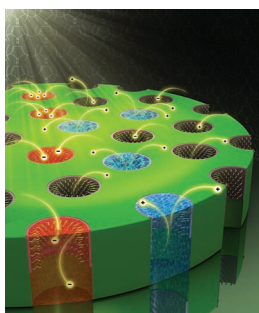


ADVANCED FUNCTIONAL MATERIALS

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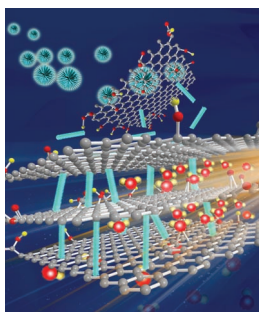
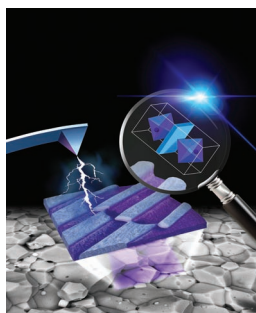


Nanochannels

On page 2091 conductive polypyrrole is integrated by Z. Liu, J. Zhai, and co-workers into alumina nanopore arrays to construct organic/inorganic hybrid nanochannels. The protonation and deprotonation of surface groups upon pH variation contributes to the pH-tunable ion rectification. Positive charges in polypyrrole layer induced by the cooperative effect of light and protons are used to regulate the channel flux, which results in a light-responsive ion current.

Conductive Interfaces

A bridge connecting electrical conductivity at the nanoscale and macroscopic electromechanical response is revealed in polycrystalline, multiferroic BiFeO_3 by T. Rojac and team on page 2099. Evidence of spontaneously formed conductive domain walls is presented, and it is shown that these local conductive paths persist after poling the ceramics. The conductive domains walls move significantly under applied subswitching electric fields and lead to a large enhancement of the macroscopic piezoelectric response.

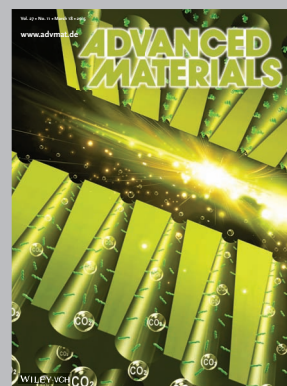
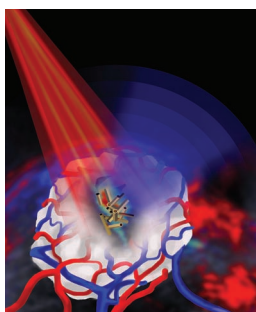


Monolithic Electrodes

Graphene oxide-induced monolithic monodisperse NiCo-carbonate hydroxide nanowire architectures are constructed by Z. Yu, J. Qiu, and co-workers on page 2109. Benefiting from a nanowire scaffold-supported super structure, ultrafast self-assembly is achieved and a superior volumetric capacitance for supercapacitors is also delivered.

Theranostics

S. D. Evans and colleagues develop a route for synthesizing gold nanotubes with controlled length and tunable absorption in the near-infrared region. The work on page 2117 represents the first in vitro and in vivo study of gold nanotubes and demonstrates their effectiveness as novel agents for multispectral optoacoustic tomography and photothermal therapy, with further potential for targeted drug delivery.



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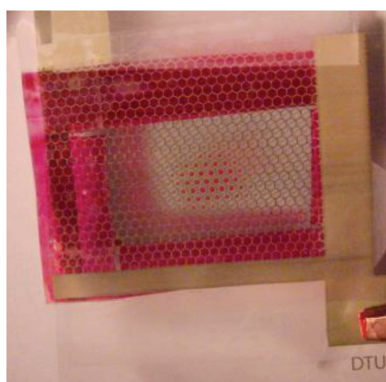
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FEATURE ARTICLE

The materials science of the electrochromic device is reviewed with particular focus on the possible manufacturing routes, the requirements they impose on the materials and the achievable overall device performance. Applications are discussed and the recent progress in realizing solid state flexible devices based on electrochromics and their combination with other advanced devices such as solar cells is reviewed along with an overview of areas where developments would have a large impact.



