thickness. On page 5375, the unusually high conductivity is attributed to surface states generated at interfaces between the two organic materials.



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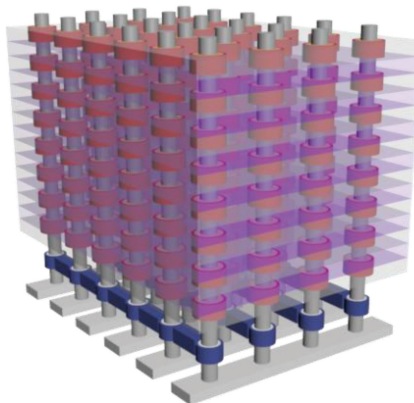
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FEATURE ARTICLE

Memory Devices

J. Y. Seok, S. J. Song, J. H. Yoon,
K. J. Yoon, T. H. Park, D. E. Kwon,
H. Lim, G. H. Kim, D. S. Jeong,
C. S. Hwang* 5316–5339

A Review of Three-Dimensional Resistive Switching Cross-Bar Array Memories from the Integration and Materials Property Points of View



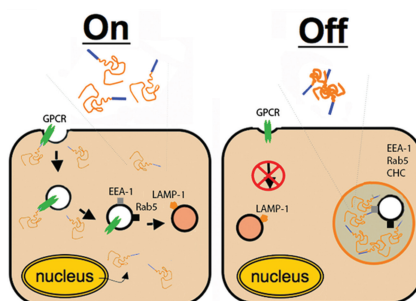
Three-dimensional resistive switching cross-bar array memories are highly desirable future memory devices for data centric computation. Issues in the circuitry, integration, and material properties of the two- and three-dimensional crossbar array memories are dealt with in a quantitative manner. The impressive progress in theoretical understanding and fabrication of these devices achieved during the past decade is summarized, and an outlook on possible applications is further provided.

FULL PAPERS

Synthetic Biology

M. K. Pastuszka, C. T. Okamoto,
S. F. Hamm-Alvarez,
J. A. MacKay* 5340–5347

Flipping the Switch on Clathrin-Mediated Endocytosis using Thermally Responsive Protein Microdomains

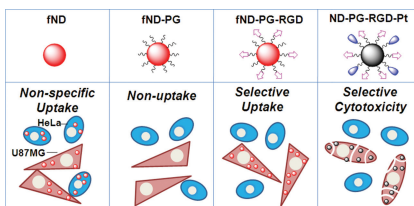


A rapid, reversible approach for the selective knock-down of clathrin-mediated internalization is developed by attaching a thermally responsive elastin-like polypeptide to clathrin light-chain, a known marker of receptor mediated endocytosis. The resulting system is active when the ELP is soluble. When raised above the ELP's transition temperature, the ELPs assemble microdomains that sequester the machinery of clathrin-mediated endocytosis and specifically inhibit receptor internalization.

Targeted Chemotherapy

L. Zhao, Y.-H. Xu, H. Qin, S. Abe,
T. Akasaka, T. Chano, F. Watari,
T. Kimura, N. Komatsu,*
X. Chen* 5348–5357

Platinum on Nanodiamond: A Promising Prodrug Conjugated with Stealth Polyglycerol, Targeting Peptide and Acid-Responsive Antitumor Drug

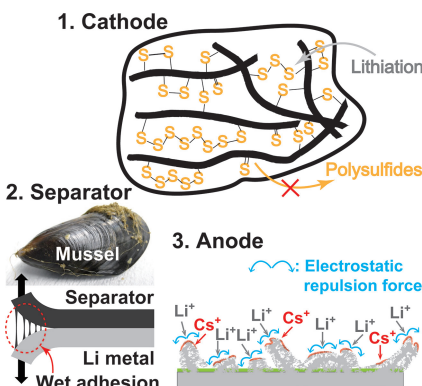


A platinum-based prodrug with a nanodiamond backbone is prepared through multi-step organic transformations. It has good solubility in a physiological environment, a stealth nature to avoid nonspecific cellular uptake, a targeting property to be taken up by a specific cell, and an acid-responsive drug release property to kill cancer cells. In in vitro cell experiments, U87MG cells are selectively killed against HeLa cells.

