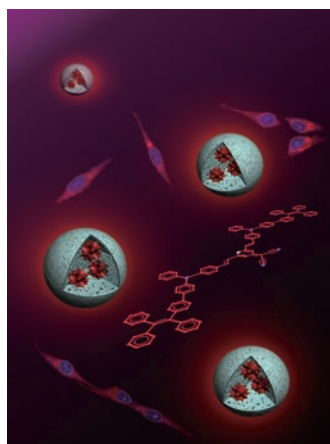


ADVANCED FUNCTIONAL MATERIALS

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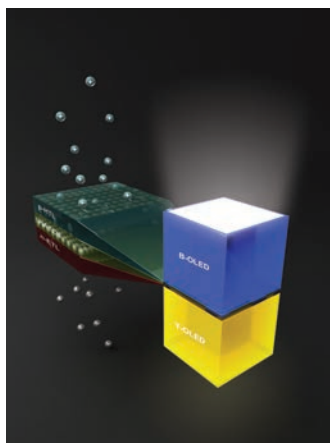
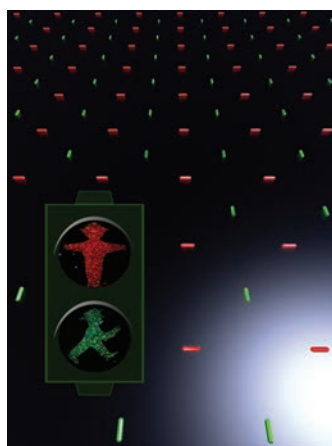


Bioimaging

On page 771, Bin Liu, Ben Zhong Tang, and co-workers report the synthesis of 2-(2,6-bis((E)-4-(phenyl(4'-(1,2,2-triphenylvinyl)-[1,1'-biphenyl]-4-yl)amino)styryl)-4H-pyran-4-ylidene)malononitrile (TPE-TPA-DCM), which has an aggregation-induced emission (AIE) feature. Further formulation of TPE-TPA-DCM using bovine serum albumin (BSA) as the polymer matrix allows for successful in vitro and in vivo far-red/near-infrared (FR/NIR) bioimaging.

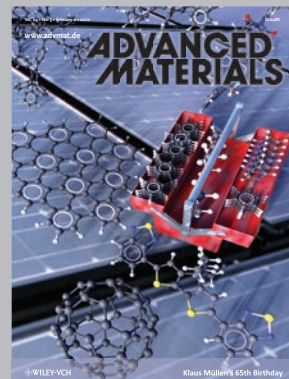
Self-Assembly

Aligning shape-anisotropic nano-objects is a heavily studied topic. On page 702, Heiko Wolf and co-workers demonstrate the oriented assembly of gold nanorods with single-particle resolution. Assembly is achieved from a dense phase of nanorods at the meniscus of an aqueous suspension through capillary forces. The parallel alignment of arrayed gold nanorods becomes evident from their characteristic plasmon colors (red, green) when observed through a polarizer.



Organic Light-Emitting Diodes

A tandem white organic light-emitting diode (OLED) composed of blue and orange emitting units interconnected by a charge-generation unit (CGU) in which both electrons and holes are efficiently generated is presented. On page 855, Jang-Joo Kim and co-workers analyze the charge generation mechanism of the CGU composed of p-doped hole-transporting layer (HTL)/1,4,5,8,9,11-hexazatriphenylene hexacarbonitrile (HATCN)/n-doped electron-transporting layer (ETL). The energy level alignment shows that the electron injection at the HATCN/n-ETL junction limits the charge generation in the CGU.



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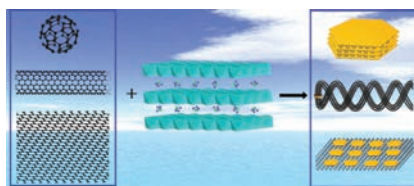
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FEATURE ARTICLE

Nanocomposites Materials

M.-Q. Zhao, Q. Zhang,* J.-Q. Huang,
F. Wei*675–694

Hierarchical Nanocomposites Derived from Nanocarbons and Layered Double Hydroxides - Properties, Synthesis, and Applications



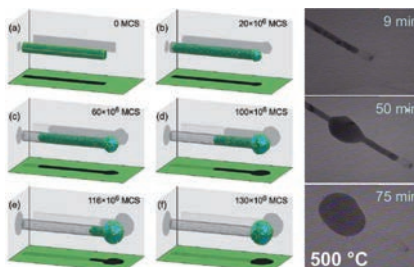
Hierarchical nanocomposites derived from nanocarbons and layered double hydroxides, representing the latest frontier for arrangement and construction of different low-dimensional nanomaterials as building blocks, are reviewed. The article highlights the fabrication of novel hierarchical nanoarchitectures via bottom-up self-organization and their promising applications in energy storage, materials science, catalysis, environmental protection, and drug delivery, with a focus on hot topics and future challenges in this field.

