

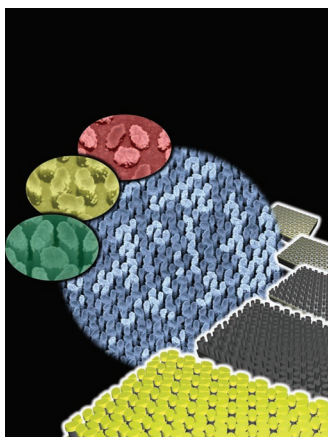
ADVANCED FUNCTIONAL MATERIALS

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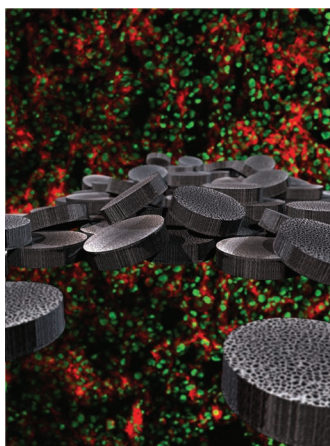
Drug Delivery

Porous silicon (pSi) disks, rendered from a scanning electron microscopy (SEM) image, are shown on the background of an immuno-histochemistry fluorescent microscopy image from a breast tumor. On page 4225, Biana Godin, Xuewu Liu, and co-workers describe the microfabrication of discoidal pSi nanoparticles with precisely controlled morphologies made by direct photolithographic patterning and demonstrate the geometry-dependent, preferable accumulation of the pSi disks over spherical nanoparticles in orthotopic murine models of breast cancer.



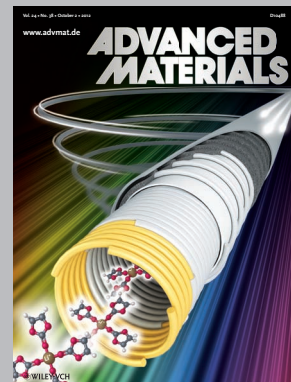
Anisotropic Particles

On page 4334 Ning Wu and co-workers report the assembly of geometrically anisotropic particles—colloidal dimers using external electric fields. Both the orientation and the packing of the non-spherical particles can be controlled reversibly. This study shows promise towards fabricating 3D photonic crystals based on non-spherical particles and electric-field-actuated displays.



Silicon Nanowires

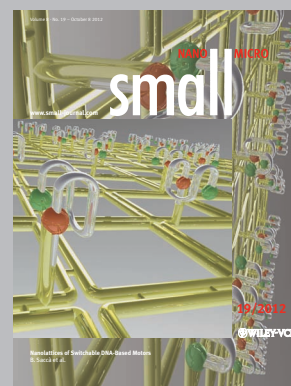
On page 4268, Seung-Man Yang and co-workers report the fabrication of unprecedentedly coordinated Au-capped elliptical silicon nanowire arrays for sensing applications using prism holographic lithography. Depending on the vertical gap distance, which is a function of the catalytic wet etching time, the resulting hybrid structures exhibit tunable optical properties. Furthermore, highly enhanced surface-enhanced Raman scattering (SERS) and fluorescence signals can be derived from the structural effects with large-scale sample homogeneity.



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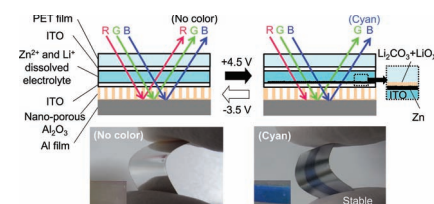
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FULL PAPERS

Flexible Electronics

S. Hirata,* T. Tsuji, Y. Kato,
C. Adachi*4195–4201

Reversible Coloration Enhanced by Electrochemical Deposition of an Ultrathin Zinc Layer onto an Anodic Nanoporous Alumina Layer

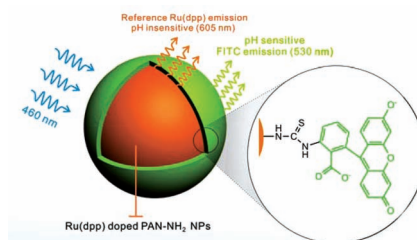


Reversible electronic coloration and decoloration triggered by electrochemical deposition and desorption, respectively, of an ultrathin zinc layer on indium tin oxide coated anodic nanoporous alumina is demonstrated. The electrochemically deposited zinc layer triggers destructive interference at a specific wavelength, producing coloration. Recorded static images are not destroyed by heating or strong UV light when the power is off. Reversible coloration and decoloration of cyan, magenta, and yellow are achieved by changing the alumina layer thickness.

