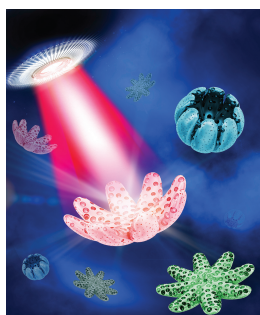


ADVANCED FUNCTIONAL MATERIALS

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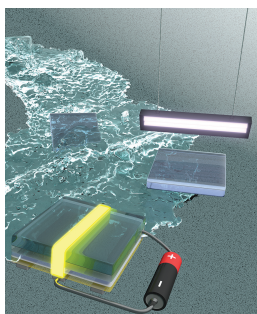


Hydrogels

On page 7272, C.-H. Chen and co-workers demonstrate a gradient porous elastic hydrogel obtained through an effective hydrothermal route, that exhibits rapid and programmable locomotion prompted by external stimuli. According to the gradient porosity control, the hydrogel simultaneously exhibits rapid response, high elasticity, and anisotropic locomotion. The tunable pore structures, mechanical properties, and locomotion of this new class of materials make these gradient porous hydrogels potentially suitable for a variety of applications.

Optoelectronics

Using a low-temperature aqueous deposition technique followed by flash light postprocessing, E. Della Gaspera, J. J. Jasieniak, and co-workers present the fabrication of highly conductive, highly transparent, intrinsically doped ZnO electrodes on page 7263. The mild processing conditions enable deposition on temperature sensitive substrates paving the way for their use in various flexible optoelectronic devices.

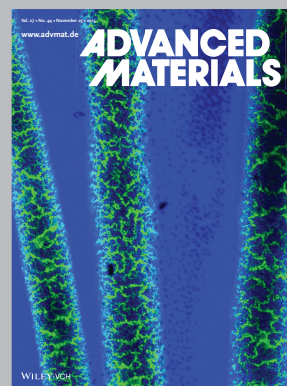
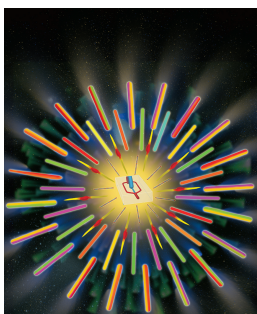


Water Electrolysis

Z.-Y. Yuan and coworkers present self-supported CoP mesoporous nanorod arrays on page 7337 as a high-efficiency bifunctional electrode towards both electrochemical hydrogen and oxygen evolution reactions. Benefiting from the 3D electrode configuration and well-defined mesoporosity, the bulk electrode provide unprecedented improvements in the electrochemical activity and reaction kinetics in full water splitting over long-term operation.

Microfluidic Spinning

A fiber microreactor is constructed based on a microfluidic spinning technique on page 7253 by S.Chen, A. J. Ryan, and co-workers, for the in-situ fabrication of nanocrystal-loaded anisotropic fluorescent hybrid microfibers. By designing co-axial-flow microdevices with different geometric features, multiple nanocrystal reactions in result in microfibers with delicate bead-shapes and Janus microstructures, capable of multiplexed optical signals. This work develops a facile platform for rapid fabrication of anisotropic fluorescent hybrid microfibers.



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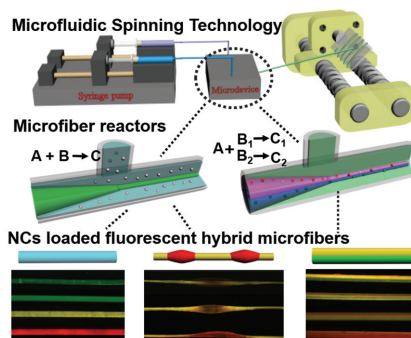
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FULL PAPERS

A fiber microreactor based on a microfluidic spinning technique is proposed for the in situ fabrication of nanocrystals loaded anisotropic fluorescent hybrid microfibers. By designing coaxial flow microdevices with different geometric features, multiple nanocrystal reactions in microreactors result in microfibers with delicate topographies and distinct optical properties. This work develops a facile platform for rapid fabrication of anisotropic fluorescent hybrid microfibers.