FULL PAPERS

Nanowires

M. E. Toimil-Molares,* L. Röntzsch,
W. Sigle, K.-H. Heinig, C. Trautmann,
R. Neumann695–701

Pipetting Nanowires: In Situ Visualization of Solid-State Nanowire-to-Nanoparticle Transformation Driven by Surface Diffusion-Mediated Capillarity

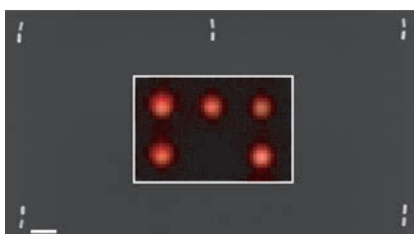


In situ transmission electron microscopy images recorded as movies provide an exceptional real-time visualization of Cu draining out of a carbon coating. The solid content of the carbon tube is effectively evacuated towards the open end, transforming each nanowire into a single monocrystalline, faceted Cu particle. Kinetic Monte Carlo simulations propose that this morphological transformation is driven by surface diffusion of Cu atoms along the wire/tube interface.

Self-Assembly

C. Kuemin, L. Nowack, L. Bozano,
N. D. Spencer, H. Wolf*702–708

Oriented Assembly of Gold Nanorods on the Single-Particle Level

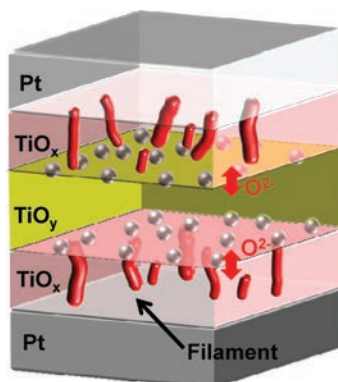


Colloidal gold nanorods are self-assembled from a receding meniscus that is moved over a nanostructured template surface. Their position and orientation can be precisely controlled on the single-particle level. Complex arrangements comprising parallel or perpendicularly aligned nanorods as well as co-aligned nanorod dimers are fabricated.

Resistive Switching

Y. C. Bae, A. R. Lee, J. B. Lee, J. H. Koo,
K. C. Kwon, J. G. Park, H. S. Im,
J. P. Hong*709–716

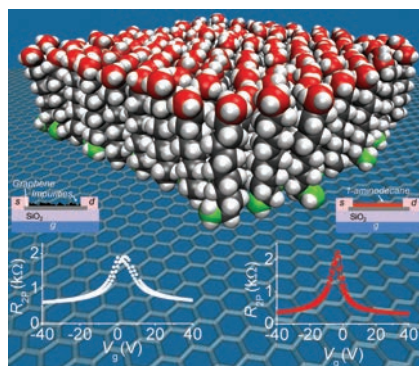
Oxygen Ion Drift-Induced Complementary Resistive Switching in Homo $\text{TiO}_x/\text{TiO}_y/\text{TiO}_x$ and Hetero $\text{TiO}_x/\text{TiON}/\text{TiO}_x$ Triple Multilayer Frameworks



A novel binary oxide-based triple-layer framework for complementary resistive switching is developed with anti-serially merged two bilayer homojunction switching elements. The oxidation/redox reaction induced by movable oxygen ions at the interface between the middle TiO_y and the top/bottom TiO_x layers plays a key role in the resistive switching, together with the formation of filamentary paths under bias.

FULL PAPERS

A simple, versatile method for non-covalent functionalization of graphene based on solution-phase assembly of alkane-amine layers is presented. For 1-aminodecane, the calculated monolayer height from atomistic molecular dynamics simulations is in good agreement with atomic force microscopy data, suggesting formation of a self-assembled monolayer. Passivation and adsorbate n-doping of graphene field-effect devices using 1-aminodecane is also reported.

