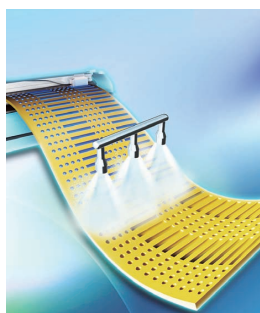


ADVANCED FUNCTIONAL MATERIALS

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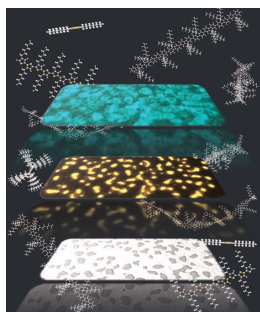
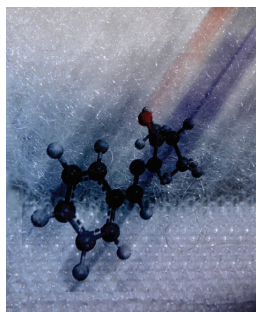


Inkjet Printing

A template-free strategy to fabricate concave microstructures by inkjet imprinting is demonstrated by Y. Song and co-workers on page 3286. A sacrificial ink is printed onto viscoelastic surfaces and imprints its shapes to construct microstructures. These results open a new way to fabricate concave microstructures and broaden their applications in material patterning.

Self-Healing Materials

“Dynamers”, i.e., highly reversible acylhydrazones, are introduced as crosslinkers for polymeric materials. As demonstrated by M. D. Hader, U. S. Schubert and co-workers on page 3295, this “molecular hook-and-loop faster” enables the design of self-healing polymers. Applied scratches can be completely healed.

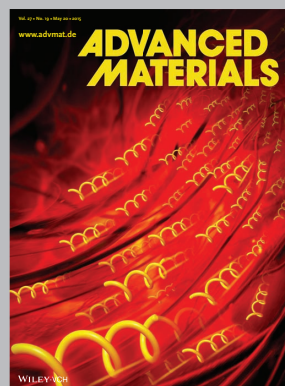
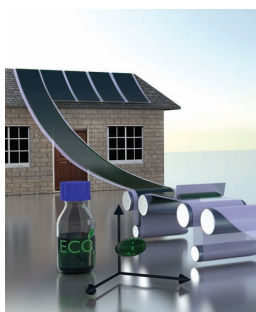


Metal Films

Physical and optical interactions between metal films and organic semiconductors underpin the functionality of many organic optoelectronic devices. As shown on page 3302 by Z. Shen and D. M. O'Carroll, disordered nanoporous silver thin films fabricated by thermally-assisted dewetting are used to influence the morphology and light-emitting properties of various conjugated polymers. Electromagnetic interactions are found to depend on pore size and porosity and on the intrinsic properties of the polymers.

Blade Coating

A five-step procedure to develop solvent systems for thin film photovoltaic materials is described on page 3393 by P. Heremans and co-workers. A combination of wettability studies, toxicological insights, and Hansen solubility parameters analysis lead to suitable inks. Organic photovoltaic devices are blade coated from several new diketopyrrolopyrrole-based inks, and achieve equal performance to those from halogenated solvents.



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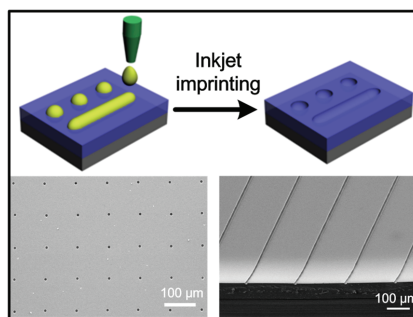
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FULL PAPERS

A template-free strategy to fabricate concave microstructures by inkjet imprinting is demonstrated. The sacrificial ink is printed onto viscoelastic surfaces and imprints its shapes to construct the microstructures. These results will open a new pathway to fabricate concave microstructures and broaden their applications in material patterning.