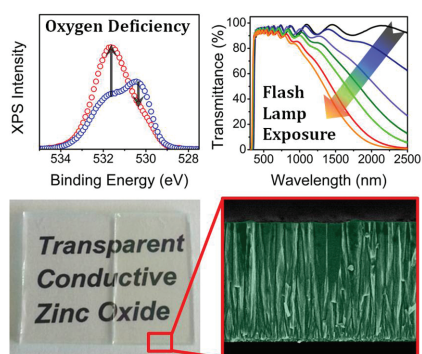


Microfluidic Spinning

Y. Zhang, C.-F. Wang, L. Chen, S. Chen,* A. J. Ryan*7253–7262

Microfluidic-Spinning-Directed Microreactors Toward Generation of Multiple Nanocrystals Loaded Anisotropic Fluorescent Microfibers

Highly conductive, intrinsically doped ZnO electrodes are prepared using a low-temperature aqueous deposition and a flash light postprocessing. The aqueous bath chemistry favors the formation of oxygen deficient ZnO films, which are then flashed with millisecond light pulses to achieve record conductivity and high transparency. Deposition on PET substrates and indium-tin-oxide-free optoelectronic devices is demonstrated.

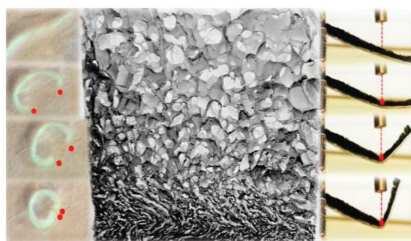


Optoelectronics

E. Della Gaspera,* D. F. Kennedy, J. van Embden, A. S. R. Chesman, T. R. Gengenbach, K. Weber, J. J. Jasieniak*7263–7271

Flash-Assisted Processing of Highly Conductive Zinc Oxide Electrodes from Water

Gradient porous elastic hydrogels with rapid and programmable locomotion to thermal-/photostimulation are obtained through an effective hydrothermal route. According to the gradient porosity control, the hydrogels simultaneously exhibit rapid responses, high elasticity, and anisotropic locomotion. The hydrothermally induced hydrogelation mechanism is applicable to other thermal-responsive monomers and crosslinkers, opening new avenues for modulating the pore structures of soft materials.

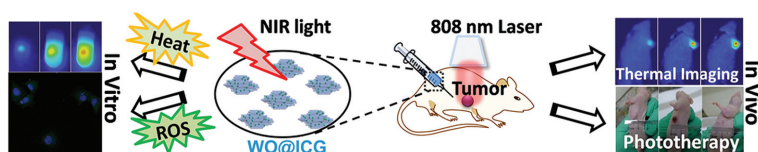


Hydrogels

R. Luo, J. Wu, N.-D. Dinh, C.-H. Chen*7272–7279

Gradient Porous Elastic Hydrogels with Shape-Memory Property and Anisotropic Responses for Programmable Locomotion

An 808-nm-light-mediated, antitumor, synergistic photothermal and photodynamic therapy nanosystem based on tungsten oxide@indocyanine green (WO@ICG) nanocomposites has been successfully constructed. These WO@ICG nanocomposites exhibit fascinating in vitro and in vivo dual-modal phototherapeutic properties under single 808 nm light irradiation, including therapeutic potential in cultured HeLa cells and HeLa tumor-bearing mice.



Cancer Therapy

K. Deng, Z. Hou,* X. Deng, P. Yang, C. Li, J. Lin*7280–7290

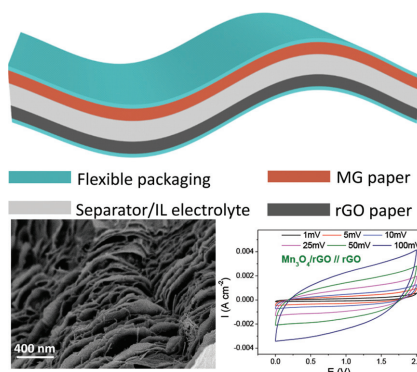
Enhanced Antitumor Efficacy by 808 nm Laser-Induced Synergistic Photothermal and Photodynamic Therapy Based on a Indocyanine-Green-Attached $W_{18}O_{49}$ Nanostructure

