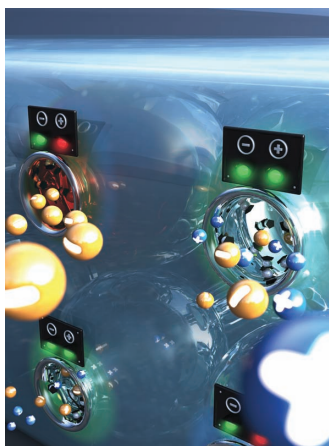


ADVANCED FUNCTIONAL MATERIALS

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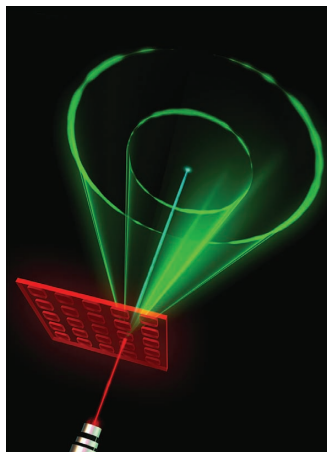


Thin Films

The control of ionic transport through nanometer-sized pores is described by M. Gallei, A. Brunsen, and co-workers. On page 1591, the charge of mesoporous silica membranes is controlled by the oxidation or reduction of redox-responsive ferrocene-containing polymers. Depending on the surface charge, mainly determined by the polymer oxidation state, positively or negatively charged test-molecules are able to diffuse into the pores or are excluded. Cover-Artwork by Criss Hohmann, Nanosystems Initiative Munich (NIM).

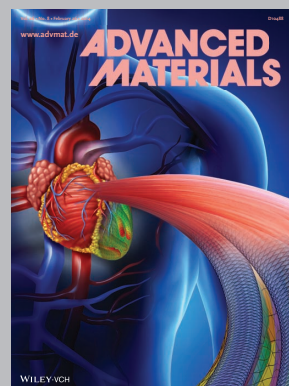
Ferroelectrics

The first example of a two-dimensional, nonlinear photonic crystal fabricated on an ultra-transparent ferroelectric fluoride crystal is demonstrated by M. O. Ramírez and co-workers via direct electron beam writing. On page 1509, up to three different Cerenkov-type second harmonic generation processes are distributed in a conical geometry and a highly efficient $\chi^{(3)}$ -UV-third harmonic generation is also demonstrated.



Defects

Beneath the surface of a topological insulator is the bulk region (represented by its band structure), whose conductance should be kept minimal. New reproducible tools are needed which do not interfere with the surface states. Such non-invasive measurements of the bulk electronic properties can be provided by NMR spectroscopy, as shown by L.-S. Bouchard and co-workers on page 1519, which probes the resonant coupling of nuclear spins to the electrons near the Fermi level. Cover credit goes to Charlotte Gomez.



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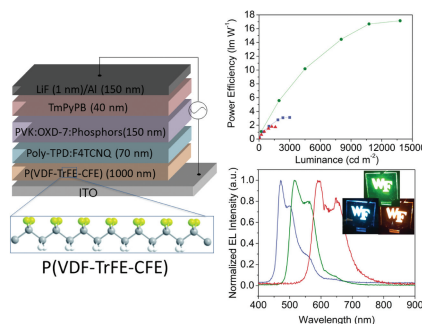
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FULL PAPERS

Thin Films

Y. Chen, Y. Xia, H. Sun,
G. M. Smith, D. Yang, D. Ma,*
D. L. Carroll* 1501–1508

Solution-Processed Highly Efficient Alternating Current-Driven Field-Induced Polymer Electroluminescent Devices Employing High- k Relaxor Ferroelectric Polymer Dielectric

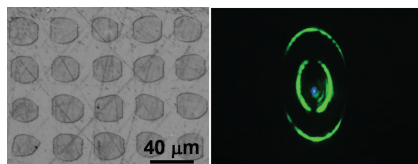


A solution-processed route to create highly efficient alternating current-driven, field-induced polymer EL (FIPEL) devices is demonstrated. Such device gives a maximum luminance, current efficiency, and power efficiency of 13 800 cd m⁻², 76.4 cd A⁻¹, and 17.1 lm W⁻¹. This is the largest improvement for FIPEL devices reported so far.