Polymer Nanoparticles

X.-d. Wang,* R. J. Meier,
O. S. Wolfbeis*4202–4207

A Fluorophore-Doped Polymer Nanomaterial for Referenced Imaging of pH and Temperature with Sub-Micrometer Resolution

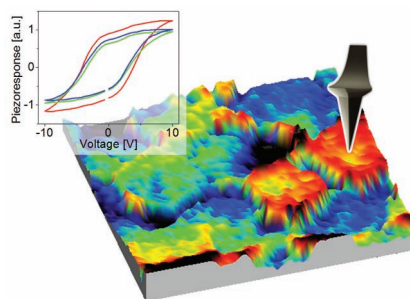


The use of core/shell structure dye-doped polymer nanoparticles in sensor films with pH and temperature sensing capabilities enables imaging of pH and temperature values with excellent spatial resolution. The new material enables referenced and temperature-compensated pH imaging with superior spatial resolution due to the use of nanosized sensor nanoparticles.

Ceramics

R. Dittmer, W. Jo, J. Rödel, S. Kalinin,
N. Balke*4208–4215

Nanoscale Insight Into Lead-Free BNT-BT-xKNN

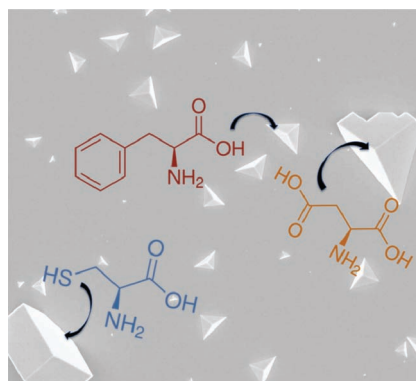


Ferroelectric switching on the nano-scale in $\text{Bi}_{1/2}\text{Na}_{1/2}\text{TiO}_3$ (BNT)- BaTiO_3 (BT) lead-free ceramics is characterized using a scanning probe microscopy tip. For a densely spaced grid, ferroelectric switching hysteresis is measured at single points and analyzed with respect to the switchable polarization. In the resulting switching polarization map, individual grains can be distinguished. Ferroelectric switching loops are extracted from several grains and compared.

Biominerallization

S. Borukhin, L. Bloch, T. Radlauer,
A. H. Hill, A. N. Fitch,
B. Pokroy*4216–4224

Screening the Incorporation of Amino Acids into an Inorganic Crystalline Host: the Case of Calcite

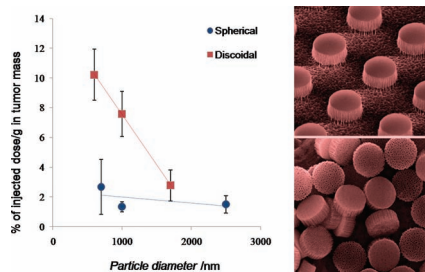


Identification of the amino acids that become incorporated into a calcite inorganic crystal host is studied systematically by growing calcite in the presence of the twenty common amino acids. Synchrotron high-resolution powder diffraction and analytical chemistry is performed to unravel this important question. The new insights gained are expected to have an impact on biomineralization and on hybrid materials and interfaces in general.



FULL PAPERS

A microfabrication strategy for direct lithographic patterning of discoidal porous silicon particles is presented that enables precise and independent control over particle size, shape, and porosity. The accumulation of the selected discoidal nanovectors into the breast tumor mass is up to five times higher than for spherical silica beads with similar diameters, as predicted by the rational design maps.