FULL PAPERS

Supercapacitors

Y. Hu, C. Guan, G. Feng, Q. Ke,
X. Huang, J. Wang* 7291–7299

Flexible Asymmetric Supercapacitor Based on Structure-Optimized Mn_3O_4 /Reduced Graphene Oxide Nanohybrid Paper with High Energy and Power Density

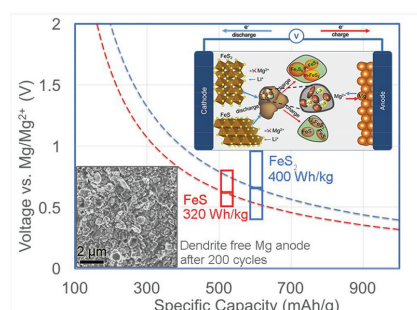


A highly flexible Mn_3O_4 /reduced graphene oxide (rGO) nanohybrid paper with high electrical conductivity and high mass loading of Mn_3O_4 nanofiber (0.71 g cm^{-3}) is successfully developed via a facile gel formation and electrochemical reduction process. Through this novel design and processing control, the energy and power density of the flexible Mn_3O_4 /rGO-based asymmetric supercapacitor are greatly improved.

Hybrid Batteries

Y. Zhang, J. Xie, Y. Han,
C. Li* 7300–7308

Dual-Salt Mg-Based Batteries with Conversion Cathodes

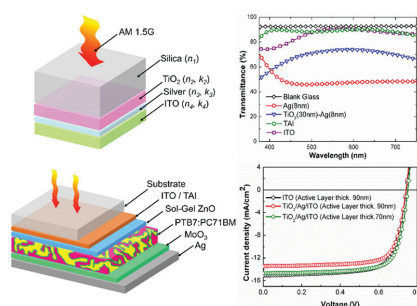


In Mg/Li hybrid battery systems with Mg anodes, FeS_x ($x = 1$ or 2) is employed as conversion cathodes. With 2–4 electron transfers these systems achieve a maximum energy density close to 400 Wh kg^{-1} without serious dendrite growth and polysulfide dissolution.

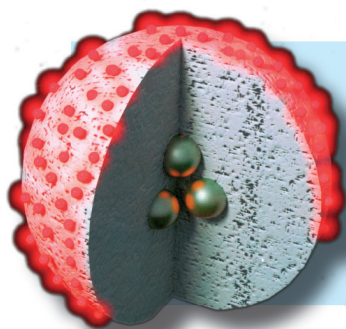
Polymer Solar Cells

D. S. Ghosh,* Q. Liu,* P. Mantilla-Perez,
T. L. Chen,* V. Mkhitarian,
M. Huang, S. Garner, J. Martorell,
V. Pruneri 7309–7316

Highly Flexible Transparent Electrodes Containing Ultrathin Silver for Efficient Polymer Solar Cells



TiO_2 /Ag/indium tin oxide (ITO)-based transparent electrodes (TEs) with sheet resistance of $6.2 \Omega \text{ sq}^{-1}$ and average optical transmittance in the visible of 87.6% are developed. These performances are superior to those of state-of-the-art single-layer ITO. Polymer solar cells employing such TEs achieve 8.34% efficiency, higher than similar structures on conventional ITO.



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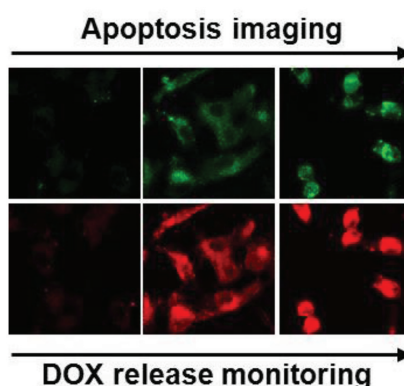
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FULL PAPERS

A dual-Förster resonance energy transfer (FRET)-based versatile prodrug (V-prodrug) is designed to provide a cascaded imaging of real-time drug release and subsequent cell apoptosis. This V-prodrug enables the in situ detection of the cancer response as well as the therapeutic efficacy evaluation of the drug.