Areal Energy Density

J.-S. Kim, T. H. Hwang, B. G. Kim,
J. Min, J. W. Choi* 5359–5367

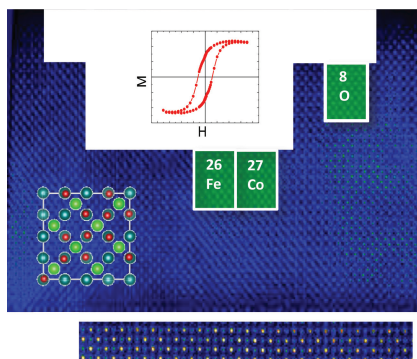
A Lithium-Sulfur Battery with a High Areal Energy Density



The highest areal energy density to date of a lithium-sulfur battery is demonstrated by the combined smart engineering of the key cell components (electrode, electrolyte, and separator). The integrated strategy suppresses both lithium polysulfide dissolution from the sulfur cathode and lithium dendrite growth from the lithium anode, leading to the highest areal capacity of 9 mAh cm⁻² while preserving stable cyclability.

FULL PAPERS

Stabilization with nanoscale control of the magnetic spinel ferrite Co_2FeO_4 phase is induced by heteroepitaxial growth at 250 °C using atomic layer deposition. This low cost and scalable thin film deposition technique opens a fascinating opportunity to develop and stabilize a large variety of materials with new properties without jeopardizing the system stability.

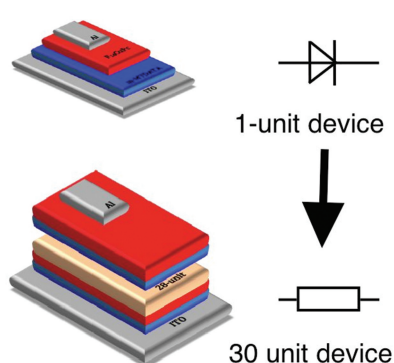


Spintronics

M. Coll,* J. M. Montero Moreno, J. Gazquez, K. Nielsch, X. Obradors, T. Puig.....5368–5374

Low Temperature Stabilization of Nanoscale Epitaxial Spinel Ferrite Thin Films by Atomic Layer Deposition

High conductivity in a thick organic multilayer stack (up to $4 \times 10^2 \text{ S cm}^{-1}$) is reported. It is shown that the high conductivity comes from the charge-transfer complex interface between m-MTDATA and F_{16}CuPc .

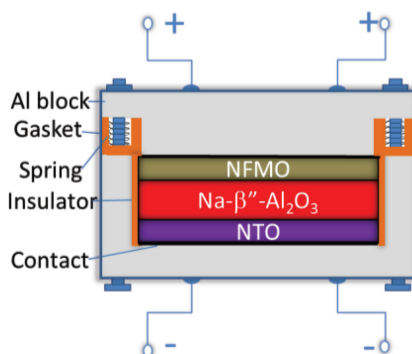


Conductivity

H.-W. Mo, M.-F. Lo, Q.-D. Yang, T.-W. Ng,* C.-S. Lee*5375–5379

Multi-Alternating Organic Semiconducting Films with High Electric Conductivity

A ceramic based solid state rechargeable Na^+ -battery is demonstrated with good reversible and stable capacity when operated at 250–350 °C, extremely low self-discharge rate, and excellent tolerance to thermal cycling.

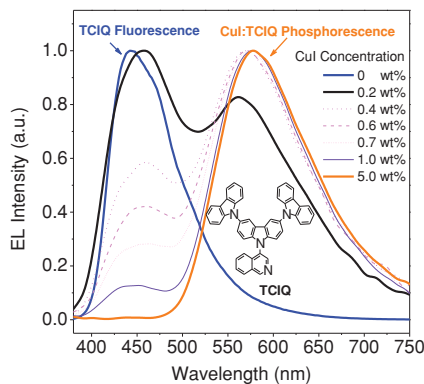


Rechargeable Batteries

T. Wei, Y. Gong, X. Zhao, K. Huang*5380–5384

An All-Ceramic Solid-State Rechargeable Na^+ -Battery Operated at Intermediate Temperatures

Four pyridyl or isoquinolyl containing compounds are designed and synthesized to co-deposition with copper iodide (CuI) in a vacuum chamber to form luminescent Cu(I) complex doped film, which could be utilized as the emissive layer in organic light-emitting diodes (OLEDs). Consequently, efficient and simplified tri-layered yellow and white OLEDs are achieved by varying the CuI doping concentrations.