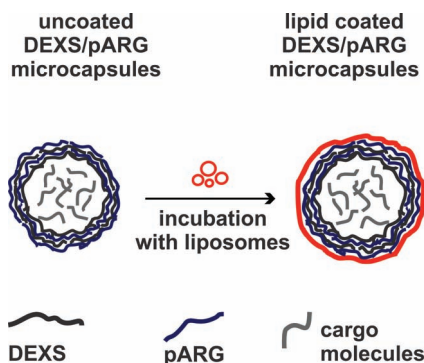


Drug Delivery

B. Godin,* C. Chiappini, S. Srinivasan, J. F. Alexander, K. Yokoi, M. Ferrari, P. Decuzzi, X. Liu*4225–4235

Discoidal Porous Silicon Particles: Fabrication and Biodistribution in Breast Cancer Bearing Mice

Surface-functionalized polyelectrolyte microcapsules are of interest for the simultaneous delivery of antigens and immunopotentiators for vaccination. Layer-by-layer (LbL) assembled dextran sulfate/poly-L-arginine microcapsules grafted at the surface with immunomodulating lipids by incubation with liposomes are presented. Their effect on dendritic cells shows the feasibility to deliver lipophilic immunopotentiators by LbL capsules to enhance and steer the type of immune response.

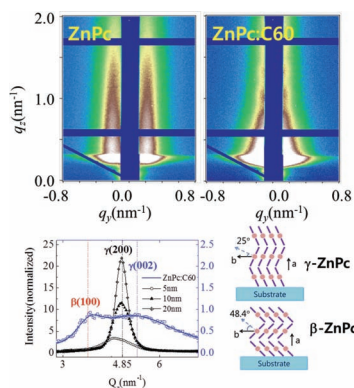


Microparticles

M.-L. De Temmerman, J. Rejman, B. Lucas, R. E. Vandenbroucke, C. Libert, J. Demeester, S. C. De Smedt*4236–4243

Modulation of Dendritic Cells by Lipid Grafted Polyelectrolyte Microcapsules

The nanostructure of a ZnPc:C60 bulk heterojunction is analyzed by GI-SAXS (grazing incidence small angle X-ray scattering) measurements and model calculations. The ellipsoid-type ZnPc nanograins remain the same shape when C60 is incorporated and have a very flat surface. The incorporation of C60 affects the molecular staking of ZnPc, which results in the formation of a $\beta(100)$ phase.

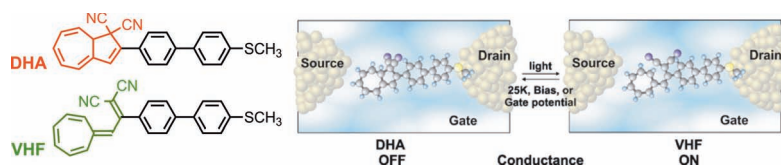


Solar Cells

H. J. Kim,* J. W. Kim, H. H. Lee,* B. Lee, J.-J. Kim*4244–4248

Initial Growth Mode, Nanostructure, and Molecular Stacking of a ZnPc:C60 Bulk Heterojunction

A dihydroazulene (DHA) photoswitch containing one methylsulfide anchoring group is synthesized and placed by sublimation in a silver nanogap. Conductance measurements show that transport through the molecule goes by sequential tunneling (weak coupling to one electrode). Reversible switching between DHA (OFF) and its vinylheptafulvene isomer (VHF; ON) is successfully controlled by gate voltage, bias voltage, temperature, and light.



Molecular Electronics

S. L. Broman, S. Lara-Avila, C. L. Thisted, A. D. Bond, S. Kubatkin, A. Danilov,* M. B. Nielsen*4249–4258

Dihydroazulene Photoswitch Operating in Sequential Tunneling Regime: Synthesis and Single-Molecule Junction Studies

FULL PAPERS

Biomimetics

B. Stidder, J. P. Alcaraz, L. Liguori,
N. Khalef, A. Bakri, E. B. Watkins,
P. Cinquin, D. K. Martin*4259–4267

**Biomimetic Membrane System
Composed of a Composite
Interpenetrating Hydrogel Film and a
Lipid Bilayer**

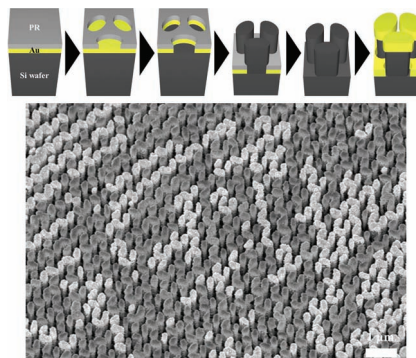


An interpenetrating hydrogel (IPH) is produced by combining a layer-by-layer polyelectrolyte membrane with agarose. The formed IPH membrane is more robust and easily manipulated and facilitates the adsorption of a stable lipid bilayer. The stable adsorption of a lipid bilayer on the IPH creates a biomimetic membrane system that is optimized for utilization in a diffusion chamber.