Ferroelectrics

L. Mateos, M. O. Ramírez,* I. Carrasco,
P. Molina, J. F. Galisteo-López,
E. G. Villora, C. de las Heras,
K. Shimamura, C. Lopez,
L. E. Bausá 1509–1518

BaMgF₄: An Ultra-Transparent Two-Dimensional Nonlinear Photonic Crystal with Strong $\chi^{(3)}$ Response in the UV Spectral Region

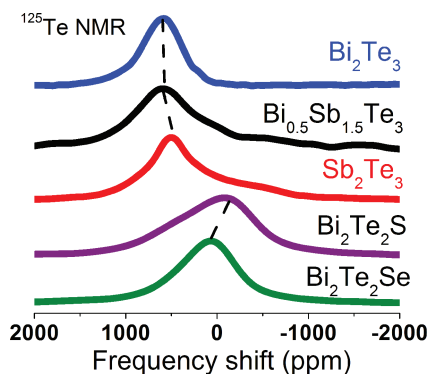


The ability of ultra-transparent barium magnesium fluoride ferroelectric crystal to operate as a two dimensional non-linear photonic crystal is demonstrated, from which different types of conical Cerenkov-second harmonic generation processes and highly efficient $\chi^{(3)}$ UV-third harmonic generation can be obtained.

Defects

D. Koumoulis, B. Leung, T. C. Chasapis,
R. Taylor, D. King Jr., M. G. Kanatzidis,
L.-S. Bouchard* 1519–1528

Understanding Bulk Defects in Topological Insulators from Nuclear-Spin Interactions

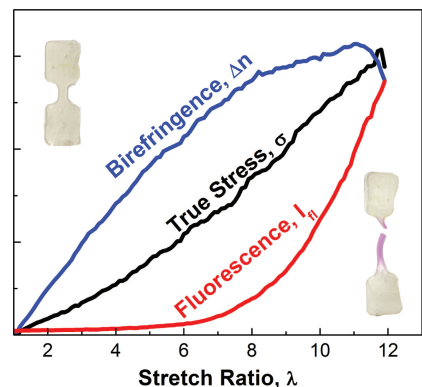


The role of bulk defects in topological insulators is investigated from the NMR standpoint. The NMR technique is validated against angle-resolved photoemission spectroscopy and transport measurements for the most commonly used binary and ternary topological insulators. Defect content is correlated with the NMR Knight shift and spin-lattice relaxation. NMR is a local probe which reports non-invasively on carrier concentration and dynamics.

Mechanochemistry

B. A. Beiermann, S. L. B. Kramer,
P. A. May, J. S. Moore, S. R. White,
N. R. Sottos* 1529–1537

The Effect of Polymer Chain Alignment and Relaxation on Force-Induced Chemical Reactions in an Elastomer

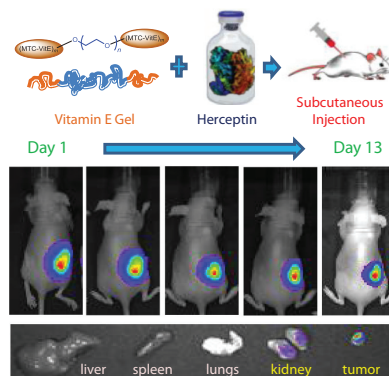


Simultaneous measurements of mechanical properties, birefringence and fluorescence images characterize the relationship between stress, polymer chain alignment, and activation of a force-sensitive chemical species centrally bonded into a polymer backbone.



FULL PAPERS

'ABA'-type triblock copolymers of vitamin E-functionalized polycarbonate and poly(ethylene glycol) are synthesized and employed to form injectable hydrogels for local and sustained delivery of Herceptin. Biodistribution and antitumor efficacy studies suggest that this hydrogel has great potential for use in subcutaneous and sustained delivery of antibodies to increase therapeutic efficacy and/or improve patient compliance.