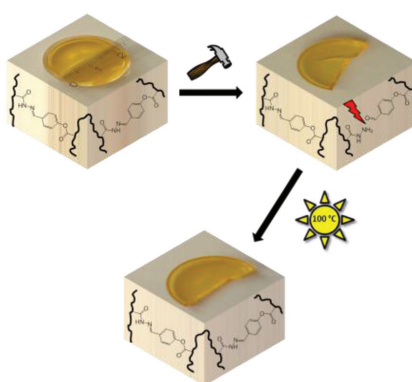


Inkjet Printing

B. Bao, J. Jiang, F. Li, P. Zhang, S. Chen, Q. Yang, S. Wang, B. Su, L. Jiang, Y. Song*3286–3294

Fabrication of Patterned Concave Microstructures by Inkjet Imprinting

Acylhydrazone crosslinked polymer films are synthesized by the copolymerization of a new acylhydrazone crosslinker with different commercially available methacrylates. The self-healing behavior of the damaged material is studied in detail with the help of differential scanning calorimetry, scratch testing experiments, profilometry, dynamic-mechanical thermal analysis, and temperature dependent FT-IR as well as solid state NMR measurements.

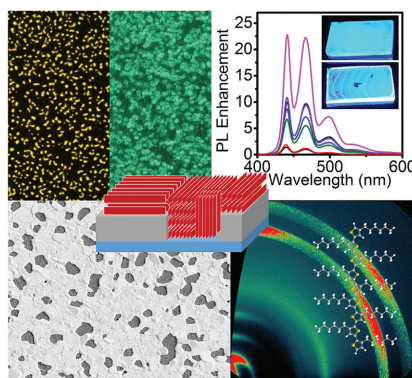


Self-Healing Materials

N. Kuhl, S. Bode, R. K. Bose, J. Vitz, A. Seifert, S. Hoeppe, S. J. Garcia, S. Spange, S. van der Zwaag, M. D. Hager,* U. S. Schubert*3295–3301

Acylhydrazones as Reversible Covalent Crosslinkers for Self-Healing Polymers

Nanoporous metal films are multifunctional platforms that affect both the morphology and emission properties of conjugated polymer layer coatings. Nanoporous silver can reorient and/or planarize a fraction of conjugated polymer molecules in the pores. Photoluminescence emission enhancements of up to 26 are possible from conjugated polymer layers using nanoporous silver instead of bare glass substrates.

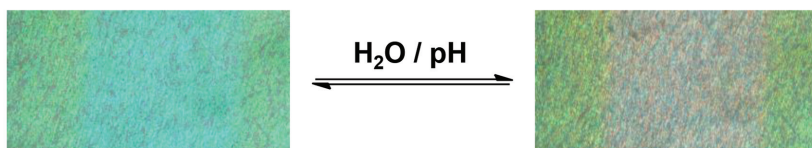


Metal Films

Z. Shen, D. M. O'Carroll*3302–3313

Nanoporous Silver Thin Films: Multifunctional Platforms for Influencing Chain Morphology and Optical Properties of Conjugated Polymers

Interpenetrating polymer networks which consist of cholesteric liquid crystals and hydrogels are prepared. These stimuli-responsive materials change color depending on the relative humidity or pH. In addition, patterned dual-responsive polymer films are created changing both topography and color.



Photonic Materials

J. E. Stumpel, E. R. Gil, A. B. Spoelstra, C. W. M. Bastiaansen, D. J. Broer,* A. P. H. J. Schenning*3314–3320

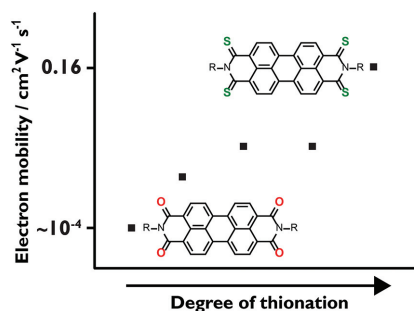
Stimuli-Responsive Materials Based on Interpenetrating Polymer Liquid Crystal Hydrogels

FULL PAPERS

Organic Electronics

A. J. Tilley, C. Guo, M. B. Miltenburg,
T. B. Schon, H. Yan, Y. Li,*
D. S. Seferos* 3321–3329

Thionation Enhances the Electron Mobility of Perylene Diimide for High Performance n-Channel Organic Field Effect Transistors

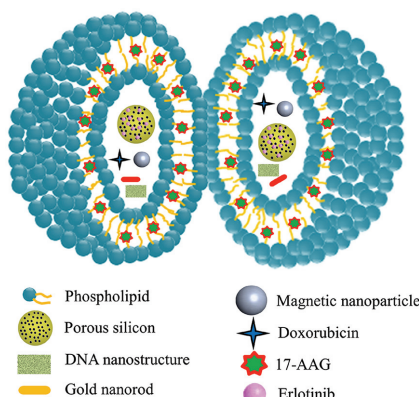


The effect of oxygen–sulfur atomic substitution (thionation) on the electron mobility of perylene diimide is investigated. Electron mobility correlates with the extent of thionation, with the highest mobilities obtained in solution processed nonannealed devices. This work shows that thionation is a promising strategy for boosting the electron mobility of perylene diimide derivatives.