Surfaces

H. C. Jeon, C.-J. Heo, S. Y. Lee,
S.-M. Yang*4268–4274

**Hierarchically Ordered Arrays of
Noncircular Silicon Nanowires Featured
by Holographic Lithography Toward a
High-Fidelity Sensing Platform**

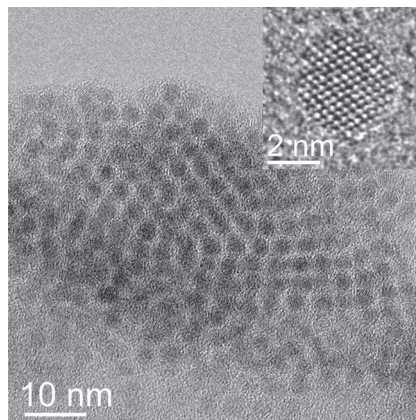


Novel uniform arrays of triangularly coordinated three Au-capped elliptical silicon nanowires can be fabricated over large areas using prism holographic lithography. The resulting hybrid structures exhibit tunable optical properties that depend on the vertical gap distance, which is a function of the catalytic wet etching time, and show highly enhanced surface-enhanced Raman scattering (SERS) signals derived from the lateral interparticle coupling. Intensified fluorescent intensity can be achieved via the combination of this technique with conventional photolithography.

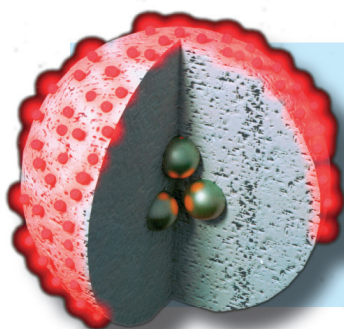
Nanoparticles

X. Bai, A. Pucci, V. T. Freitas,
R. A. S. Ferreira,*
N. Pinna*4275–4283

**One-Step Synthesis and Optical
Properties of Benzoate- and
Biphenolate-Capped ZrO_2
Nanoparticles**



A simple one-pot nonaqueous sol-gel approach is used for the preparation of gram quantities of benzoate- and biphenolate-capped zirconia and, benzoate-capped Eu-doped zirconia nanoparticles. The as-synthesized nanoparticles exhibit interesting emission properties in the UV, blue, and red spectral regions. Tunable emission is obtained by simply selecting different excitation wavelengths.



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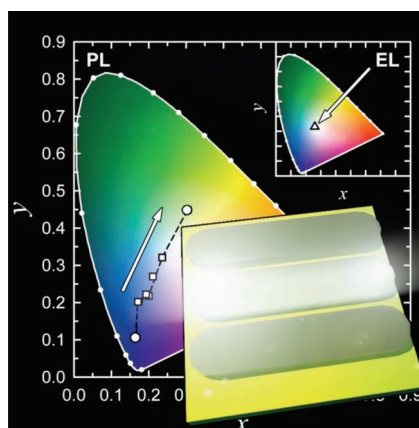
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FULL PAPERS

Blends of a blue-emitting polymer and a green/yellow-emitting threaded molecular wire emit white luminescence due to control of the minimum intermolecular distance at the nanoscale, which results in suppressed energy transfer between the blend constituents and reduced formation of interchain charge-transfer complexes. Light-emitting diodes incorporating only 20% by weight of the encapsulated material display white electroluminescence with a turn-on voltage of just 3 V.

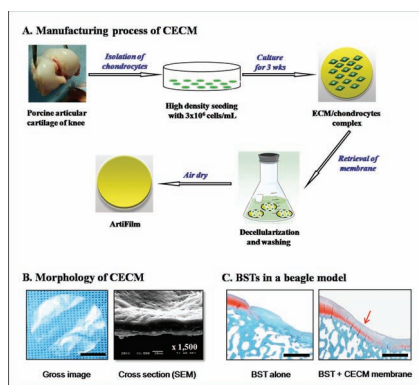


Light-Emitting Diodes

S. Brovelli, G. Sforazzini, M. Serri, G. Winroth, K. Suzuki, F. Meinardi, H. L. Anderson,*
F. Cacialli*4284–4291

Emission Color Trajectory and White Electroluminescence Through Supramolecular Control of Energy Transfer and Exciplex Formation in Binary Blends of Conjugated Polyrotaxanes

Cartilage extracellular matrix (CECM) membrane is fabricated naturally from the porcine chondrocytes and decellularized to remove cellular components. It is thin (30–60 μm) and semitransparent in appearance, but has a good tensile strength (85.6 N) to protect blood clots after bone marrow stimulation techniques (BSTs) for cartilage regeneration, as shown in a beagle model.

