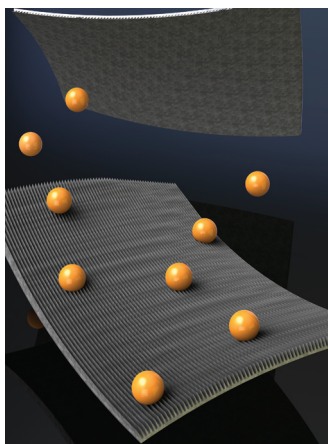


# ADVANCED FUNCTIONAL MATERIALS

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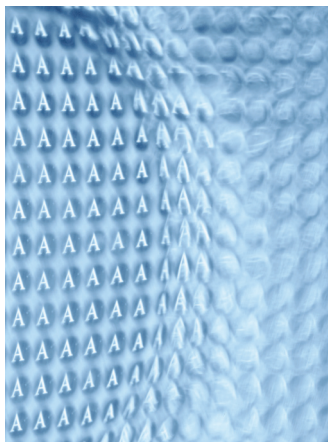


## Biomimetics

On page 3256, Andrew G. Gillies and co-workers describe a gecko synthetic adhesive surface fabricated with magneto-elastomer microridges, which can be controlled remotely with an external magnetic field. By changing the microridge configuration, adhesion can be switched on and off to selectively capture and release particles.

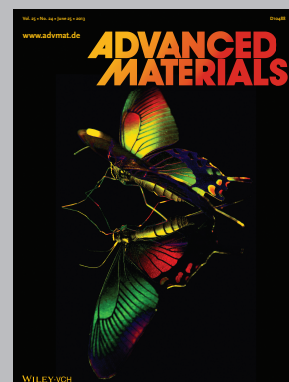
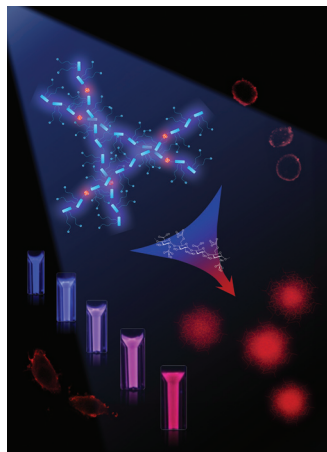
## Biosensing and Bioimaging

On page 3268 Qiang Zhao, Bin Liu, Wei Huang, and co-workers report the application of a time-resolved photoluminescent technique and fluorescence lifetime imaging microscopy for heparin sensing and bioimaging based on phosphorescent conjugated polyelectrolytes containing iridium(III) complexes to enhance the signal-to-noise ratio. This time-resolved technique for heparin quantification in complicated media may have important clinical applications.



## Shape-Memory Polymers

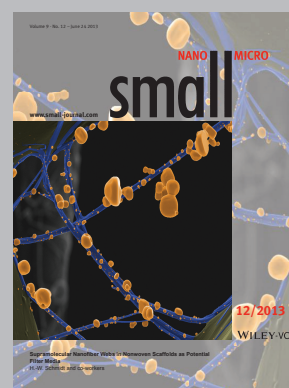
Micro-optical elements with micro- and nanoscale surface features prepared from an optically transparent shape-memory elastomer via replica molding at high precision are reported by Tao Xie, John A. Rogers, and co-workers on page 3299. Through shape-memory programming, the surface features and corresponding optical functions can be manipulated both globally and locally in a controlled manner. The image illustrates that a flattened microlens array loses the capability to focus light and only those completely recovered microlenses (coupled with a circular indium tin oxide heater) are able to project the letter "A" after thermal activating.



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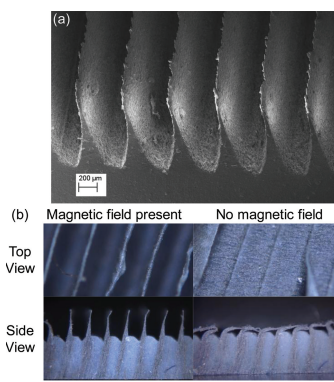
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## FULL PAPERS

## Biomimetics

A. G. Gillies,\* J. Kwak,  
R. S. Fearing ..... 3256–3261

### Controllable Particle Adhesion with a Magnetically Actuated Synthetic Gecko Adhesive

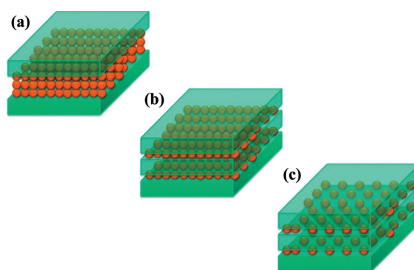


Controllable adhesion to glass spheres with a new magnetically actuated synthetic gecko adhesive made from a magnetoelastomer is demonstrated. Adhesion is controlled by orienting the microfabricated surface features with an external magnetic field. Results show sphere pull-off forces can be increased 10-fold by changing the ridge orientation. Applications include solar panel cleaning, reusable adhesives, and microfabrication.

