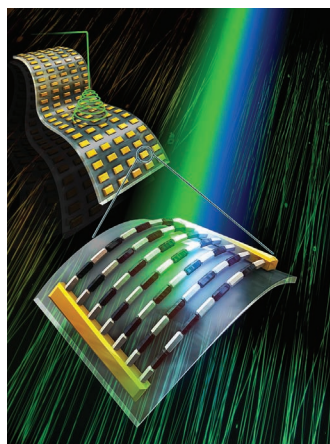


ADVANCED FUNCTIONAL MATERIALS

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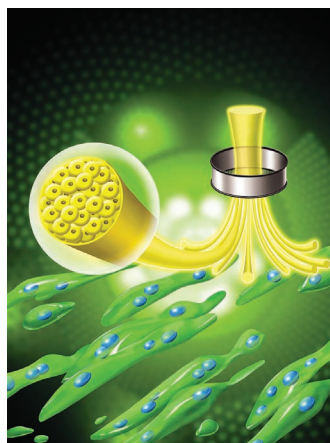


Photodetectors

Flexible, highly transparent, and wide spectral-response-range (ultraviolet to visible) ZnO–CdO nanofiber array-based photodetectors are fabricated via a modified electrospun method by T. Y. Zhai and co-workers on page 5885. Simply mixing the precursors of the target active materials for electrospinning is proven to be a facile way to widen the spectral response of the final product, and is expected to be beneficial for future flexible optoelectronics.

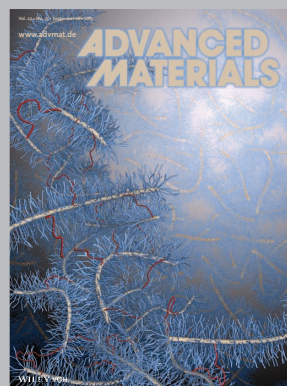
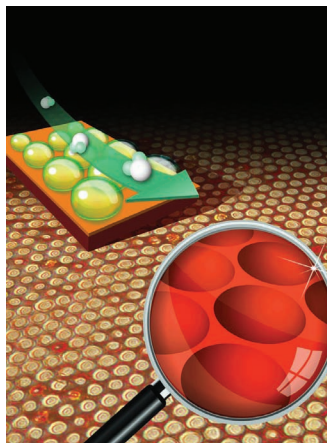
Thin Films

Large area semitransparent thin films with highly ordered microporous structures are formed from a commercial conjugated polymer by the use of the breath figure technique, as shown by T. A. Venkatesh, M. Cotlet, and co-workers on page 5902. In this self-assembly method, humid air flow encounters the polymer solution and the condensation of water droplets onto hexagonal arrays acts as a template for the film.



Hydrogel Fibers

F. Xu and co-workers successfully fabricate cell-laden hydrogel fibers on page 5999, using a simple, facile, high-throughput, and mechanical-based method, inspired by fabrication process of Chinese noodles. Muscle myotubes are generated in 3D hydrogel fibers under mechanical strain. Such an approach holds the potential to create functional tissue constructs and help in understand the mechanobiological responses of cells in 3D.



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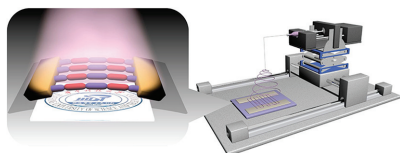
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FULL PAPERS

A photodetector based on ZnO-CdO heterojunctions with a large photoresponse range and a fast response speed is fabricated. Its comprehensive photoelectric and carrier transport properties at different wavelengths, light intensities, and pressures are investigated. The detector is highly transparent at 400–800 nm and maintains its properties even after 200 bending cycles. This photodetector has a high potential for use in multicolor optoelectronic devices.