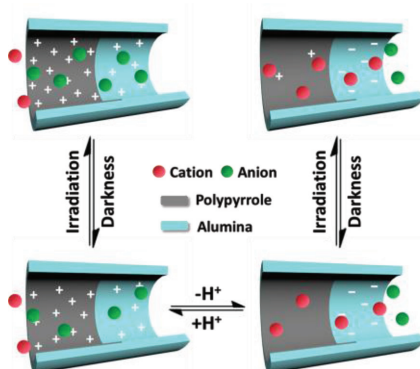
Electrochromics

J. Jensen, M. Hösel, A. L. Dyer, F. C. Krebs*2073–2090

Development and Manufacture of Polymer-Based Electrochromic Devices

FULL PAPERS

Organic/inorganic hybrid nanochannels are constructed by integrating conductive polypyrrole (PPy) into alumina nanopore arrays. The protonation and deprotonation of surface groups upon pH variation contribute to the pH-tunable ion rectification. Positive charges in PPy layer induced by the cooperative effect of light and protons are used to regulate the channel flux, which results in a light-responsive ion current.

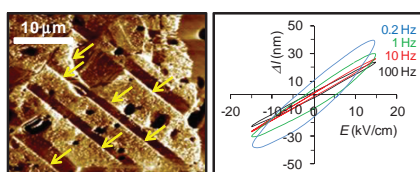


Nanochannels

Q. Zhang, Z. Liu,* K. Wang, J. Zhai*2091–2098

Organic/Inorganic Hybrid Nanochannels Based on Polypyrrole-Embedded Alumina Nanopore Arrays: pH- and Light-Modulated Ion Transport

A link between electrical conductivity at the nanoscale and macroscopic electromechanical response is revealed in polycrystalline, ferroelectric BiFeO₃. The existence of spontaneously formed conductive domain walls, which persist after poling, is demonstrated. It is shown that these conductive interfaces move significantly under applied subswitching electric fields, revealing emerging phenomena and large enhancement of the macroscopic piezoelectric response.

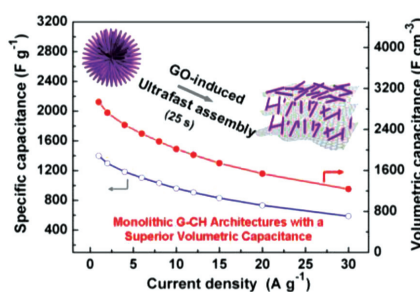


Conductive Interfaces

T. Rojac,* H. Ursic, A. Bencan, B. Malic, D. Damjanovic2099–2108

Mobile Domain Walls as a Bridge between Nanoscale Conductivity and Macroscopic Electromechanical Response

A novel strategy for ultrafast self-assembly of the monolithic composite architectures (G–CH) with alternate connections of the monodisperse NiCo-carbonate hydroxide nanowires and graphene nanosheets is reported. The as-made G–CH films exhibit a superior volumetric capacitance of 2936 F cm⁻³ at a current density of 1 A g⁻¹ and excellent cycle ability.



Monolithic Electrodes

J. Yang, C. Yu,* X. Fan, C. Zhao, J. Qiu*2109–2116

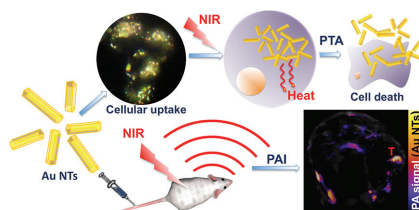
Ultrafast Self-Assembly of Graphene Oxide-Induced Monolithic NiCo-Carbonate Hydroxide Nanowire Architectures with a Superior Volumetric Capacitance for Supercapacitors

FULL PAPERS

Theranostics

S. Ye, G. Marston, J. R. McLaughlan, D. O. Sigle, N. Ingram, S. Freear, J. J. Baumberg, R. J. Bushby, A. F. Markham, K. Critchley, P. L. Coletta, S. D. Evans* ... 2117–2127

Engineering Gold Nanotubes with Controlled Length and Near-Infrared Absorption for Theranostic Applications

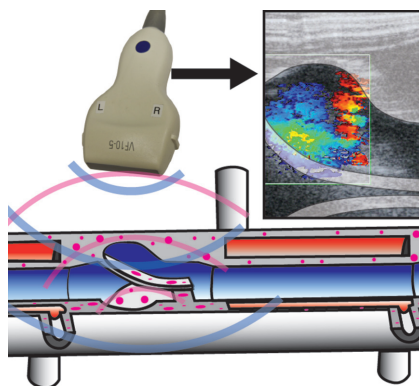


Gold nanotubes with controlled length and tunable absorption in the near-infrared region are developed. The present work represents the first in vitro and in vivo study of gold nanotubes and demonstrates their effectiveness as novel agents for photoacoustic imaging and photothermal therapy with potential for drug delivery.