## Coercivity

O. Akdogan, W. Li,  
B. Balasubramanian, D. J. Sellmyer,  
G. C. Hadjipanayis\* ..... 3262–3267

### Effect of Exchange Interactions on the Coercivity of $\text{SmCo}_5$ Nanoparticles Made by Cluster Beam Deposition

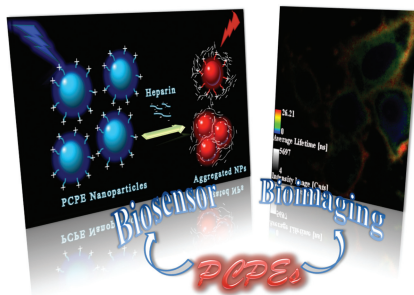


The effect of  $\text{SmCo}_5$  nanoparticle dispersion in a carbon matrix on the coercivity is investigated. Poor dispersion of these nanoparticles results in a moderate room temperature coercivity of  $\approx 1$  kOe. By increasing the interparticle distance substantially, coercivity increases up to 12 kOe due to the overall anisotropy increase with the decrease in exchange interactions according to the random anisotropy model.

## Biosensors

H. Shi, H. Sun, H. Yang, S. Liu,  
G. Jenkins, W. Feng, F. Li, Q. Zhao,\*  
B. Liu,\* W. Huang\* ..... 3268–3276

### Cationic Polyfluorenes with Phosphorescent Iridium(III) Complexes for Time-Resolved Luminescent Biosensing and Fluorescence Lifetime Imaging

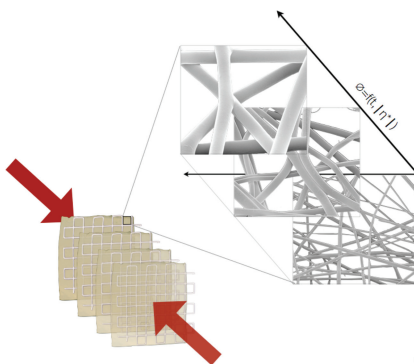


The application of time-resolved photoluminescence and fluorescence lifetime imaging for heparin sensing and bioimaging based on phosphorescent conjugated polyelectrolytes (PCPEs) containing iridium(III) complexes to eliminate background fluorescence with an enhanced signal-to-noise ratio is reported.

## Tissue Engineering

M. Angarano, S. Schulz, M. Fabritius,  
R. Vogt, T. Steinberg, P. Tomakidi,  
C. Friedrich, R. Mülhaupt\*.. 3277–3285

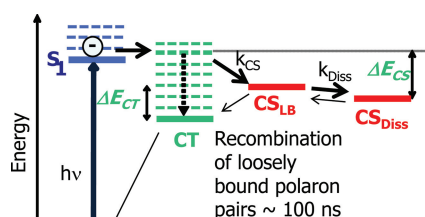
### Layered Gradient Nonwovens of In Situ Crosslinked Electrospun Collagenous Nanofibers Used as Modular Scaffold Systems for Soft Tissue Regeneration



Water resistant, in situ crosslinked gelatin nanofibers are produced in a versatile one-step electrospinning process, using glyoxal as a crosslinking agent. The slowly progressing crosslinking reaction during electrospinning increases the solution viscosity and the average fiber diameter, thus forming gradient nonwovens. To improve the mechanical stability, the crosslinked gelatin nonwovens are laminated with perforated polycaprolactone layers.

## FULL PAPERS

A model of charge separation from polymer singlet excitons, including both interfacial charge-transfer (CT) states, loosely bound polaron pairs and dissociated polarons is presented. For blend films where at least one material is relatively crystalline, efficient dissociation of photogenerated polarons is observed. For amorphous blend films, significant recombination of loosely bound polaron pairs is observed on the 100 ns timescale.