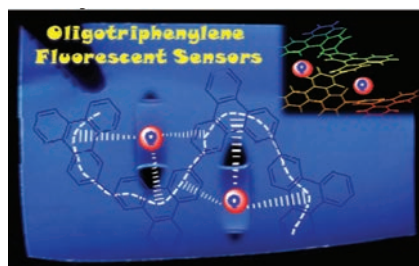


Graphene

B. Long, M. Manning, M. Burke, B. N. Szafrank, G. Visimberga, D. Thompson, J. C. Greer, I. M. Povey, J. MacHale, G. Lejosne, D. Neumaier, A. J. Quinn* 717–725

Non-Covalent Functionalization of Graphene Using Self-Assembly of Alkane-Amines

Blue light-emitting oligotriphenylene nanofiber molecular wires exhibit high thermal stability, high fluorescence quantum yield, enhanced conductivity, and stable fluorescence, when compared to the monomer. Fluorescent sensors based on oligotriphenylene nanofibers and their polysulfone composite films enable trace detection, high sensitivity, and high selectivity of nitro-based explosives including nitromethane, nitrobenzene, and 2,4,6-trinitrophenol as well as Fe(III) owing to formation of stable π -electron/charge transfer complexes between the fluorophores and the analytes.

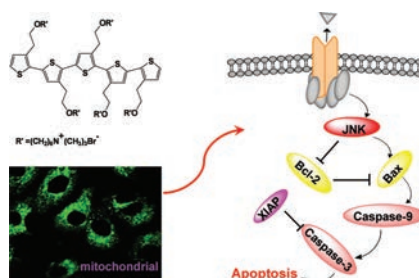


Sensors

Y. Z. Liao, V. Strong, Y. Wang, X.-G. Li,* X. Wang,* R. B. Kaner* 726–735

Oligotriphenylene Nanofiber Sensors for Detection of Nitro-Based Explosives

A cationic pentathiophene (5T) is synthesized and discovered with both anticancer activity and molecular imaging properties. 5T can selectively accumulate in mitochondria to exhibit organellar imaging and efficiently induce cell apoptosis associating with c-jun N-terminal kinase (JNK) pathway activation. The 5T-chlorambucil nanoparticles enhance anticancer activity by 2 to 9 fold due to the synergistical anticancer activity of 5T and chlorambucil.

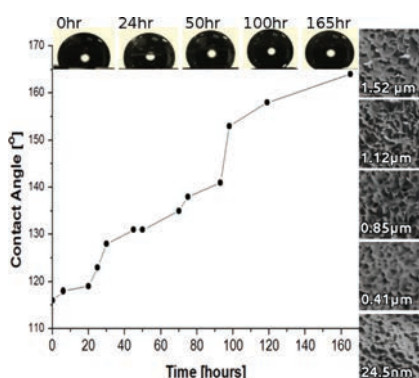


Biomedical Materials

G. Yang, L. Liu,* Q. Yang, F. Lv, S. Wang* 736–743

A Multifunctional Cationic Pentathiophene: Synthesis, Organelle-Selective Imaging, and Anticancer Activity

Bioinspired wax films exhibit time-dependent nanostructure evolution that includes strain release and a nanoroughness increase. Nanoroughness evolution leads to time-dependent wettability changes, from hydrophobic to superhydrophobic. The mechanism for the nanoroughness increase is most likely recrystallization induced by residual strain that develops during the rapid film formation. This provides a basis for the production of tuned, time-dependent, temperature-sensitive material surfaces with changeable wettability.



Biomimetics

S. Pechook, B. Pokroy* 745–750

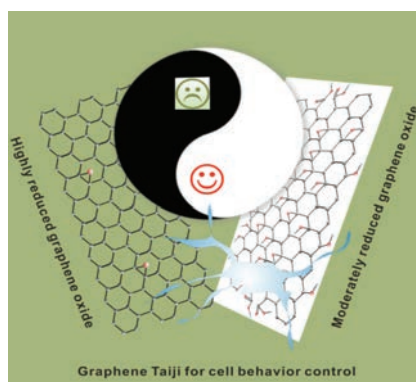
Self-Assembling, Bioinspired Wax Crystalline Surfaces with Time-Dependent Wettability

FULL PAPERS

Graphene

X. Shi, H. Chang,* S. Chen, C. Lai,
A. Khademhosseini, H. Wu*.....751–759

Regulating Cellular Behavior on Few-Layer Reduced Graphene Oxide Films with Well-Controlled Reduction States

