Nanomagnets

A trigon structure formed by submonolayer gadolinium deposition onto Au(111) is revealed as a robust growth template for cobalt nanodot arrays by Frederik Schiller and co-workers in article 1600187. The cobalt nanoislands behave as independent magnetic entities with an out-of-plane easy axis of anisotropy and enhanced magnetic anisotropy values, as compared to other self-organized cobalt nanodot superlattices.

Electroceuticals

There has been a lot of recent interest in using electrical impulses to interface with the nervous system to regulate organ functions in the body. In article 1500386, Shih-Cheng Yen, Chengkuo Lee, and co-workers demonstrate the ability to selectively stimulate the nerve trunk and, for the first time, record simultaneously the effect on different nerve branches with a range of very small diameters from 200 to 500 µm. This allows the nerve trunk to be mapped with high precision, potentially greatly increasing the efficacy of the stimulation and reducing the incidence of unintended side effects.

Polymer Solar Cells

In article 1600032, an efficient new wide-bandgap polymer based on a novel moiety of pyrrolo[3,4-f]benzotriazole-5,7-dione (TZBI) is developed by Lei Ying, Feng Lui, Thomas P. Russel, Fei Huang, and co-workers. The new chemistry enables fine electronic structure tuning and solution-processed single-junction polymer solar cells provided a remarkable power conversion efficiency of 8.63%. Full electrical and structural characterization reveals that TZBI is a promising building block for the application in highly efficient organic photovoltaics.
**REVIEW**

**Li-Ion Batteries**

F. Zhang, L. Qi* .......................1600049

Recent Progress in Self-Supported Metal Oxide Nanoarray Electrodes for Advanced Lithium-Ion Batteries

As a new class of binder-free electrodes for lithium-ion batteries (LIBs), self-supported metal oxide nanoarray electrodes have attracted considerable attention. This review highlights the recent progress in the utilization of self-supported metal oxide nanoarrays grown on 2D planar and 3D porous substrates as high-performance electrodes for advanced LIBs, and discusses their future prospects.

**RESEARCH NEWS**

**Controlled Polymerization**

T. G. McKenzie, Q. Fu, M. Uchiyama, K. Satoh, J. Xu, C. Boyer,* M. Kamigaito,*, G. G. Qiao* ....1500394

Beyond Traditional RAFT: Alternative Activation of Thiocarbonylthio Compounds for Controlled Polymerization

The versatility of thiocarbonylthio compounds in the control of a range of radical and cationic polymerization reactions has been recently expanded. In addition to the increasingly popular reversible addition–fragmentation chain transfer (RAFT) polymerization employing a radical initiator, other means of activation have been developed. Key examples of alternative activation are discussed and the implications on the synthesis of functional materials are highlighted.

**COMMUNICATIONS**

**Electroceuticals**

Z. Xiang, S. Sheshadri, S.-H. Lee, J. Wang, N. Xue, N. V. Thakor, S.-C. Yen*, C. Lee* ...................1500386

Mapping of Small Nerve Trunks and Branches Using Adaptive Flexible Electrodes

Selective stimulation is delivered to the sciatic nerve using different pairs of contacts on a split-ring electrode, while simultaneous recordings are acquired by the neural ribbon electrodes on three different branches. Two hook electrodes are also implanted in the muscle to monitor the activated muscle responses. It shows that the high precision implantation of electrodes, increases the efficacy and reduces the incidence of side effects.

**Solar Cells**

Z. Zhu, C.-C. Chueh, F. Lin, A. K.-Y. Jen* ..............................1600027

Enhanced Ambient Stability of Efficient Perovskite Solar Cells by Employing a Modified Fullerene Cathode Interlayer

A novel fullerene cathode interlayer is employed to facilitate the fabrication of stable and efficient perovskite solar cells. This modified fullerene surfactant significantly increases air stability of the derived devices due to its hydrophobic characteristics to enable 80% of the initial PCE to be retained after being exposed in ambient condition with 20% relative humidity for 14 days.
A polymer/PCBM hybrid electron transport layer is reported that enables high-performance perovskite solar cells with a high power conversion efficiency of 16.2% and with negligible hysteresis. Unlike previous approaches of reducing hysteresis by thermal annealing or fullerene passivation, the success of our approach can be mainly attributed to the doping of the PCBM layer using an insulating polymer (polystyrene) and an amine-containing polymeric semiconductor named PFNOX.