Soft Mechanics

M. Loepfe, C. M. Schumacher, C. H. Burri, W. J. Stark* 2129–2137

Contrast Agent Incorporation into Silicone Enables Real-Time Flow-Structure Analysis of Mammalian Vein-Inspired Soft Pumps

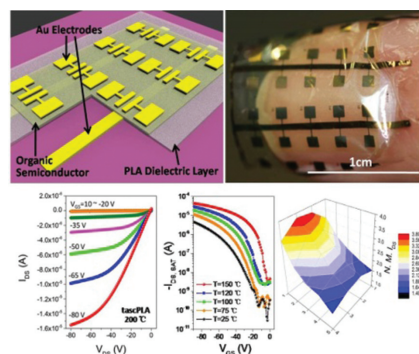


There is a nascent research field on machines that are made essentially from soft materials. A new type of mammalian vein-inspired soft silicone liquid pump is presented and characterized, that is based on lost-wax casting of 3D printed injection molds. By functionalizing the material with contrast agents, inner workings can be visualized in real-time by the use of medical ultrasonography.

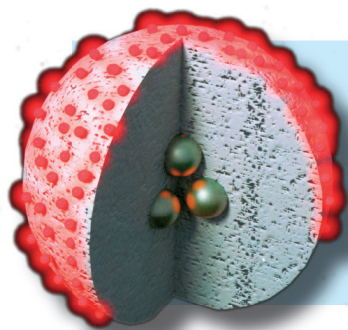
Organic Electronics

X. Wu, Y. Ma, G. Zhang, Y. Chu, J. Du, Y. Zhang, Z. Li, Y. Duan, Z. Fan,* J. Huang* 2138–2146

Thermally Stable, Biocompatible, and Flexible Organic Field-Effect Transistors and Their Application in Temperature Sensing Arrays for Artificial Skin



A highly thermally stable, biocompatible, and flexible organic field-effect transistor is realized by applying a three-arm stereo-complex polylactide as dielectric and substrate materials. Temperature sensitivity of the devices is significantly enhanced by utilizing polar-group-induced dielectric/semiconductor interfacial charge trapping effect. 2D temperature sensing array is demonstrated based on such transistors, which are applicable for artificial skin.



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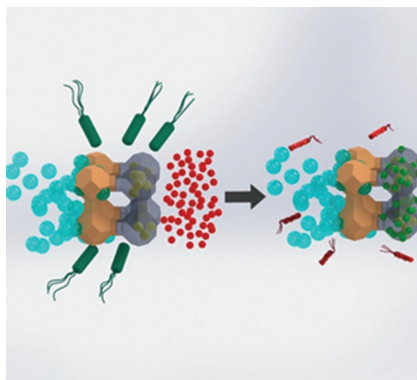
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FULL PAPERS

Multifunctional reactive-zeolite micromotors that combine the remarkable adsorption capacity of zeolites with the efficient catalytic properties of reactive Ag^+ and the effective movement for accelerated “on-the-fly” detoxification of chemical and biological threats are described. The attractive capabilities of these self-propelled zeolite micromotors pave the way for their diverse applications in defense and environmental applications in a more economical and sustainable manner.

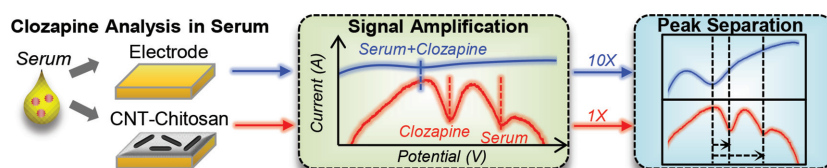


Decontamination

V. V. Singh, B. Jurado-Sánchez, S. Sattayasamitsathit, J. Orozco, J. Li, M. Galarnyk, Y. Fedorak, J. Wang*2147–2155

Multifunctional Silver-Exchanged Zeolite Micromotors for Catalytic Detoxification of Chemical and Biological Threats

A **semismart electrochemical sensor** is prepared from a composite film of multiwalled carbon nanotubes in a chitosan matrix. The aminopolysaccharide chitosan enables programmable assembly of the composite at an electrode address while carbon nanotubes confer electrocatalytic properties. This sensor enables highly sensitive detection of the antipsychotic medication clozapine from blood samples of schizophrenia patients without the need for sample pretreatment.