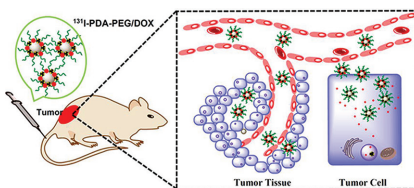


Theranostics

S.-Y. Li, L.-H. Liu, L. Rong,
W.-X. Qiu, H.-Z. Jia, B. Li, F. Li,
X.-Z. Zhang*7317–7326

A Dual-FRET-Based Versatile Prodrug for Real-Time Drug Release Monitoring and In Situ Therapeutic Efficacy Evaluation

Polydopamine (PDA) nanoparticles as a biocompatible nanocarrier platform are developed for loading of both radionuclides and an anticancer drug to realize nuclear-imaging-guided combined radioisotope therapy and chemotherapy of cancer. Utilizing this synergistic manner, ^{131}I -PDA-poly(ethylene glycol)/doxorubicin nanoparticles exhibited effective cancer treatment efficacy, without rendering significant toxicity to the treated animals.

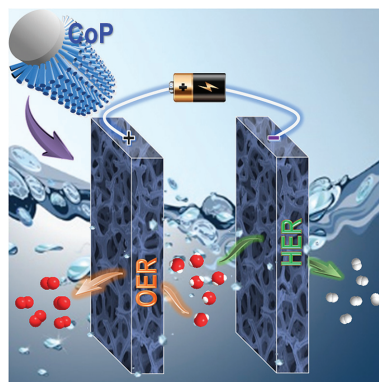


Drug Delivery

X. Zhong, K. Yang,* Z. Dong, X. Yi,
Y. Wang, C. C. Ge, Y. Zhao,
Z. Liu*7327–7336

Polydopamine as a Biocompatible Multifunctional Nanocarrier for Combined Radioisotope Therapy and Chemotherapy of Cancer

Flexible, bifunctional electrodes with self-supported CoP mesoporous nanorod arrays are fabricated through an electrodeposition strategy. The electrodes possess well-structured mesoporosity and a high specific surface area, exhibiting high activities toward both electrochemical hydrogen and oxygen evolution reactions. In a further step, an alkaline electrolyzer with a current density of 10 mA cm^{-2} at 1.62 V in a long-term operation is realized.

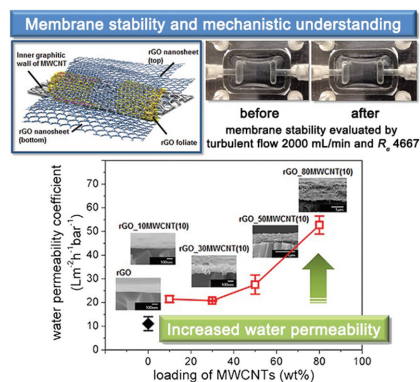


Water Electrolysis

Y.-P. Zhu, Y.-P. Liu, T.-Z. Ren,
Z.-Y. Yuan*7337–7347

Self-Supported Cobalt Phosphide Mesoporous Nanorod Arrays: A Flexible and Bifunctional Electrode for Highly Active Electrocatalytic Water Reduction and Oxidation

All-carbon nanoarchitected membranes comprising reduced graphene oxide and multi-walled carbon nanotubes exhibit a high water permeability, which is five to ten times higher than most commercial nanofiltration membranes. The membranes show almost 100% organic dye rejection and, most importantly, superior membrane stability under a turbulent hydrodynamic flow condition of 2000 mL min^{-1} and a Reynolds number of 4667.