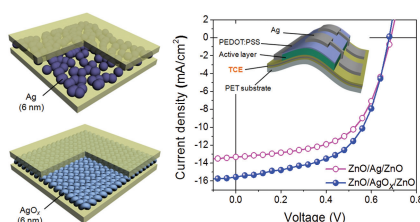


Drug Delivery

A. L. Z. Lee, V. W. L. Ng, S. Gao,
J. L. Hedrick,* Y. Y. Yang*1538–1550

Injectable Hydrogels from Triblock Copolymers of Vitamin E-Functionalized Polycarbonate and Poly(ethylene glycol) for Subcutaneous Delivery of Antibodies for Cancer Therapy

An ultrathin-film-type oxygen-doped silver conducting electrode, which is significantly more transparent than, but as conductive as, silver, provides a power conversion efficiency of 6.34% from a highly flexible inverted organic solar cell.

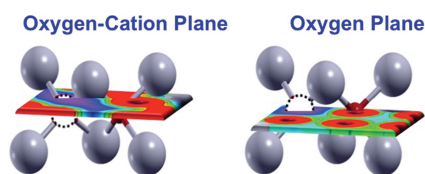


Organic Solar Cells

W. Wang, M. Song,* T.-S. Bae,
Y. H. Park, Y.-C. Kang, S.-G. Lee,
S.-Y. Kim, D. H. Kim, S. Lee, G. Min,
G.-H. Lee, J.-W. Kang,*
J. Yun*1551–1561

Transparent Ultrathin Oxygen-Doped Silver Electrodes for Flexible Organic Solar Cells

Electro-chemo-mechanic coupling is investigated for ionic conducting ceria-based materials. The impact of lattice strain on the near order characteristics and ionic conductivity is experimentally studied for bulk pellets and thin films. Density functional theory computation reveals an increase in migration energy and consequent drop in ionic conductivity, observed for lattice strains of up to 2% in doped ceria thin films.

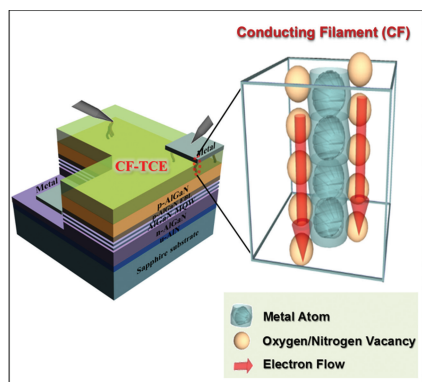


Thin Films

J. L. M. Rupp,* E. Fabbri, D. Marrocchelli,
J. W. Han, D. Chen, E. Traversa,
H. L. Tuller, B. Yildiz1562–1574

Scalable Oxygen-Ion Transport Kinetics in Metal-Oxide Films: Impact of Thermally Induced Lattice Compaction in Acceptor Doped Ceria Films

A universal method of producing transparent conductive electrodes (TCEs) with high conductivity and high optical transmittance in the UV regimes is presented using electrical breakdown to form conducting filaments (CFs) providing a current path between the TCEs and the semiconductor, which leads to a direct Ohmic contact to $p\text{-Al}_{0.5}\text{Ga}_{0.5}\text{N}$ layer as well as high optical transmittance of over 95% at 250 nm.