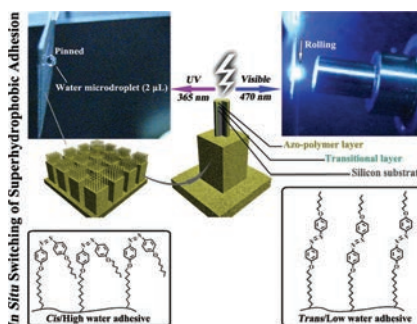


Regulating cellular behaviors on few-layer reduced graphene oxide (FRGO) films are explored by delicately controlling the reduction states of graphene oxide. Importantly, the results indicate that the surface oxygenous content of FRGO has a strong influence on cellular behaviors, and therefore can be tuned in a facile way to regulate cellular behaviors on FRGO.

Superhydrophobic Surfaces

C. Li, Y. Y. Zhang, J. Ju, F. T. Cheng,
M. J. Liu, L. Jiang, Y. L. Yu*.....760–763

In Situ Fully Light-Driven Switching of Superhydrophobic Adhesion

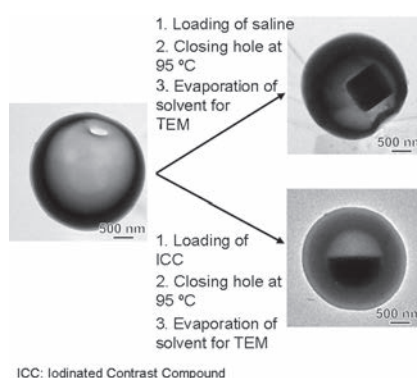


An in situ fully light-driven switching of superhydrophobic adhesion is demonstrated based on simply spin-coating a hydrophobic azo-polymer on an optimized micro-nanopost arrayed silicon substrate. The detailed designing principles are discussed and might shed light on efficient exploitation of superhydrophobic liquid/solid interfaces for smart microfluidic control.

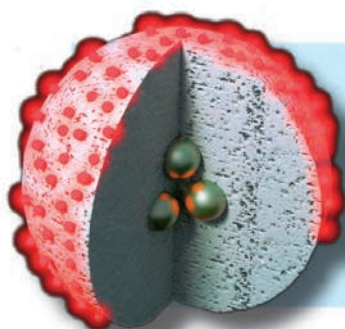
Colloidal Particles

M.-Y. Bai, C. H. Moran, L. Zhang,
C. Liu, Y. Zhang, L. V. Wang,
Y. Xia*764–770

A Facile and General Method for the Encapsulation of Different Types of Imaging Contrast Agents Within Micrometer-Sized Polymer Beads



A facile method based on hollow beads with holes on the surfaces for quick encapsulation of various types of contrast agents is described. The potential uses of these encapsulated contrast agents for biomedical imaging is also demonstrated.



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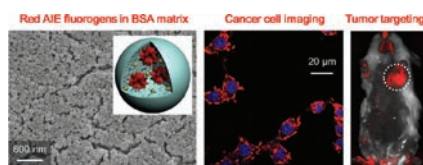
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FULL PAPERS

Encapsulation of far-red/near-infrared luminogens with aggregation-induced emission (AIE) characteristics in a bovine serum albumin (BSA) matrix yields nanoparticles (NPs) with uniform size, high brightness, and low cytotoxicity. Applications of these AIE-active NPs for in vitro and in vivo fluorescence imaging are demonstrated using MCF-7 breast-cancer cells and a murine hepatic H₂₂-tumor-bearing mouse model, respectively.

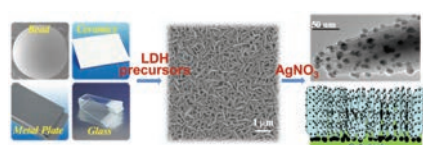


Bioimaging

W. Qin, D. Ding, J. Liu, W. Z. Yuan,
Y. Hu, B. Liu,*
B. Z. Tang*771–779

Biocompatible Nanoparticles with Aggregation-Induced Emission Characteristics as Far-Red/Near-Infrared Fluorescent Bioprobes for In Vitro and In Vivo Imaging Applications

A simple method to grow well-oriented nanoporous layered double hydroxide (LDH) coatings from the homogenous suspension of the LDH precursors is developed. The removal of the free electrolytes is critical in developing high quality LDH coatings. Ag nanoparticles can be readily deposited on the LDH coatings without any reducing agents or toxic organic solvents. The resulting Ag-LDH composite coatings present excellent and durable antimicrobial activities.