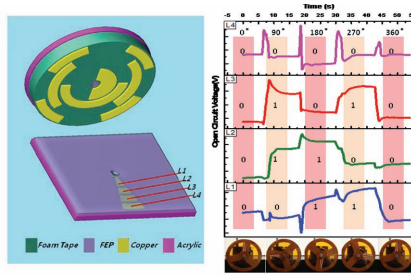


Electrocatalytic Sensors

E. Kim, S. E. Chocron, H. Ben-Yoav, T. E. Winkler, Y. Liu, M. Glassman, C. Wolfram, D. L. Kelly, R. Ghodssi,* G. F. Payne*2156–2165

Programmable “Semismart” Sensor: Relevance to Monitoring Antipsychotics

A **self-powered, sliding electrification based quasi-static triboelectric sensor** for detecting angle from rotating motion is reported. The sensor reads and remembers the absolute angular position, angular velocity, and acceleration regardless of whether it is being continuously monitored or segmented monitored. This work not only demonstrates a new principle for angular measurement but also greatly expands the applicability of triboelectric nanogenerator as self-powered sensors.

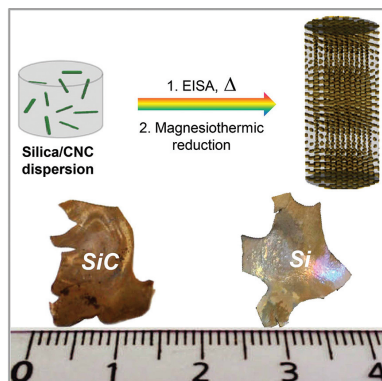


Nanogenerators

Y. Wu, Q. Jing, J. Chen, P. Bai, J. Bai, G. Zhu, Y. Su, Z. L. Wang*2166–2174

A Self-Powered Angle Measurement Sensor Based on Triboelectric Nanogenerator

Magnesiothermal reduction of chiral nematic silica/carbon and mesoporous silica films templated by cellulose nanocrystals is investigated. The reduction process of silica/carbon forms MgC_2/SiC intermediates and then transforms to chiral nematic mesoporous SiC , while silica produces mesoporous Si with a layered hierarchical structure. These novel semiconducting materials are available as film replicas and may be useful for developing thin film sensors.



Semiconductors

T.-D. Nguyen, J. A. Kelly, W. Y. Hamad, M. J. MacLachlan*2175–2181

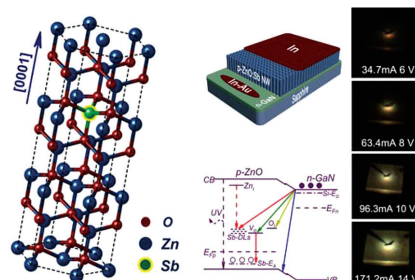
Magnesiothermal Reduction of Thin Films: Towards Semiconducting Chiral Nematic Mesoporous Silicon Carbide and Silicon Structures

FULL PAPERS

Light-Emitting Diodes

X. Ren, X. Zhang, N. Liu, L. Wen,
L. Ding, Z. Ma, J. Su, L. Li, J. Han,
Y. Gao* 2182–2188

**White Light-Emitting Diode From
Sb-Doped p-ZnO Nanowire Arrays/
n-GaN Film**



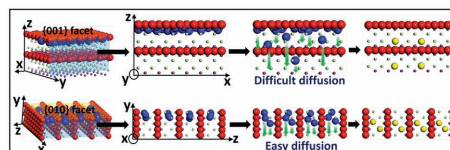
A whole interfacial transition of electrons from conduction bands of n-type GaN film to the acceptor levels of p-type antimony (Sb) doped ZnO nanowire arrays makes the energy band engineering successful. It tunes intrinsic ZnO UV emission to UV-free and warm white light-emitting diode (W-LED) emission with color coordinates around (0.418, 0.429) at the bias of 8–15.5 V.

Carbon Doping

J. Li, K. Zhao, Y. Yu,
L. Zhang* 2189–2201

**Facet-Level Mechanistic Insights into
General Homogeneous Carbon Doping
for Enhanced Solar-to-Hydrogen
Conversion**

Facet-level understanding of a general homogeneous carbon doping mechanism is demonstrated. The initial facet-dependent adsorption of the dopant precursor, regulated by the surface atomic structures, and the subsequent facet-dependent diffusion of the carbon dopant, associated with the facet-related arrangements of bulk atoms, are identified as the two key factors to determine the concentration of carbon dopants.



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