Transparent Conductive Electrodes

H.-D. Kim, H.-M. An, K. H. Kim,
S. J. Kim, C. S. Kim, J. Cho, E. F. Schubert,
T. G. Kim*1575–1581

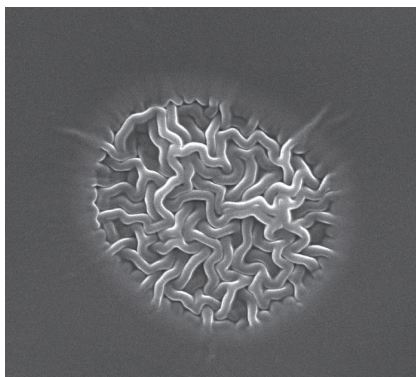
A Universal Method of Producing Transparent Electrodes Using Wide-Bandgap Materials

FULL PAPERS

Crystal Engineering

G. Di Profio,* M. Polino, F. P. Nicoletta,
B. D. Belviso, R. Caliendo,
E. Fontananova, G. De Filpo,
E. Curcio, E. Drioli..... 1582–1590

Tailored Hydrogel Membranes for Efficient Protein Crystallization

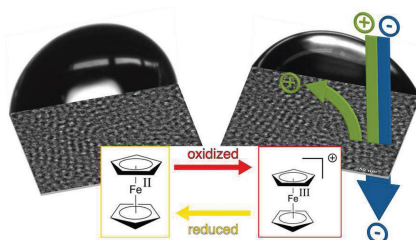


Composite membranes supporting a homogeneous hydrogel layer, with tailored chemical composition, nano-architecture (mesh size), and selected morphologies, are fabricated and tested for protein crystallization. As such, the general advantages of gel and membrane-assisted crystallization are combined to produce crystals displaying enhanced diffraction features at lower protein concentration with respect to conventionally grown crystals.

Thin Films

J. Elbert, F. Krohm, C. Rüttiger,
S. Kienle, H. Didzoleit, B. N. Balzer,
T. Hugel, B. Stühn, M. Gallei,*
A. Brunsen*..... 1591–1601

Polymer-Modified Mesoporous Silica Thin Films for Redox-Mediated Selective Membrane Gating

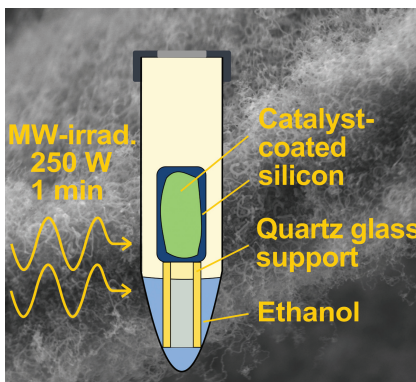


Mesoporous silica thin films are combined with redox-responsive ferrocene-containing polymers. The influence of chemical oxidation on the ionic accessibility shows a redox-controlled membrane gating as function of polymer location and pH value. This is a first step towards a redox-controlled ionic transport through nanopores, and thus towards fast, reversible, and external control of charge-selective membrane gating.

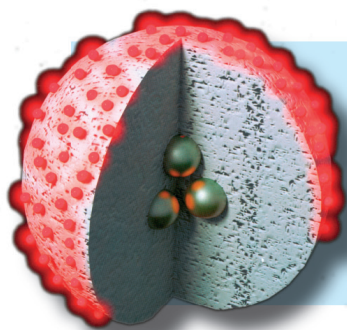
Carbon Nanofibers

A. M. Schwenke, S. Stumpf,
S. Hoepfner,*
U. S. Schubert 1602–1608

Free-Standing Carbon Nanofibrous Films Prepared by a Fast Microwave-Assisted Synthesis Process



A fast microwave-assisted synthesis for the fabrication of square centimeter large free-standing carbon nanofibrous (CNF) films is reported. The obtained CNF coatings are about 10 μm thin and exhibit a good stability and partial self-delamination from the substrate, which enables their detachment from the substrate without the need for further treatment. Morphologic investigations by scanning electron microscopy and a growth model are presented.