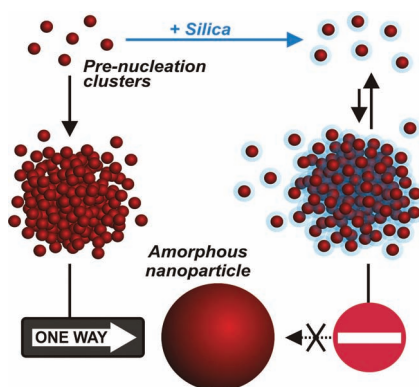


Biomedical Applications

T. Z. Li, C. Z. Jin, B. H. Choi, M. S. Kim, Y. J. Kim, S. R. Park, J. H. Yoon, B.-H. Min*4292–4300

Using Cartilage Extracellular Matrix (CECM) Membrane to Enhance the Reparability of the Bone Marrow Stimulation Technique for Articular Cartilage Defect in Canine Model

Under suitable conditions, added silica binds to ion clusters that exist in CaCO_3 solutions prior to nucleation. The resulting colloidal interactions can be tuned to either fully prevent nucleation and isolate the clusters or allow for their gradual transformation into amorphous nanoparticles. The processes underlying homogeneous nucleation of CaCO_3 become decelerated and can be observed experimentally.

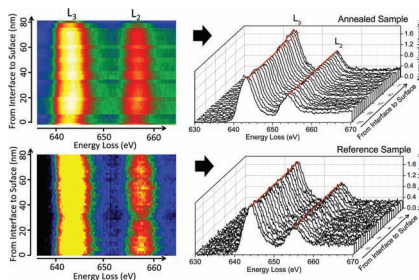


Phase Transitions

M. Kellermeier, D. Gebauer, E. Melero-García, M. Drechsler, Y. Talmon, L. Kienle, H. Cölfen,*
J. M. García-Ruiz, W. Kunz* ...4301–4311

Colloidal Stabilization of Calcium Carbonate Prenucleation Clusters with Silica

During film growth, oxygen vacancies modify the cation stoichiometry in pulsed laser deposited $\text{La}_{0.8}\text{Sr}_{0.2}\text{MnO}_3$ films. Mn is partially substituted by La/Sr cations near strained interfaces, leading to a gradient in the Mn nominal valence along the film growth direction. Without elimination of oxygen vacancies during growth, anomalous magnetic properties will prevent the controlled fabrication of spintronic devices.



Thin Films

Z. P. Li, M. Bosman,* Z. Yang, P. Ren, L. Wang, L. Cao, X. Yu, C. Ke, M. B. H. Breese, A. Rusydi, W. G. Zhu,*
Z. Dong,* Y. L. Foo*4312–4321

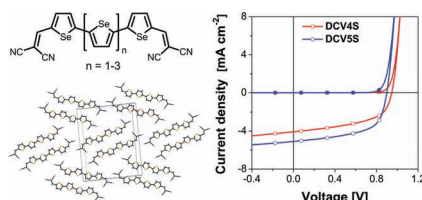
Interface and Surface Cation Stoichiometry Modified by Oxygen Vacancies in Epitaxial Manganite Films

FULL PAPERS

Structure–Property Relationships

S. Haid, A. Mishra,* M. Weil,
C. Uhrich, M. Pfeiffer,
P. Bäuerle*4322–4333

**Synthesis and Structure–Property
Correlations of Dicyanovinyl-
Substituted Oligoselenophenes and
their Application in Organic Solar Cells**

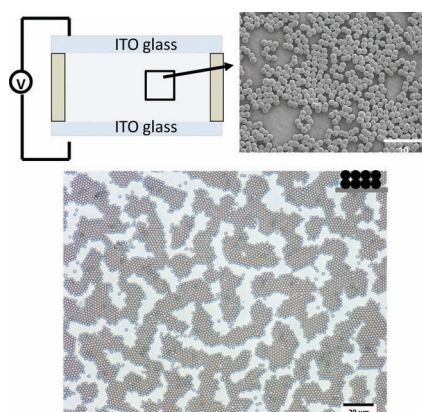


Trends in the thermal and optoelectronic properties of a series of dicyanovinyl-substituted oligoselenophenes are studied and compared to corresponding thiophene analogs. X-ray structure analysis corroborates the importance of the dicyanovinyl acceptor groups for the molecular ordering. These oligomers show efficiencies as high as 3.4% in vacuum-processed planar heterojunction solar cells.