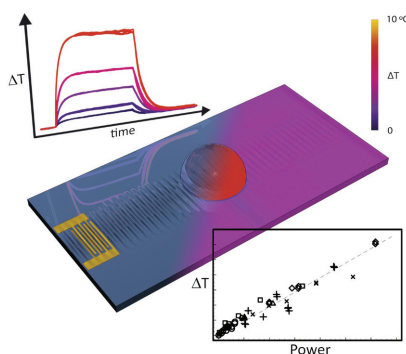


Photodetectors

Z. Zheng, L. Gan, H. Q. Li, Y. Ma,
Y. Bando, D. Golberg,
T. Y. Zhai*5885–5894

**A Fully Transparent and Flexible
Ultraviolet–Visible Photodetector Based
on Controlled Electrospun ZnO-CdO
Heterojunction Nanofiber Arrays**

Fast and controllable surface acoustic wave (SAW) driven digital microfluidic temperature changes are demonstrated. Small temperature changes in typical SAW microfluidic conditions and the possibility for rapid and controllable high temperature changes, for use with lab-on-a-chip devices, are shown.

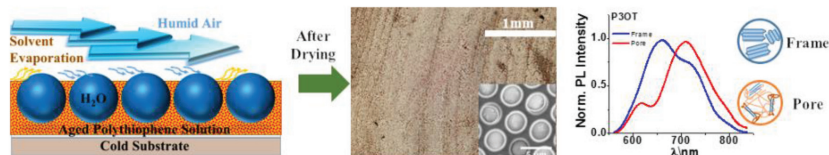


Microfluidics

R. J. Shilton,* V. Mattoli, M. Travaglini,
M. Agostini, A. Desii, F. Beltram,
M. Cecchini*5895–5901

**Rapid and Controllable Digital
Microfluidic Heating by Surface Acoustic
Waves**

Ordered microporous thin films of centimeter sized large area are successfully prepared from commercially available polythiophenes by using a breath figure technique. Structural and optical characterization of these thin films reveals increased crystallinity and ordered aggregates in the frame.

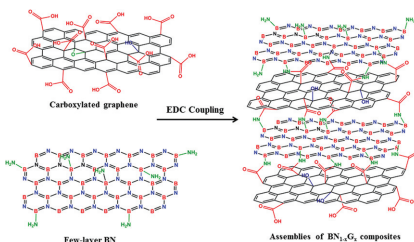


Thin Films

P. K. Routh, D. Nykypanchuk,
T. A. Venkatesh,* M. Cotlet*...5902–5909

**Long Range Self-Assembly of
Polythiophene Breath Figures: Optical
and Morphological Characterization**

Covalently cross-linked composites of BN and graphene prepared using amide bond chemistry are characterized and their functional properties are investigated. $\text{BN}_{1-x}\text{G}_x$ ($x \approx 0.25, 0.5$, and 0.75) composites show tunable resistivity that is dependent on the composition. The composites are microporous and show satisfactory performance as supercapacitor electrodes and as catalysts in the oxygen reduction reaction.



Composite Materials

R. Kumar, K. Gopalakrishnan, I. Ahmad,
C. N. Rao*5910–5917

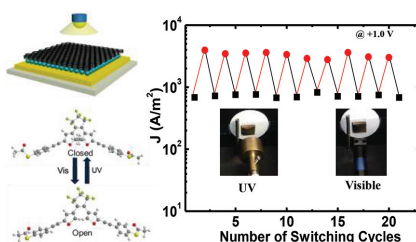
**BN–Graphene Composites Generated
by Covalent Cross-Linking with Organic
Linkers**

FULL PAPERS

Molecular Electronics

D. Kim, H. Jeong, W.-T. Hwang, Y. Jang,
D. Sysoiev, E. Scheer, T. Huhn, M. Min,*
H. Lee, T. Lee* 5918–5923

**Reversible Switching Phenomenon in
Diarylethene Molecular Devices with
Reduced Graphene Oxide Electrodes on
Flexible Substrates**

