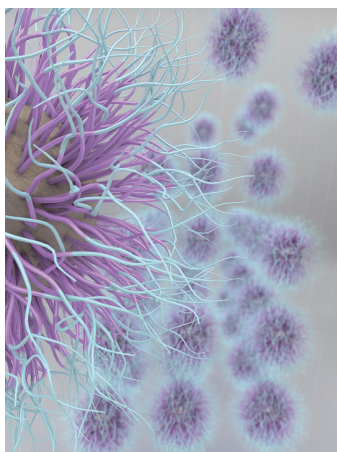


# ADVANCED FUNCTIONAL MATERIALS

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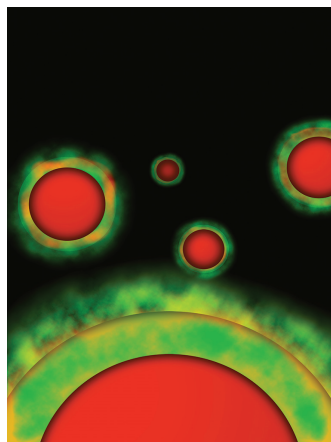
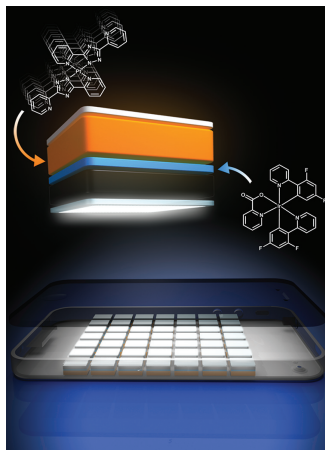


## Magnetic Coatings

A methodology for making anisotropic, reversibly reconfigurable and erasable coatings is developed by K. G. Kornev, S. Minko, and co-workers using core-shell superparamagnetic particles with a locking behavior. On page 4738, magnetic particles are reversibly locked in the chains by adjusting the pH of the aqueous solution. The anisotropy of the coating is imposed by the external magnetic field.

## Organic Electronics

A square-planar Pt(II)-pyridyltriazolate phosphor with excellent n-type electrical behavior is used for dopant-free white organic light-emitting diodes (DFW-OLEDs) by B. E. Gnade, M. A. Omary, and co-workers. On page 4746, the devices display a simple dopant-free architecture and exhibit unparalleled color stability, with negligible efficiency roll-off at high luminance levels so as to make them competitive with today's state-of-the-art doped devices.



## Chemotherapy

Time-staggered combination chemotherapy fails to translate clinically due to different drug formulation parameters and routes of administration. On page 4753, E. Blanco and co-workers show how drug-containing polymer nanoparticles, with a shell of drug complexed with cationic cyclodextrin, enable release in a time- and sequence-specific manner. Encapsulation of fluorescent moieties within the nanoconstruct allows effective visualization of site-specific sequential drug release in vitro and murine models.



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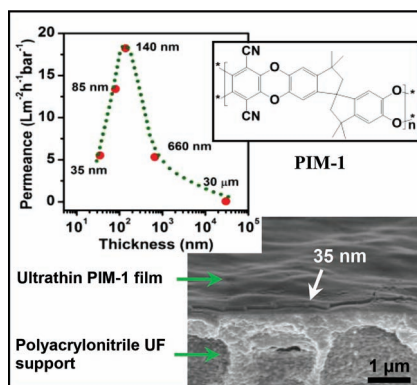
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## FULL PAPERS

## Membranes

P. Gorgojo, S. Karan, H. C. Wong,  
M. F. Jimenez-Solomon, J. T. Cabral,  
A. G. Livingston\* ..... 4729–4737

### Ultrathin Polymer Films with Intrinsic Microporosity: Anomalous Solvent Permeation and High Flux Membranes

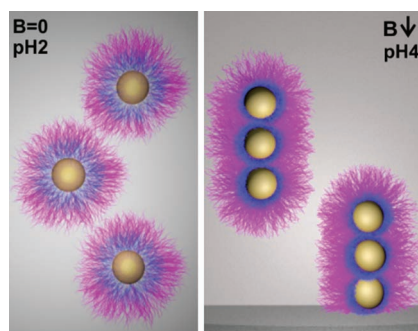


**Ultrathin PIM-1 membranes** are fabricated and applied to organic solvent nanofiltration. A 140 nm thick PIM-1 membrane shows a permeance value for heptane 90 times higher than Starmem240 (a commercial polyimide-based organic solvent nanofiltration membrane). Its mechanical response is found to be robust to nanofiltration pressures of about 10 bar. The performance of even thinner membranes deteriorates due to enhanced packing upon further confinement.