Cancer Therapy

F. Kong, X. Zhang, H. Zhang, X. Qu,
D. Chen, M. Servos, E. Mäkilä,
J. Salonen, H. A. Santos, M. Hai,*
D. A. Weitz* 3330–3340

Inhibition of Multidrug Resistance of Cancer Cells by Co-Delivery of DNA Nanostructures and Drugs Using Porous Silicon Nanoparticles@Giant Liposomes

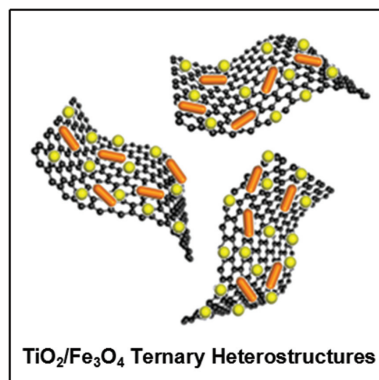


PSi NPs @ giant liposomes are fabricated on a microfluidic device to deliver simultaneously hydrophilic and hydrophobic drugs with synthesized DNA nanostructures. Gold nanorods and magnetic nanoparticles are introduced to the platform for stimuli responsiveness. This bio-compatible nano-in-micro platform holds great potential for a cocktail delivery of therapeutics for effective cancer therapy, controllable drug release, and photothermal and magnetic dual responsiveness.

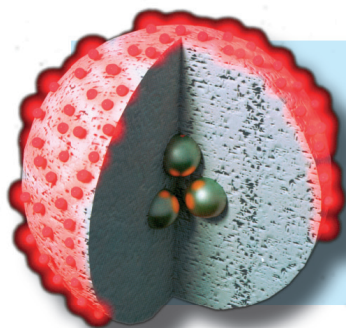
Energy Storage

L. Pan, X.-D. Zhu, X.-M. Xie,*
Y.-T. Liu* 3341–3350

Smart Hybridization of TiO₂ Nanorods and Fe₃O₄ Nanoparticles with Pristine Graphene Nanosheets: Hierarchically Nanoengineered Ternary Heterostructures for High-Rate Lithium Storage



A smart hybridization strategy is proposed for the hierarchical co-assembly of TiO₂ nanorods and Fe₃O₄ nanoparticles on pristine graphene nanosheets, aiming to simultaneously address the deficiencies of TiO₂ by coupling it with high-capacity (Fe₃O₄) and high-conductivity (pristine graphene) components. Benefiting from a remarkable synergy, the resulting novel, multifunctional ternary heterostructures deliver superior reversible capacities and rate capabilities, thus casting new light on developing advanced LIB anode materials.



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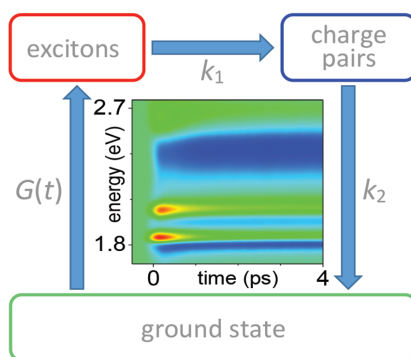
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FULL PAPERS

Few-layer MoS₂ flakes are intermediates between conventional semiconductors and excitonic nanomaterials. By femto-second optical pump–probe spectroscopy it is shown that photoexcitation creates excitons as the primary species. The excitons efficiently dissociate into charge carriers with a time constant of 700 fs, making few-layer MoS₂ an excellent candidate for efficient photodetectors and photovoltaic devices.

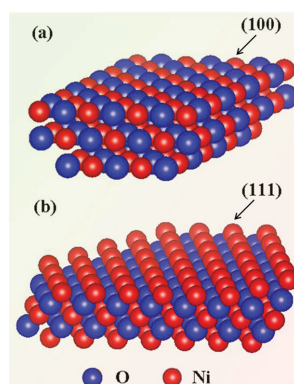


Semiconductors

T. Borzda,* C. Gadermaier,* N. Vujicic, P. Topolovsek, M. Borovsak, T. Mertelj, D. Viola, C. Manzoni, E. A. A. Pogna, D. Brida, M. R. Antognazza, F. Scotognella, G. Lanzani, G. Cerullo, D. Mihailovic.....3351–3358

Charge Photogeneration in Few-Layer MoS₂

In a **Li⁺-containing electrolyte**, Ni oxide can be bleached or colored under negative or positive potential bias from an initial state. The cation and anion from the electrolyte are co-responsible for the electrochromic effect. Electrochromic effect is a surface process and it is found that ion exchange is different on (100) and (111) surfaces.