Self Assembly

F. Ma, S. Wang, L. Smith,
N. Wu*4334–4343

**Two-Dimensional Assembly of
Symmetric Colloidal Dimers under
Electric Fields**

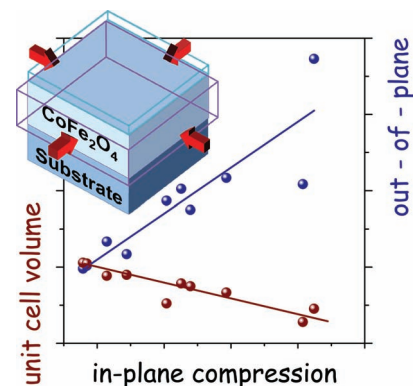


Monodisperse colloidal dimers are synthesized and their assembly is studied under an electric field. The electric torque aligns colloidal dimers to stand on the conducting substrate, while electrohydrodynamic flow induces the standing dimers to form two-dimensional crystals.

Thin Films

M. Foerster, M. Iliev, N. Dix, X. Martí,
M. Barchuk, F. Sánchez,
J. Fontcuberta*4344–4351

**The Poisson Ratio in CoFe_2O_4 Spinel
Thin Films**



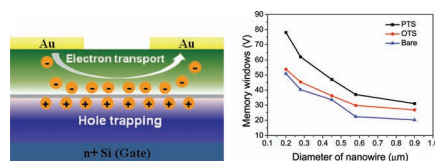
The response of CoFe_2O_4 thin films to epitaxial compressive stress is studied. It is found that the unit cell expands in the perpendicular direction, signaling a non-auxetic behavior, but not enough to conserve the unit cell volume. The Poisson ratio is in agreement with expectations based on general arguments of atomic packing density but smaller than theoretical predictions.

Transistors

Y.-H. Chou, W.-Y. Lee,
W.-C. Chen*4352–4359

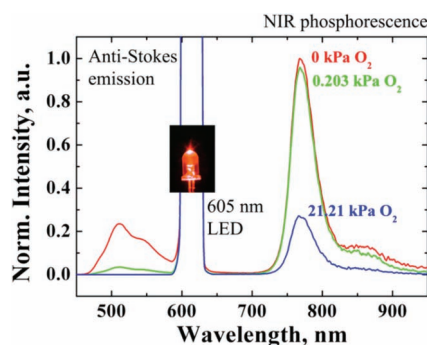
**Self-Assembled Nanowires of Organic
n-Type Semiconductor for Nonvolatile
Transistor Memory Devices**

Organic n-channel N,N' -bis(2-phenylethyl)-perylene-3,4:9,10-tetracarboxylic diimide (BPI-PTCDI) nanowire based nonvolatile organic field-effect transistor (OFET) memory devices exhibit significantly larger memory windows than those of thin films. The memory windows are enhanced with a smaller nanowire diameter or a more hydrophobic self-assembled monolayer. The potential applications of organic semiconducting nanowires for advanced transistor memory devices are revealed.



FULL PAPERS

Novel optical oxygen sensors based on triplet–triplet annihilation enable an unmatched sensitivity range from trace oxygen quantities to concentrations exceeding air saturation. This is possible because of dual emission in the green and near-infrared part of the spectrum upon excitation with red light.

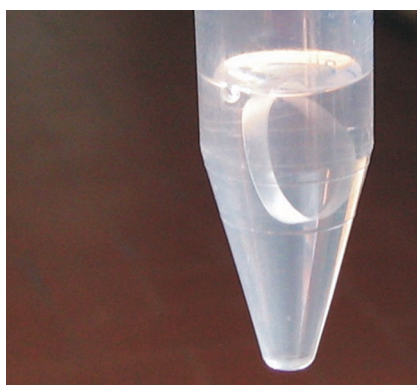


Luminescence

S. M. Borisov,* C. Larndorfer,
I. Klimant.....4360–4368

Triplet–Triplet Annihilation-Based Anti-Stokes Oxygen Sensing Materials with a Very Broad Dynamic Range

The evaporation method is used to prepare a well-functioning single-walled-carbon-nanotube (SWCNT)-based saturable absorber for an ultrafast Nd:glass laser. The slow evaporation of the SWCNT dispersion allows a good nanotube alignment to be obtained on the quartz substrate, avoiding the use of polymers.