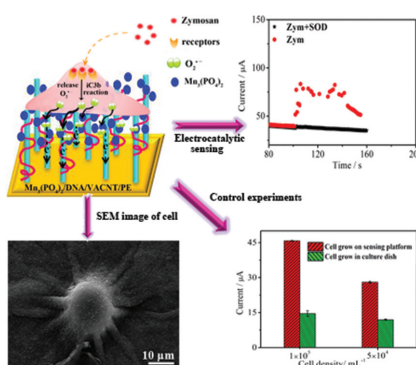


The photoswitching characteristics of diarylethene molecular devices with reduced graphene oxide (rGO) electrodes on flexible substrates are studied. The diarylethene molecular devices with rGO electrodes can be converted from the open state to the closed state or vice versa with UV or visible light. The reversible photoswitching of these devices is successfully demonstrated with UV or visible light illumination.

Cell Assays

F. X. Hu, Y. J. Kang, F. Du, L. Zhu,
Y. H. Xue, T. Chen, L. M. Dai,*
C. M. Li* 5924–5932

**Living Cells Directly Growing on a DNA/
 $\text{Mn}_3(\text{PO}_4)_2$ -Immobilized and Vertically
Aligned CNT Array as a Free-Standing
Hybrid Film for Highly Sensitive In
Situ Detection of Released Superoxide
Anions**

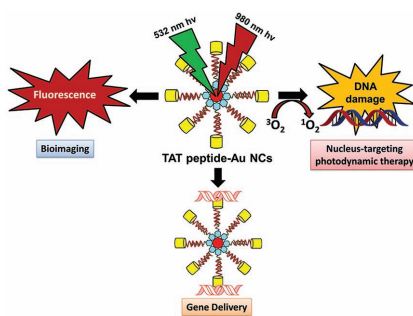


A DNA/ $\text{Mn}_3(\text{PO}_4)_2$ -immobilized and vertically aligned carbon nanotube (VACNT) array nanostructure is applied as a smart free-standing hybrid film for directly growing living cells and investigating their electrochemical behaviors in response to drug stimulation. This holds a great promise for the fabrication of next-generation biomedical devices for living cell assays, drug screening, and monitoring cell activity in situ.

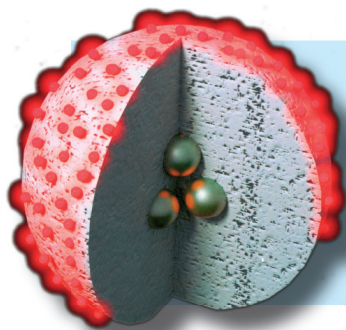
Cancer Therapy

R. Vankayala, C.-L. Kuo, K. Nuthalapati,
C.-S. Chiang, K. C. Hwang* 5934–5945

**Nucleus-Targeting Gold Nanoclusters
for Simultaneous In Vivo Fluorescence
Imaging, Gene Delivery, and NIR-Light
Activated Photodynamic Therapy**



A unique nucleus-targeting gold nanocluster (TAT peptide-Au NC)-based multifunctional theranostic platform is designed to perform simultaneous in vitro and in vivo cellular fluorescence imaging, gene delivery, and intrinsic near infrared light-activated photodynamic therapy. This is done without the co-presence of organic photosensitizers for the effective cancer cell killing.



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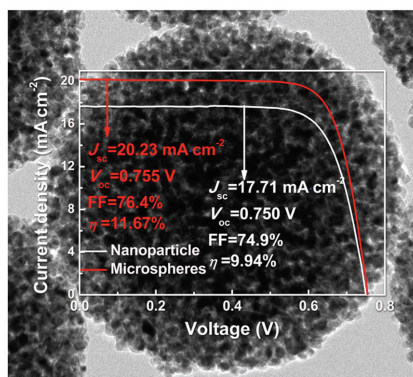
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FULL PAPERS

Mesoporous TiO₂ microspheres with controllable diameter, pore size, and porosity are synthesized. The porosity of the microspheres can be easily tuned without sacrificing the specific surface area by adjusting the content of ethanol. The large porosity of microspheres shows an abundant dye adsorption, rapid dye regeneration, and sufficient electrolyte diffusion, resulting in a higher efficiency of 11.67%.