## Magnetic Coatings

A. Tokarev, Y. Gu, A. Zakharchenko,  
O. Trotsenko, I. Luzinov, K. G. Kornev,\*  
S. Minko\* ..... 4738–4745

### Reconfigurable Anisotropic Coatings via Magnetic Field-Directed Assembly and Translocation of Locking Magnetic Chains

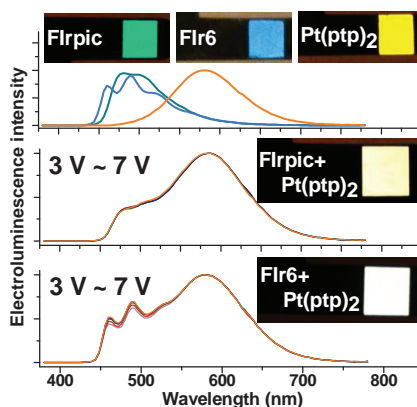


A methodology of making anisotropic, reversibly reconfigurable and erasable coatings is developed. The core-shell superparamagnetic particles with a locking behavior are employed to make the colloidal aqueous dispersion sensitive to pH. Particles are reversibly locked in chains by adjusting pH of the aqueous solution. The anisotropy of the coating is imposed by the external magnetic field.

## Organic Electronics

Q. Wang, I. W. H. Oswald,  
M. R. Perez, H. P. Jia, A. A. Shahub,  
Q. Q. Qiao, B. E. Gnade,\*  
M. A. Omary\* ..... 4746–4752

### Doping-Free Organic Light-Emitting Diodes with Very High Power Efficiency, Simple Device Structure, and Superior Spectral Performance

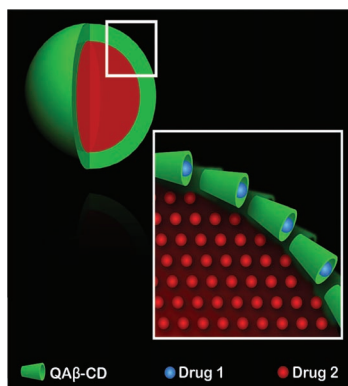


**Undoped yellow-orange and white OLEDs** based on a Pt(II)-phosphor [Pt(ftp)<sub>2</sub>] realize very high power efficiencies of  $79.2 \pm 0.2 \text{ lm W}^{-1}$  and  $49.5 \pm 0.1 \text{ lm W}^{-1}$ , respectively. The working mechanisms of both devices are studied to unveil the determining factors leading to such high efficiencies.

## Chemotherapy

G. U. Ruiz-Esparza, S. Wu, V. Segura-Ibarra,  
F. E. Cara, K. W. Evans, M. Milosevic,  
A. Ziemys, M. Kojic, F. Meric-Bernstam,  
M. Ferrari, E. Blanco\* ..... 4753–4761

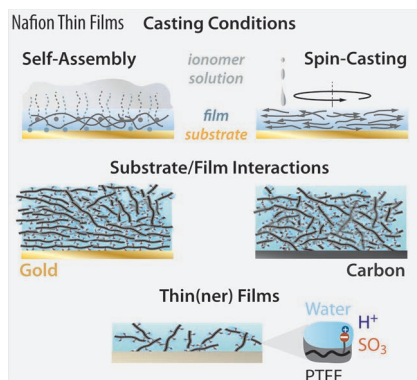
### Polymer Nanoparticles Encased in a Cyclodextrin Complex Shell for Potential Site- and Sequence-Specific Drug Release



A nanoplatform consisting of drug-containing PLGA polymer nanoparticles, stably fashioned with a shell composed of drug complexed with cationic cyclodextrin, enables drug release in a time- and sequence-specific manner within tumors for synergy enhancement. Sequential release in both the in vitro and in vivo setting, site-specifically, highlights the potential to translate time-staggered combination chemotherapy strategies to the clinical arena.

## FULL PAPERS

**Structure-property-processing behavior of Nafion thin films** is controlled by a complex interplay between substrate/film interactions, thickness, and casting method. Self-assembled and spin-cast films demonstrate different behavior depending on the substrate. Swelling decreases from the bulk polymer values or films between  $\approx 20$  to 100 nm thick and then increases for films thinner than 20 nm, for which phase-separation is weak.