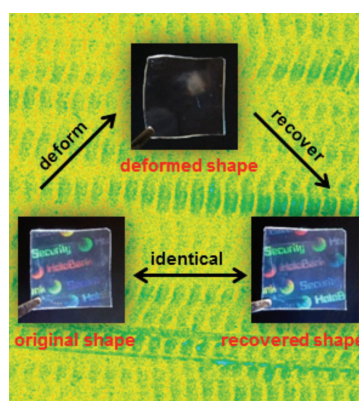


## Solar Cells

S. Shoaee,\* S. Subramanian, H. Xin, C. Keiderling, P. S. Tuladhar, F. Jamieson, S. A. Jenekhe, J. R. Durrant\* .....3286–3298

### Charge Photogeneration for a Series of Thiazolo-Thiazole Donor Polymers Blended with the Fullerene Electron Acceptors PCBM and ICBA

Micro-optical components, ranging from micropillar and microlens arrays to diffraction gratings and holograms, are fabricated from a semi-crystalline shape-memory elastomer. These resulting components represent a class of micro-optical devices with programmable optical properties. Spatio-selective manipulation of these optical devices can be further achieved by the integration of individually addressable arrays of microheaters.



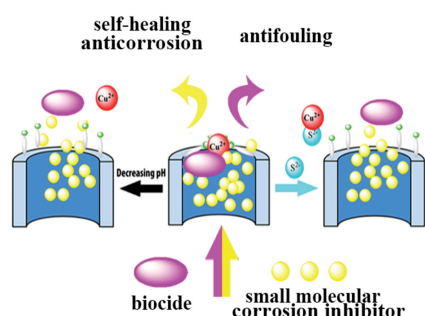
## Elastomers

H. Xu, C. Yu, S. Wang, V. Malyarchuk, T. Xie,\* J. A. Rogers\* ..... 3299–3306

### Deformable, Programmable, and Shape-Memorizing Micro-Optics



A system for controlled release of small molecular corrosion inhibitors and anti-fouling agents is designed to entrap the active compounds and open the nano-valves only in the presence of pH lowering and sulfide ions, thus obtaining a multifunctional coating with self-healing anticorrosion and antifouling properties.



## Self-Healing Materials

Z. Zheng,\* X. Huang, M. Schenderlein, D. Borisova, R. Cao, H. Möhwald, D. Shchukin .....3307–3314

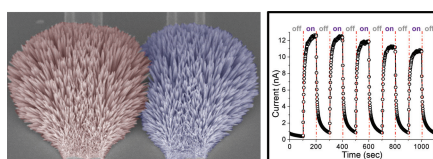
### Self-Healing and Antifouling Multifunctional Coatings Based on pH and Sulfide Ion Sensitive Nanocontainers

Laser induced hydrothermal growth (LIHG) is developed for rapid, one step, digital selective growth of nanowires directly on 3D micro/nanostructures without using conventional photolithography or chemical vapor deposition. The LIHG process greatly reduces the process lead time and simplifies nanowire-based nanofabrication by removing multiple steps for growth, harvesting, manipulation/placement, and integration of the nanowires. Furthermore, the LIHG process can grow nanowires directly on 3D micro/nanostructures.

## Nanowires

J. Yeo, S. Hong, M. Wanit, H. W. Kang, D. Lee, C. P. Grigoropoulos, H. J. Sung, S. H. Ko\* .....3316–3323

### Rapid, One-Step, Digital Selective Growth of ZnO Nanowires on 3D Structures Using Laser Induced Hydrothermal Growth



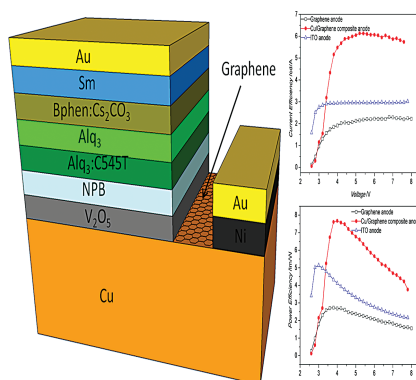


## FULL PAPERS

## Organic Light-Emitting Diode

H. Meng, J. Luo, W. Wang, Z. Shi,  
Q. Niu, L. Dai,\* G. Qin\* ..... 3324–3328

**Top-Emission Organic Light-Emitting Diode with a Novel Copper/Graphene Composite Anode**

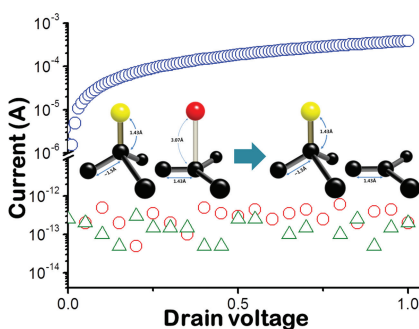


A novel copper/graphene composite anode is proposed and applied as the anode of a top-emission organic light-emitting diode without any graphene transfer process. The maxima of current and power efficiency of a typical copper/graphene composite anode device reach  $6.1 \text{ cd A}^{-1}$  and  $7.6 \text{ lm W}^{-1}$ , respectively, which are markedly higher than those of the control devices with a graphene anode or an indium tin oxide (ITO) anode.