Organic Electronics

X. C. Liu, T. Zhang, T. C. Ni, N. Jiang,* Z. W. Liu,* Z. Q. Bian,* Z. H. Lu, C. H. Huang.....5385–5392

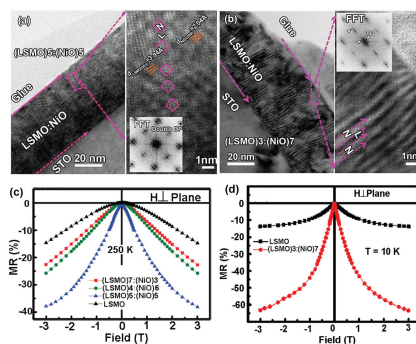
Co-deposited Cu(I) Complex for Tri-layered Yellow and White Organic Light-Emitting Diodes

FULL PAPERS

Magnetoresistance

X. K. Ning, Z. J. Wang,*
Z. D. Zhang 5393–5401

Large, Temperature-Tunable Low-Field Magnetoresistance in $\text{La}_{0.7}\text{Sr}_{0.3}\text{MnO}_3\text{:NiO}$ Nanocomposite Films Modulated by Microstructures

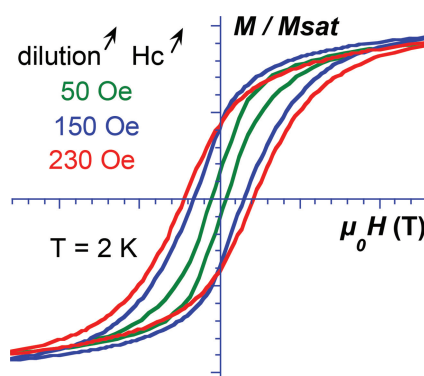


$(\text{LSMO})_5\text{:}(\text{NiO})_5$ nanocomposite films have a checkerboard-like structure and show a large LFMR in a temperature range from 200 to 300 K ($\approx 17\%$ at 250 K with a magnetic field of 1 T). By contrast, the $(\text{LSMO})_3\text{:}(\text{NiO})_7$ nanocomposite films have a nano-columnar structure with a large LFMR of 41% at 10 K and 1 T.

Magnetic Nanoparticles

Y. Prado,* S. Mazerat, E. Rivière,
G. Rogez, A. Gloter, O. Stéphan,
L. Catala,* T. Mallah* 5402–5411

Magnetization Reversal in $\text{CsNi}^{\text{II}}\text{Cr}^{\text{III}}(\text{CN})_6$ Coordination Nanoparticles: Unravelling Surface Anisotropy and Dipolar Interaction Effects

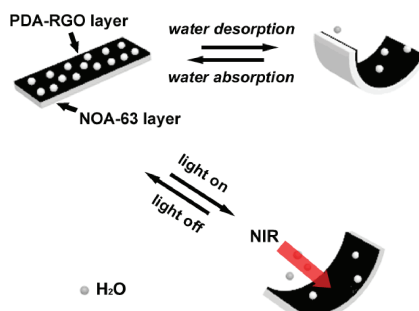


The interplay between dipolar interaction, surface anisotropy, and size control at the molecular level allows the fine tuning of the magnetic anisotropy, the energy barrier for the reorientation of the magnetization, and the blocking temperatures (4 to 22 K) of individual $\text{CsNiCr}(\text{CN})_6$ coordination nanoparticles. Upon dilution of the objects, the coercive field shifts from 50 to 230 Oe for 6 nm objects, highlighting the contribution of surface anisotropy.

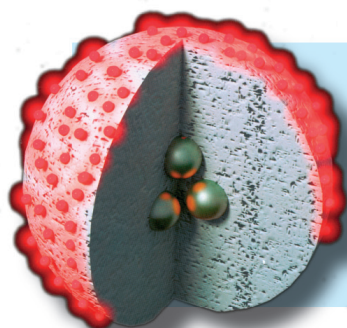
Actuators

M. Ji, N. Jiang, J. Chang,
J. Sun* 5412–5419

Near-Infrared Light-Driven, Highly Efficient Bilayer Actuators Based on Polydopamine-Modified Reduced Graphene Oxide



Near-infrared (NIR) light-driven bilayer actuators are fabricated by exploiting the photothermal conversion and humidity-sensitive properties of polydopamine-modified reduced graphene oxide. The bilayer actuator is capable of fast, highly efficient, and reversible bending/unbending motions toward periodic NIR light irradiation. The bilayer actuator is also utilized to build a NIR light-driven walking device capable of performing quick worm-like motion.