A novel polymer donor (PBDTS-Se) is designed to match with a non-fullerene acceptor (SdiPBI-S). The corresponding solar cells show a high efficiency of 8.22%, which result from synergetic improvements of light harvesting, charge carrier transport and collection, and morphology. The results indicate that rational design of novel donor materials is important for non-fullerene organic solar cells.

The innovative design of sliding transfer based on a liquid substrate can succinctly transfer high-quality, wafer-size, and contamination-free graphene within a few seconds. Moreover, it can be extended to transfer other 2D materials. The efficient sliding transfer approach can obtain high-quality and large-area graphene for fundamental research and industrial applications.
Ultra-Specific Isolation of Circulating Tumor Cells Enables Rare-Cell RNA Profiling

The clinical potential of circulating tumor cells (CTCs) in managing cancer metastasis is significant. However, low CTC isolation purities from patient blood have hindered sensitive molecular assays of these rare cells. Described herein is the ultra-pure isolation of CTCs from patient blood samples and how this platform has enabled highly specific molecular (mRNA and miRNA) profiling of patient CTCs.

Ferroelectric Memory

A new type of ferroelectric FET based on the single nanowire is demonstrated. The design of the side-gated architecture not only simplifies the manufacturing process but also avoids any postdeposition damage to the organic ferroelectric film. The devices exhibit excellent performances for nonvolatile memory applications, and the memory hysteresis can be effectively modulated by adjusting the side-gate geometries.

Drug Delivery

A wearable adhesive skin patch for transdermal drug delivery is developed with bendable microneedles, dry adhesive and triboelectric energy harvester (TEH). The bendable microneedle array can overcome the needle breakage issue. The dry adhesive can realize a conformal attachment. The TEH can generate power when attached on flat skin or joint to power active components to be integrated in the future.

Oxygen Reduction

The vital role of ethylenediaminetetraacetic acid on the structure and the oxygen reduction reaction activity of the non-precious-metal-based pyrolyzed catalyst is reported and elaborated. The resultant catalyst can overtake the performance of commercial Pt/C catalyst in an alkaline medium.
A hexagonal array of magnetically independent Cobalt nanodots is grown on a Gd-Au trigon surface structure. The nanodots exhibit an out-of-plane easy axis of magnetization with enhanced anisotropy values. The large strain induced by the lattice mismatch at the Co/substrate interface is suggested as the main reason for the exceptional magnetic properties of the nanodots.

A novel electron-accepting cyclic-imide substituted benzotriazole unit TZBI (4,8-di(thien-2-yl)-6-octyl-2-octyl-5H-pyrrolo[3,4-f]benzotriazole-5,7(6H)-dione) is developed, which can pair with benzo[1,2-b:4,5-b']dithiophene to present a donor–acceptor wide-bandgap conjugated polymer. High-performance polymer solar cell with a champion power conversion efficiency of 8.63% is realized, demonstrating that TZBI can be a very promising building block for wide-bandgap conjugated polymers.

A safer sodium ion battery is constructed first by using Sb-based anode, NaNi0.35Mn0.35Fe0.3O2 cathode, and nonflammable trimethyl phosphate (TMP) + 10 vol% fluoroethylene carbonate electrolyte, which works very well with considerable capacity and cyclability, demonstrating a promising prospect to build safer sodium-ion batteries for large-scale energy storage applications.

Nanomagnets
L. Fernández, M. Ilyn, A. Magaña, L. Vitali, J. E. Ortega, F. Schiller* ........................1600187

Growth of Co Nanomagnet Arrays with Enhanced Magnetic Anisotropy

Polymer Solar Cells
L. Y. Lan, Z. M. Chen, Q. Hu, L. Ying, R. Zhu, F. Liu, T. P. Russell, F. Huang, Y. Cao ........................1600032

High-Performance Polymer Solar Cells Based on a Wide-Bandgap Polymer Containing Pyrrolo[3,4-f]benzotriazole-5,7-dione with a Power Conversion Efficiency of 8.63%

Safer Batteries
Z. Q. Zeng, X. Y. Jiang, R. Li, D. D. Yuan, X. P. Ai, H. X. Yang, Y. L. Cao* ...1600066

A Safer Sodium-Ion Battery Based on Nonflammable Organic Phosphate Electrolyte