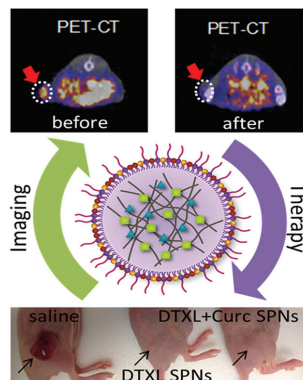


Electrochromism

R.-T. Wen,* C. G. Granqvist, G. A. Niklasson.....3359–3370

Anodic Electrochromism for Energy-Efficient Windows: Cation/Anion-Based Surface Processes and Effects of Crystal Facets in Nickel Oxide Thin Films

Spherical polymeric nanoconstructs (SPNs) are multifunctional nanoparticles designed for combinatorial therapy and disease management. The platform presented here is used to codeliver docetaxel, a strong antitumor drug, with curcumin as sensitizing agent. SPNs are labeled with ⁶⁴Cu for PET imaging to detect the delivery of SPNs and follow the therapy efficacy over time. This combinatorial approach is successful in glioblastoma xenograft mouse model.

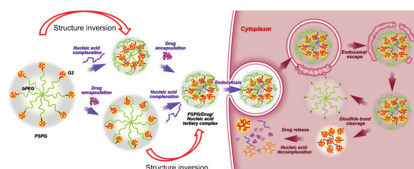


Chemosensitivity

C. Stigliano, J. Key, M. Ramirez, S. Aryal, P. Decuzzi*.....3371–3379

Radiolabeled Polymeric Nanoconstructs Loaded with Docetaxel and Curcumin for Cancer Combinatorial Therapy and Nuclear Imaging

Structure-invertible nanoparticles are developed for the triggered co-delivery of nucleic acids and hydrophobic drugs for combination cancer therapy in vivo. The co-delivery nanoparticle is able to lock loaded cargos through structure inversion, and release these cargos in the glutathione-rich reduction environment. The low cytotoxic structure-invertible nanoparticles may constitute a promising stimuli-responsive system for the efficacious co-delivery of multiple cargoes in future applications of combination therapies.



Drug Delivery

K. Wang, Q. Hu, W. Zhu, M. Zhao, Y. Ping,* G. Tang*.....3380–3392

Structure-Invertible Nanoparticles for Triggered Co-Delivery of Nucleic Acids and Hydrophobic Drugs for Combination Cancer Therapy

FULL PAPERS

Blade Coating

J. G. Tait, T. Merckx, W. Li, C. Wong,
R. Gehlhaar, D. Cheyns, M. Turbiez,
P. Heremans* 3393–3398

Determination of Solvent Systems for Blade Coating Thin Film Photovoltaics

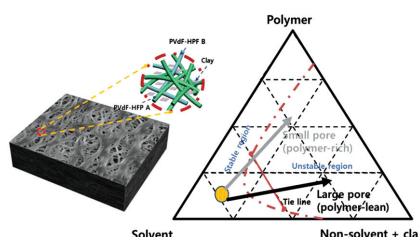


A five-step process to develop new solvent systems for thin film photovoltaic materials is presented. Suitable inks are determined via Hansen solubility parameters analysis and wettability studies. Several new solvent systems are presented for blade coating diketopyrrolopyrrole-based materials for organic photovoltaics, achieving >6% efficiency, equivalent to that with halogenated inks.

Energy Storage

M. Kim, J. K. Kim,
J. H. Park* 3399–3404

Clay Nanosheets in Skeletons of Controlled Phase Inversion Separators for Thermally Stable Li-Ion Batteries

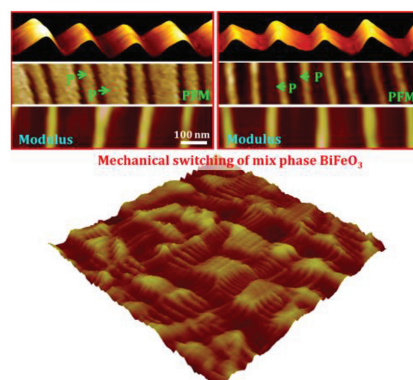


A straightforward route to solve the drawbacks of phase-inversion-based separators for Li-ion batteries is demonstrated by means of directly incorporating 2D clay sheets in the skeleton of poly(vinylidene fluoride-co-hexafluoropropylene) (PVdF-HFP) with multiscale pore generation from a simple one-step solution coating method.