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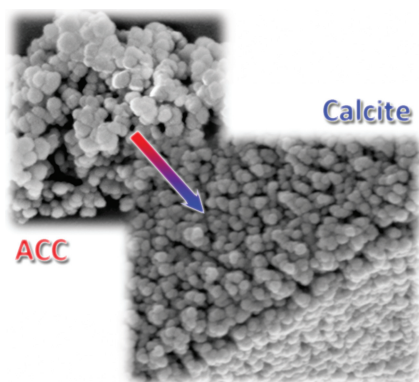
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FULL PAPERS

Single calcite crystals are grown by amorphous calcium carbonate (ACC) particle-accretion using a synthetic procedure inspired by biogenic systems. The transformation of solid ACC particles in the presence of certain additives retards the classical dissolution-precipitation process facilitating growth by a particle-mediated process. The results provide a mechanistic understanding of biogenic and synthetic single crystal growth.

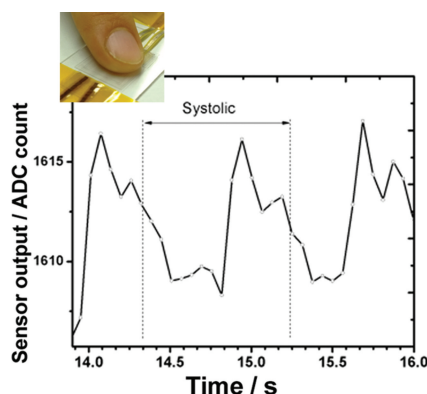


Biom mineralization

A. Gal, K. Kahil, N. Vidavsky, R. T. DeVos, P. U. P. A. Gilbert, P. Fratzl, S. Weiner, L. Addadi*5420–5426

Particle Accretion Mechanism Underlies Biological Crystal Growth from an Amorphous Precursor Phase

A highly sensitive and flexible pressure sensors using microstructured dielectric to measure fingertip pulse pressure for mobile health applications. The sensor can detect pulsations at the fingertip and can be made on various flexible and stretchable substrates to capture touch information, in order to facilitate large area human–computer interfaces for next generation input devices and continuous health-monitoring sensors.

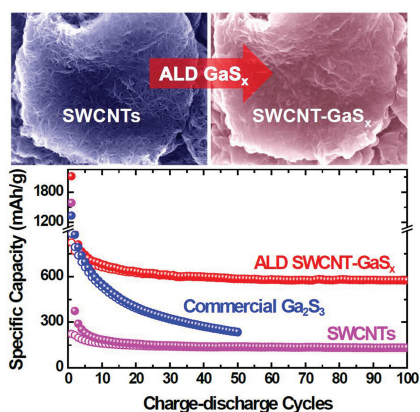


Intuitive Electronics

B.C.-K. Tee, A. Chortos, R. R. Dunn, G. Schwartz, E. Eason, Z. Bao*5427–5434

Tunable Flexible Pressure Sensors using Microstructured Elastomer Geometries for Intuitive Electronics

Single-walled carbon nanotubes (SWCNTs) are uniformly infiltrated and coated with amorphous GaS_x using atomic layer deposition (ALD). The resulting SWCNT- GaS_x core–shell nanocomposites exhibit reliable cycling and sustained high capacity as lithium-ion battery anodes compared to pure SWCNTs and commercial micro-sized Ga_2S_3 . This work demonstrates a general strategy for the design and synthesis of functional nanomaterials.

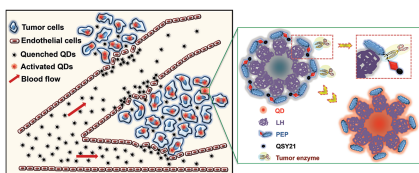


Lithium-Ion Batteries

X. Meng, K. He, D. Su, X. Zhang, C. Sun, Y. Ren, H.-H. Wang, W. Weng, L. Trahey, C. P. Canlas, J. W. Elam*5435–5442

Gallium Sulfide–Single-Walled Carbon Nanotube Composites: High-Performance Anodes for Lithium-Ion Batteries

Tumor-associated proteases (TAP), such as **legumain**, are actively involved in cancer progression, and have been used as biomarkers. Therefore, in vivo detection and trafficking of TAPs have received a great deal of attention. A legumain-responsive hybrid nanoprobe system based on quantum dots (QD) and the fluorescence resonance energy transfer (FRET) effect is reported and shown to detect legumain (asparaginyl endopeptidase) in a colon-cancer animal model.



Cancer Therapy

Y. Wang, Y. Jiang, M. Zhang, J. Tan, J. Liang, H. Wang, Y. Li, H. He, V. C. Yang,* Y. Huang*5443–5453

Protease-Activatable Hybrid Nanoprobe for Tumor Imaging