Membranes

K. Goh, W. Jiang, H. E. Karahan, S. Zhai,
L. Wei, D. Yu, A. G. Fane, R. Wang,*
Y. Chen*7348–7359

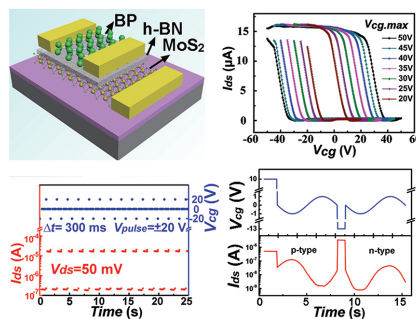
All-Carbon Nanoarchitectures as High-Performance Separation Membranes with Superior Stability

FULL PAPERS

Memory Devices

D. Li, X. Wang, Q. Zhang, L. Zou, X. Xu,
Z. Zhang* 7360–7365

Nonvolatile Floating-Gate Memories Based on Stacked Black Phosphorus–Boron Nitride–MoS₂ Heterostructures

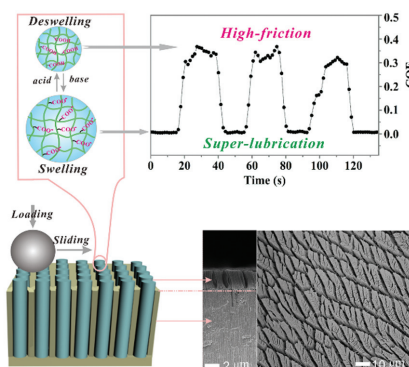


Nonvolatile ambipolar memory devices are developed based on stacked black phosphorus–boron nitride–molybdenum disulphide heterostructure floating-gate field-effect transistors. The memory device exhibits a fairly large memory window with a width (ΔV) of ≈ 60 V for a maximum control gate voltage of 40 V and can be switched well between the erase and program state.

Hydrogels

S. Ma, M. Scaraggi, D. Wang, X. Wang,
Y. Liang, W. Liu, D. Dini,*
F. Zhou* 7366–7374

Nanoporous Substrate-Infiltrated Hydrogels: a Bioinspired Regenerable Surface for High Load Bearing and Tunable Friction

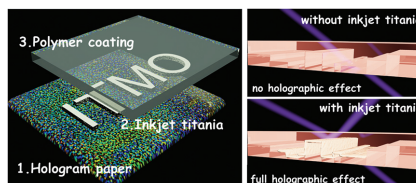


A novel composite surface of ordered nanohydrogel arrays confined in an anodic aluminum oxide template based on a soft/hard combination strategy is reported. The surface shows a low friction coefficient (<0.01) under 40 N and contact pressures of ≈ 2 MPa, along with desirable regenerative and antiwear properties, while exhibiting smart switching between high friction (>0.3) and superlubrication ($\approx 10^{-3}$) by acidic and basic actuation.

Holography

A. V. Yakovlev, V. A. Milichko,
V. V. Vinogradov,
A. V. Vinogradov* 7375–7380

Sol–Gel Assisted Inkjet Hologram Patterning

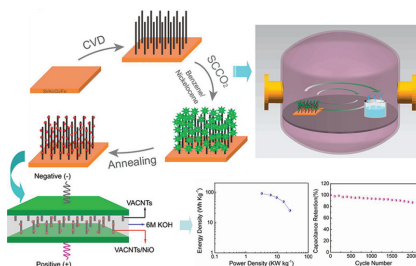


A method of producing holographic text and images using colorless TiO₂ ink with a high refractive index is presented for the first time. The TiO₂ ink is deposited on top of exposed PET-based micro-embossed paper by an inkjet printer. The represented technology allows to quickly generate any image with a holographic effect.

Supercapacitors

J. Cheng, B. Zhao,* W. Zhang,
F. Shi, G. Zheng, D. Zhang,
J. Yang* 7381–7391

High-Performance Supercapacitor Applications of NiO-Nanoparticle-Decorated Millimeter-Long Vertically Aligned Carbon Nanotube Arrays via an Effective Supercritical CO₂-Assisted Method



An effective supercritical CO₂-assisted approach is presented for synthesizing vertically aligned carbon nanotube (VACNT)/NiO hybrid structures. NiO nanoparticles are distributed uniformly in the highly dense, millimeter-long VACNTs. The unique hybrid structures of VACNT/NiO exhibit high capacity and long cycle stability. The great electrochemical properties of the VACNT/NiO hybrid materials plus their simple fabrication make this class of materials attractive for supercapacitor applications.