Multiferroics

Y.-J. Li, J.-J. Wang, J.-C. Ye, X.-X. Ke,
G.-Y. Gou, Y. Wei, F. Xue, J. Wang,
C.-S. Wang, R.-C. Peng, X.-L. Deng,
Y. Yang, X.-B. Ren, L.-Q. Chen,
C.-W. Nan, J.-X. Zhang* 3405–3413

Mechanical Switching of Nanoscale Multiferroic Phase Boundaries

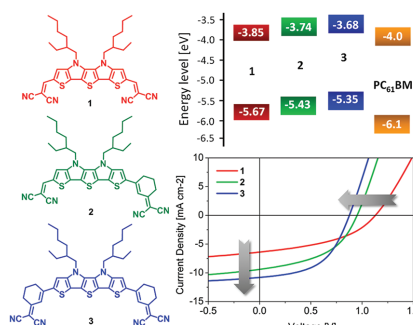


A pure mechanical control of the nanoscale multiferroic phase boundaries is achieved in mixed-phase BiFeO₃, which is attributed to pressure-induced elastic deformation and reconstruction of the spontaneous strain gradient across the boundaries. This demonstrates a new pathway to reversibly control the multiple ferroic orders such as ferroelectricity, ferroelasticity, and so on.

Solar Cells

H. Kast, A. Mishra,* G. L. Schulz,
M. Urdanpilleta, E. Mena-Osteritz,
P. Bäuerle* 3414–3424

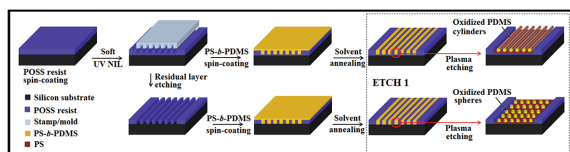
Acceptor-Substituted S,N-Heteropentacenes of Different Conjugation Length: Structure–Property Relationships and Solar Cell Performance



A new class of A–D–A-type molecular donor materials based on S,N-heteropentacene is developed for incorporation into solution-processed bulk heterojunction solar cells providing promising power conversion efficiencies of 3.1–4.9%. The extension of the π -system and increase in the highest occupied molecular orbital energy level provide direct correlation for the improved short circuit current (J_{SC}) and decreased open circuit voltage (V_{OC}) values.

FULL PAPERS

A methodology for fabricating highly ordered silicon nanostructures at a substrate is reported using nanoimprint lithography imprinted polyhedral oligomeric silsesquioxane (POSS) substrates for graphoeptaxial directed self-assembly (DSA) of block copolymer (BCP). The patterned POSS materials provide a surface chemistry and topography for DSA of a cylinder forming polystyrene-*block*-polydimethylsiloxane BCP with well-ordered microphase segregation upon solvent annealing.

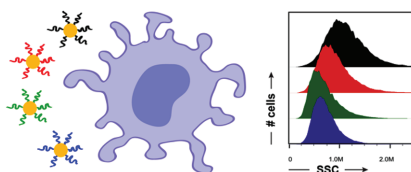


Directed Self-Assembly

D. Borah,* S. Rasappa, M. Salaun, M. Zellsman, O. Lorret, G. Lontos, K. Ntetsikas, A. Avgeropoulos, M. A. Morris*3425–3432

Soft Graphoeptaxy for Large Area Directed Self-Assembly of Polystyrene-*block*-Poly(dimethylsiloxane) Block Copolymer on Nanopatterned POSS Substrates Fabricated by Nanoimprint Lithography

Cellular uptake of gold nanoparticles depends on the hydrophilic-to-hydrophobic balance of the (co)polymer coating as shown by a novel flow cytometry strategy.



Flow Cytometry

Z. Zhang, K. Van Steendam, S. Maji, L. Balcaen, Y. Anoshkina, Q. Zhang, G. Vanluchene, R. De Rycke, F. Van Haecke, D. Deforce, R. Hoogenboom,* B. G. De Geest*3433–3439

Tailoring Cellular Uptake of Gold Nanoparticles Via the Hydrophilic-to-Hydrophobic Ratio of their (Co)polymer Coating

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