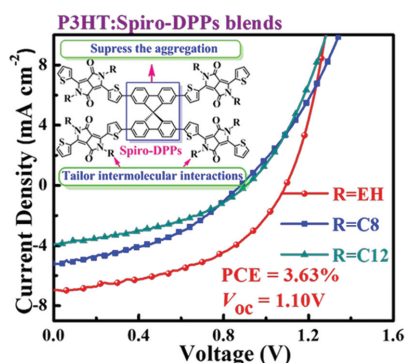


Dye-Sensitized Solar Cells

Y. Ding, L. Zhou, L. Mo, L. Jiang, L. Hu,*
Z. Li, S. Chen, S. Dai*5946–5953

TiO₂ Microspheres with Controllable Surface Area and Porosity for Enhanced Light Harvesting and Electrolyte Diffusion in Dye-Sensitized Solar Cells

A series of **spiro-diketopyrrolopyrroles-based nonfullerene acceptors with X-shapes** is developed. The substituted alkyl side chains on the acceptors can significantly tailor their crystallinity and bulk heterojunction film morphology. When paring these acceptors with poly(3-hexylthiophene), a dramatic variation of power conversion efficiency from 1.42% to 3.63% is observed.

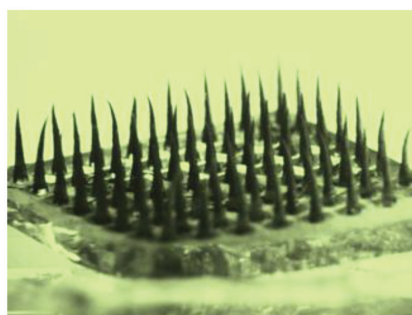


Organic Solar Cells

X.-F. Wu, W.-F. Fu, Z. Xu, M. Shi,
F. Liu,* H.-Z. Chen,* J.-H. Wan,*
T. P. Russell.....5954–5966

Spiro Linkage as an Alternative Strategy for Promising Nonfullerene Acceptors in Organic Solar Cells

A **magnetically induced fog collector** is fabricated through the integration of cactus-inspired spine structures and magnetically responsive flexible conical arrays. Quasistatic fog water can be spontaneously and continuously captured and directionally transported, driven by the external magnetic field and the Laplace pressure difference. This work opens a new avenue for fog-harvesting systems under windless conditions.

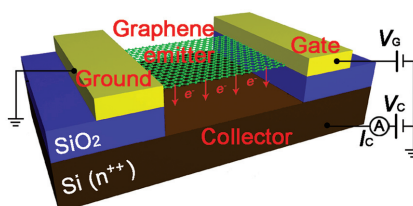


Fog Harvesting

Y. Peng, Y. He, S. Yang, S. Ben,
M. Cao, K. Li, K. Liu,*
L. Jiang5967–5971

Magnetically Induced Fog Harvesting via Flexible Conical Arrays

Graphene-based transistors with an ON/OFF current ratio up to 10⁶ and a subthreshold slope of 120 mV dec⁻¹ are developed by employing a vacuum channel. These transistors exhibit switching performances superior to those of graphene-based transistors with solid-state mediums for carrier transport.



Transistors

G. Wu, X. Wei,* Z. Zhang,
Q. Chen, L. Peng.....5972–5978

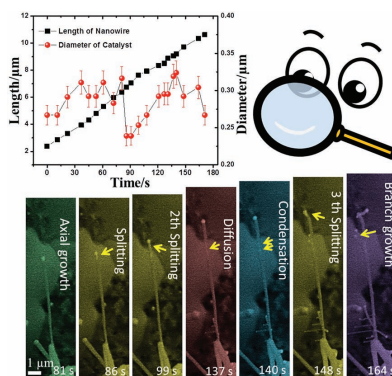
A Graphene-Based Vacuum Transistor with a High ON/OFF Current Ratio