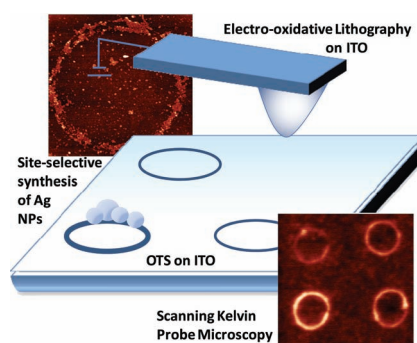


Carbon Nanotubes

S. Ferrari, M. Bini, D. Capsoni,
P. Galinetto, M. S. Grandi, U. Griebner,
G. Steinmeyer, A. Agnesi, F. Pirzio,
E. Ugolotti, G. Reali,
V. Massarotti*4369–4375

Optimizing Single-Walled-Carbon-Nanotube-Based Saturable Absorbers for Ultrafast Lasers

Chemically active nanostructures are created on transparent *n*-octadecyltrichlorosilane coated indium tin oxide substrates by electro-oxidative probe lithography. In addition to being a study of diamond substrates, this is the first example that the tip-mediated oxidation process can be performed on substrates other than silicon. Detailed comparative studies of the oxidation process by the site-selective, template-mediated synthesis of nanoparticles and scanning Kelvin probe microscopy reveal the similarity of the oxidation processes.

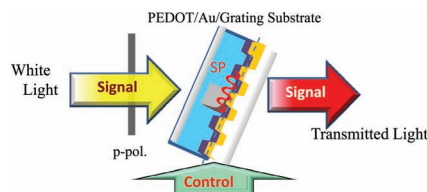


Surface Modification

D. Meroni, S. Ardizzzone, U. S. Schubert,
S. Hoeppener*4376–4382

Probe-Based Electro-Oxidative Lithography of OTS SAMs Deposited onto Transparent ITO Substrates

Surface plasmon resonance (SPR)-enhanced optical transmission is actively controlled by an electrochromism of conducting polymer thin films. The transmission SPR system is combined with an electrochemical setup to manipulate the resonance. The study of controllable SPR-enhanced optical transmission provides a pathway toward novel active plasmonic devices such as active band pass filters or biosensors.



Conducting Polymers

A. Baba,* K. Tada, R. Janmanee,
S. Sriwichai, K. Shinbo,
K. Kato, F. Kaneko,
S. Phanichphant4383–4388

Controlling Surface Plasmon Optical Transmission with an Electrochemical Switch Using Conducting Polymer Thin Films

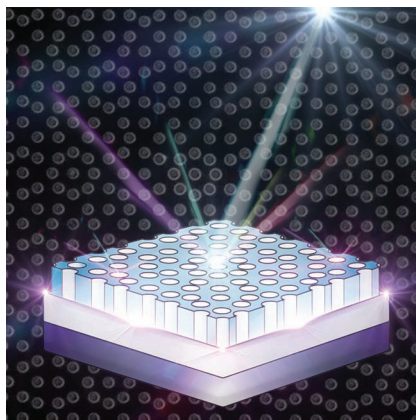
FULL PAPER

Plasmonics

A. Crescitelli, A. Ricciardi, M. Consales,
E. Esposito,* C. Granata, V. Galdi,
A. Cutolo, A. Cusano*.....4389–4398



**Nanostructured Metallo-Dielectric
Quasi-Crystals: Towards Photonic-
Plasmonic Resonance Engineering**



When illuminated by normally incident light, hybrid metallo-dielectric quasi-crystal nanostructures composed of metal-backed dielectric layers, aperiodically patterned according to the Ammann-Beenker octagonal tiling geometry, may exhibit a rich spectrum of resonant modes characterized by a distinctive plasmonic or photonic behavior. The ability to control the number, spectral position, and field distribution of the resonances may be exploited in label-free biosensing or in energy harvesting applications.