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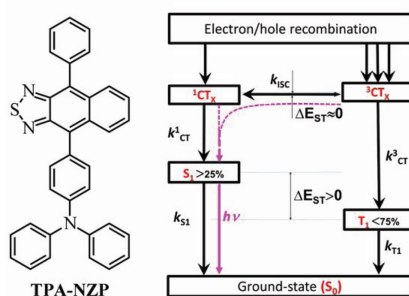
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FULL PAPERS

A hybridized local and charge-transfer state character—identified based on solvatochromic effects, lifetime measurements, and DFT calculations—endows twisting donor–acceptor triphenylamine-thiadiazol molecules (TPA-NZP) with a high singlet ratio of nearly 100% in OLEDs. Electroluminescent decay analysis and negative magnetic-field effects indicate that the reason for the high singlet ratio could be the reverse intersystem crossing (RISC) process in the high-lying charge transfer (CT)_x state

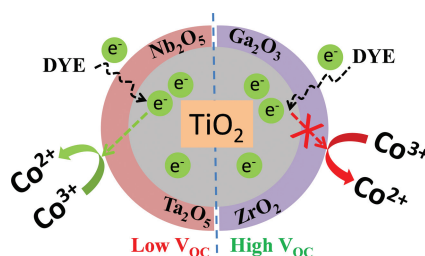


OLEDs

W. J. Li, Y. Y. Pan, R. Xiao, Q. M. Peng,
S. T. Zhang, D. G. Ma, F. Li, F. Z. Shen,
Y. H. Wang, B. Yang,*
Y. G. Ma*1609–1614

Employing ~100% Excitons in OLEDs by Utilizing a Fluorescent Molecule with Hybridized Local and Charge-Transfer Excited State

It is shown that not all the insulating layers can block the electron recombination in dye-sensitized solar cells. The blocking properties are analyzed with four different insulating oxides deposited by atomic layer deposition, and the recombination properties are investigated in detail.

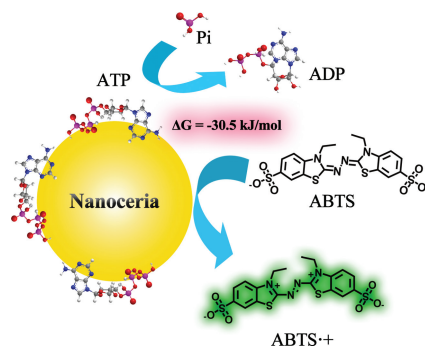


Photovoltaic Devices

A. K. Chandiran, M. K. Nazeeruddin,*
M. Grätzel*1615–1623

The Role of Insulating Oxides in Blocking the Charge Carrier Recombination in Dye-Sensitized Solar Cells

Nucleoside triphosphates (NTPs) can improve the oxidase-like activity of nanoceria and the enhancement is correlated with the type of NTP. Accordingly, series effective and high-throughput colorimetric assays for single-nucleotide polymorphism (SNP) typing are developed.

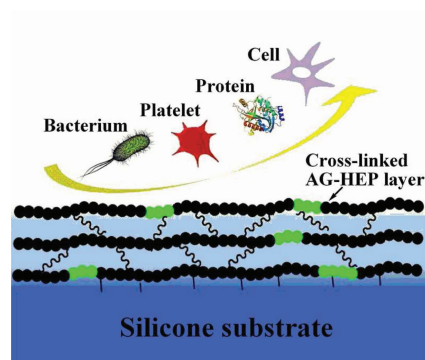


Nucleoside Triphosphates

C. Xu, Z. Liu, L. Wu, J. Ren,
X. Qu*1624–1630

Nucleoside Triphosphates as Promoters to Enhance Nanoceria Enzyme-like Activity and for Single-Nucleotide Polymorphism Typing

The surface modification of silicone with a microscale crosslinked agarose (AG)–heparin (HEP) layer is described. This natural polymer coating reduces biofilm formation by both Gram-positive and Gram-negative bacteria by more than two orders of magnitude. In addition, the coating is highly stable, and has excellent antifouling and hemocompatible properties, as well as low cytotoxicity.



Antibacterials

M. Li, K.-G. Neoh,* E.-T. Kang, T. Lau,
E. Chiong1631–1643

Surface Modification of Silicone with Covalently Immobilized and Crosslinked Agarose for Potential Application in the Inhibition of Infection and Omental Wrapping