## Graphene

J. H. Lee, G. K. W. Koon, D. W. Shin,  
V. E. Fedorov, J.-Y. Choi, J.-B. Yoo,\*  
B. Özyilmaz\* ..... 3329–3334

**Property Control of Graphene by Employing “Semi-Ionic” Liquid Fluorination**

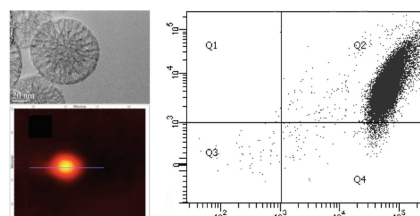


Semi-ionically fluorinated graphene (s-FG) has good insulating properties. After selective elimination of ionic C–F bonds, s-FG recovers in current by a factor of  $10^9$ , from  $10^{-13}$  to  $10^{-4}$  A. The fluorination and reduction processes permit the safe and facile non-destructive property control of the s-FG film.

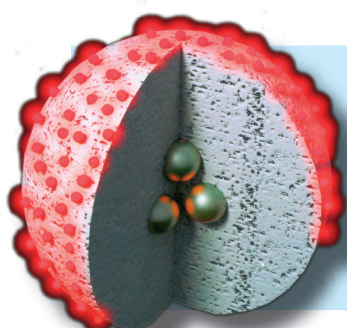
## Florescent Nanoparticles

M. T. Hurley,\* Z. Wang, A. Mahle,  
D. Rabin, Q. Liu, D. S. English,  
M. R. Zachariah, D. Stein,  
P. DeShong\* ..... 3335–3343

**Synthesis, Characterization, and Application of Antibody Functionalized Fluorescent Silica Nanoparticles**



Fluorescent silica nanoparticles (FSNs) are prepared by incorporating dye into a mesoporous silica nanoparticle synthesis procedure. The particles do not leach dye and have strong, stable fluorescence. FSNs functionalized with antibody specific for *Neisseria gonorrhoeae* selectively bind *Neisseria gonorrhoeae* in flow cytometry experiments.



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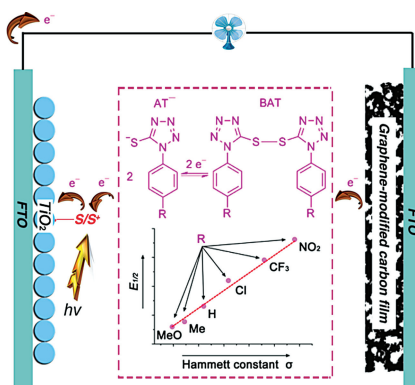


## FULL PAPERS

### Photovoltaics

X. Li, L. Liu, G. Liu, Y. Rong, Y. Yang,  
H. Wang, Z. Ku, M. Xu, C. Zhong,  
H. Han\* .....3344–3352

#### Efficient Dye-Sensitized Solar Cells with Potential-Tunable Organic Sulfide Mediators and Graphene-Modified Carbon Counter Electrodes

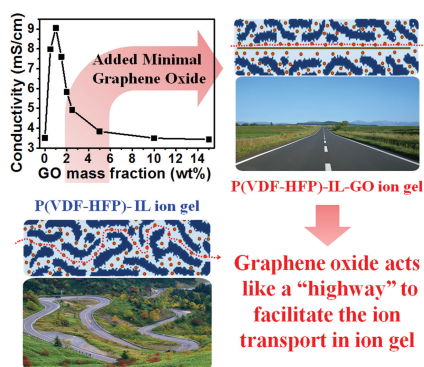


A new series of organic sulfide mediators with programmable redox properties is synthesized for efficient dye-sensitized solar cells (DSCs) through simple structural modification. Furthermore, addition of graphene components into the normal carbon counter electrode material can dramatically improve the catalytic activity of the counter electrode towards these sulfide mediators, giving the DSCs formed using these organic mediators good conversion efficiency.

### Graphene

X. Yang, F. Zhang, L. Zhang,  
T. F. Zhang, Y. Huang,  
Y. S. Chen\* .....3353–3360

#### A High-Performance Graphene Oxide-Doped Ion Gel as Gel Polymer Electrolyte for All-Solid-State Supercapacitor Applications



A high-performance graphene oxide (GO)-doped ion gel is developed, which may have great potential for applications in wearable energy storage devices. This GO-doped ion gel demonstrates significantly improved ionic conductivity compared with that of pure ion gel, due to the homogeneously distributed GO as a 3D network throughout the ion gel by acting like an ion “highway”.