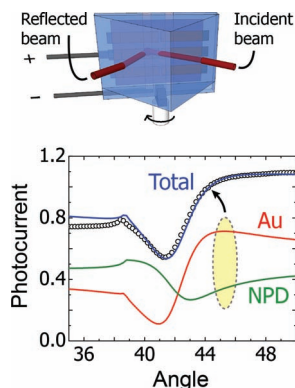


## Polymer Physics

A. Kusoglu, D. Kushner, D. K. Paul, K. Karan, M. A. Hickner, A. Z. Weber\* .....4763–4774

## Impact of Substrate and Processing on Confinement of Nafion Thin Films

**Plasmon-coupled internal photoemission** is demonstrated as a means to accurately determine the injection energy barrier directly in thin film organic electronic devices. As compared to conventional internal photoemission, this approach eliminates ambiguity due to sub-gap photoconductivity in organic thin films and greatly enhances sensitivity to enable measurement of the interface density of states distribution that is key to the current injection process in organic devices.

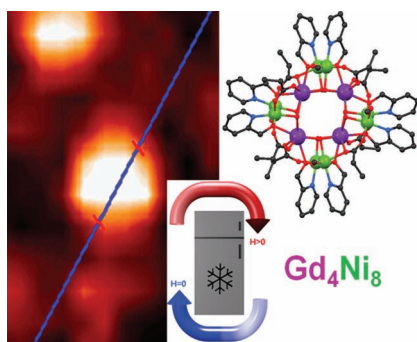


## Organic Electronics

R. Dhankar, N. Chopra, N. C. Giebink\* .....4775–4781

## Plasmonic Internal Photoemission for Accurate Device In Situ Measurement of Metal-Organic Semiconductor Injection Barriers

Using an appropriate deposition protocol and combined experimental techniques (STM, AFM, XPS, XAS, and XMCD), it is shown, that the  $\text{Gd}_4\text{M}_8$  ( $\text{M} = \text{Zn}, \text{Ni}$ ) molecules remain intact and they preserve their magnetothermal properties when dispersed on gold and graphite substrates. In particular, a remarkable magnetocaloric effect is measured, namely,  $\Delta S = S(6 \text{ T}) - S(0 \text{ T})$  exceeds  $8 \text{ R}$  ( $20 \text{ J kg}^{-1} \text{ K}^{-1}$ ) for  $\text{Gd}_4\text{Ni}_8$  at 4 K. These results demonstrate the dealing with single molecule coolers.

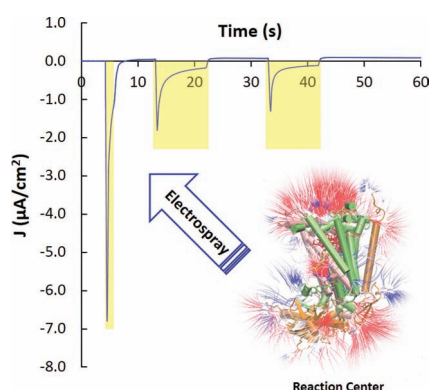


## Molecular Magnetism

V. Corradini, A. Ghirri, A. Candini, R. Biagi, U. del Pennino, V. De Renzi, G. Dotti, E. Otero, T. N. Hooper, R. Inglis, E. K. Brechin, M. Affronte\* .....4782–4788

Surface Investigation on  $\text{Gd}_4\text{M}_8$  ( $\text{M} = \text{Zn}, \text{Ni}$ ) Single Molecule Coolers

**Photoactive electrodes** are fabricated by electrospraying bacterial reaction centers on the surface of highly oriented pyrolytic graphite substrates. Photo-current densities of up to  $7 \mu\text{A cm}^{-2}$  are measured by using the reaction centers from *Rhodobacter sphaeroides* as the photoactive material.