FULL PAPERS

Catalyst Splitting

X. Huang, Z.-J. Wang,
G. Weinberg, X.-M. Meng,*
M.-G. Willinger* 5979–5987

In Situ Scanning Electron Microscopy Observation of Growth Kinetics and Catalyst Splitting in Vapor–Liquid–Solid Growth of Nanowires

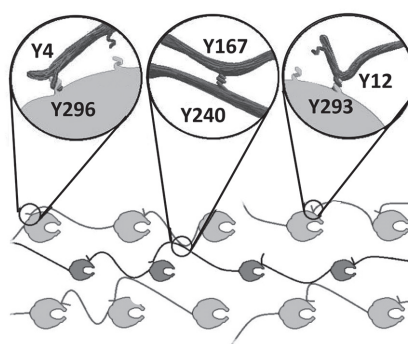


Catalyst splitting in vapor–liquid–solid growth kinetics is observed during in situ growth of nanowires inside the chamber of a scanning electron microscope. The splitting occurs with the majority of catalyst remaining at the nanowire tip, further enabling nanowire growth, while the other portion remains attached to the nanowire and subsequently induces the growth of a nanowire branch.

Protein-Based Materials

D. W. Howell, S. P. Tsai, K. Churion,
J. Patterson, C. Abbey, J. T. Atkinson,
D. Porterpan, Y. H. You, K. E. Meissner,
K. J. Bayless,* S. E. Bondos* ... 5988–5998

Identification of Multiple Dityrosine Bonds in Materials Composed of the *Drosophila* Protein Ultrabithorax

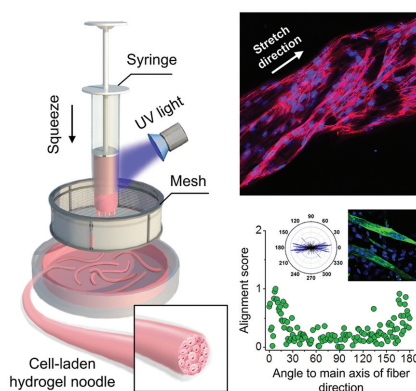


Amino acids that form dityrosine bonds in Ultrabithorax protein-based materials are identified. Dityrosine content can be increased or decreased by mutagenesis, controlling the strength of the materials. These tyrosine-containing motifs, inserted in other proteins, should increase the strength of the corresponding materials.

Hydrogel Fibers

Y. Li, C. T. Poon, M. Li, T. J. Lu,
B. Pingguan-Murphy, F. Xu* ... 5999–6008

Chinese-Noodle-Inspired Muscle Myofiber Fabrication

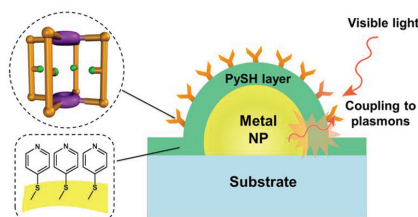


C2C12 muscle myofibers within hydrogel fibers are successfully generated using a simple, facile, and high-throughput method that is inspired by the fabrication process of Chinese noodles. The effect of mechanical tensile strain on cell viability, spreading, and proliferation is also investigated. Such an approach holds potential to create functional tissue constructs and provides insight into the mechanobiological responses of cells in three dimensions.

Explosives Detection

C. Wang, J. Shang, Y. Lan, T. Tian,
H. Wang, X. Chen, J.-Y. Gu, J. Z. Liu,
L.-J. Wan, W. Zhu,* G. T. Li* ... 6009–6017

Metal–Organic Polyhedra Cages Immobilized on a Plasmonic Substrate for Sensitive Detection of Trace Explosives



A novel strategy for highly sensitive detection and discrimination of explosives is developed based on a metal–organic polyhedra (MOP)-decorated plasmonic substrate. MOP can serve as a receptor for selective uptake and binding of explosives. Grafting of the MOP onto a plasmonic substrate with good surface-enhanced Raman scattering enhancement factor, the sensor shows excellent discrimination power toward explosives.