## Electrospray

S. M. Mirvakili, J. E. Slota, A. R. Usugaocar, A. Mahmoudzadeh, D. Jun, M. N. Mirvakili, J. T. Beatty, J. D. W. Madden\* .....4789–4794

## Photoactive Electrodes Incorporating Electrosprayed Bacterial Reaction Centers



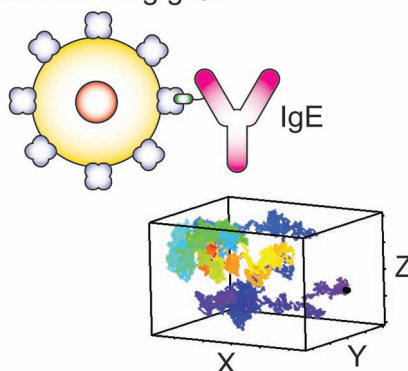
## FULL PAPERS

## Live Cell Imaging

A. M. Keller, Y. Ghosh, M. S. DeVore,  
M. E. Phipps, M. H. Stewart, B. S. Wilson,  
D. S. Lidke, J. A. Hollingsworth,\*  
J. H. Werner\* ..... 4796–4803

### 3-Dimensional Tracking of Non-blinking 'Giant' Quantum Dots in Live Cells

#### Non-Blinking gQD



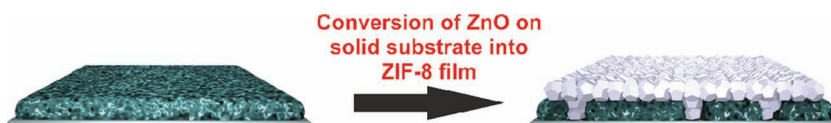
The bioconjugation of non-blinking 'giant' quantum dots to the IgE allergen receptor allows for extended 3D tracking of receptor dynamics in live cells. The extended tracking duration afforded by the stable quantum dot fluorescence emission allows the observation of heterogeneous diffusion occurring on long time scales for individual allergen receptors.

## Thin Films

K. Khaletskaya, S. Turner, M. Tu,  
S. Wannapaiboon, A. Schneemann,  
R. Meyer, A. Ludwig, G. Van Tendeloo,  
R. A. Fischer\* ..... 4804–4811

### Self-Directed Localization of ZIF-8 Thin Film Formation by Conversion of ZnO Nanolayers

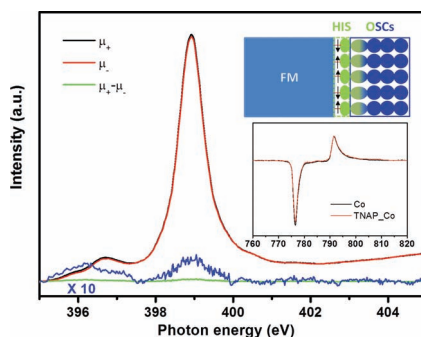
The self-template route for the manufacturing of ZIF-8 films on silicon (Si) and quartz crystal microbalance (QCM) substrates involves the pre-deposition of ZnO films prepared by sputtering or atomic layer deposition methods and the subsequent conversion of the immobilized ZnO phase into crystalline and homogeneously dense ZIF-8 films via microwave-assisted synthesis.



## Interfaces

S. Shi,\* Z. Sun, A. Bedoya-Pinto,  
P. Graziosi, X. Li, X. Liu, L. Hueso,  
V. A. Dediu, Y. Luo,  
M. Fahlman\* ..... 4812–4821

### Hybrid Interface States and Spin Polarization at Ferromagnetic Metal–Organic Heterojunctions: Interface Engineering for Efficient Spin Injection in Organic Spintronics

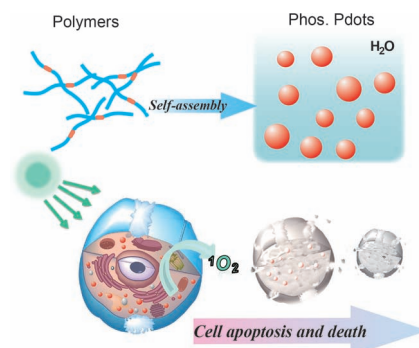


Hybrid interface states and spin polarization are observed at ferromagnetic metal (FM)–organic interfaces, which result from the chemical interaction and hybridization between the FM and the organic molecules. It provides a way for spintronic interface engineering in organic spintronics. This approach allows full control of the spin band appropriate for carrier injection, opening up new spintronic device concepts for future exploitation.

## Cancer Treatment

H. F. Shi, X. Ma, Q. Zhao, B. Liu,  
Q. Qu, Z. F. An, Y. L. Zhao,\*  
W. Huang\* ..... 4823–4830

### Ultrasmall Phosphorescent Polymer Dots for Ratiometric Oxygen Sensing and Photodynamic Cancer Therapy



Novel ultrasmall phosphorescent polymer dots are developed via the self-assembly of semiconducting Ir(III) complex-containing polyfluorene. The polymer dots serve as not only an optical probe for oxygen sensing, but also an efficient photosensitizer in photodynamic cancer therapy.