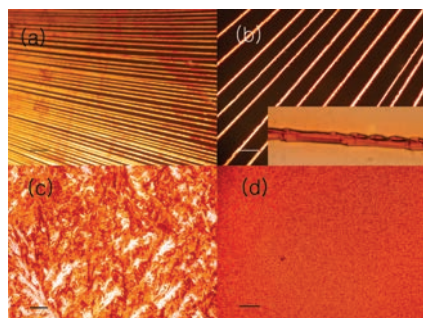


Functional Coatings

C. Chen, P. Gunawan, X. W. (D.) Lou,
R. Xu*780–787

Silver Nanoparticles Deposited Layered Double Hydroxide Nanoporous Coatings with Excellent Antimicrobial Activities

Octupolar films composed of 1,3,5-tricyano-2,4,6-tris(*p*-diethylaminostyryl) benzene (TTB) octupolar molecules display both polycrystalline and cylindrical domains. The molecular orientation, second harmonic generation (SHG) efficiencies, and electro-optic (EO) coefficients of the crystalline domains are studied theoretically and experimentally. Both structures exhibit high and stable SHG and EO efficiencies. These characteristics will be useful in second order nonlinear optical applications.

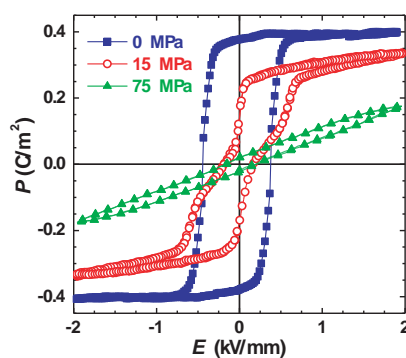


Optical Materials

M.-Y. Jeong,* S. Brasselet,* T.-K. Lim,
B. R. Cho*788–796

Octupolar Films with Large Second Harmonic Generation and Electro-Optical Effects

Dramatic changes are seen in the polarization vs. electric field hysteresis loops recorded from Pb(Mg_{1/3}Nb_{2/3})O₃–PbTiO₃ (PMN–PT) piezoelectric single crystals under uniaxial as well as radial compressive pre-stresses. The results demonstrate a general and effective approach to overcome the drawback of low coercive fields in these relaxor-based ferroelectric crystals, which could help facilitate widespread implementation of these piezocrystals in engineering devices.



Electronic Materials

M. Marsilius, J. Frederick, W. Hu,
X. Tan,* T. Granzow,
P. D. Han797–802

Mechanical Confinement: An Effective Way of Tuning Properties of Piezoelectric Crystals

FULL PAPERS

Batteries

J. Guo, Q. Liu, C. Wang,*
M. R. Zachariah*803–811

Interdispersed Amorphous MnO_x –Carbon Nanocomposites with Superior Electrochemical Performance as Lithium-Storage Material

Amorphous MnO_x -carbon nanoparticles as anode materials for lithium-ion batteries are synthesized via aerosol spray pyrolysis. The resulting MnO_x -carbon anode shows high lithium storage capacity, superior cycling stability, rate capability, and lower over-potential owing to its amorphous nature and unique nanostructure of interdispersed MnO_x and carbon.



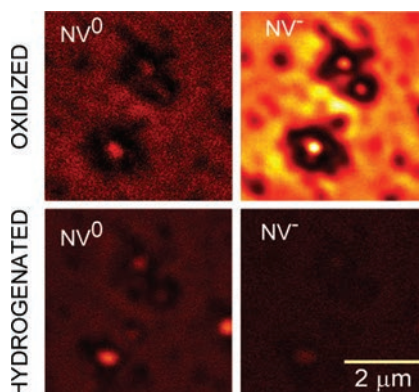
Luminescence

V. Petráková,* A. Taylor,
I. Kratochvílová, F. Fendrych, J. Vacík,
J. Kučka, J. Štursa, P. Cígler,
M. Ledvina, A. Fišerová, P. Kneppo,
M. Nesládek*812–819



Luminescence of Nanodiamond Driven by Atomic Functionalization: Towards Novel Detection Principles

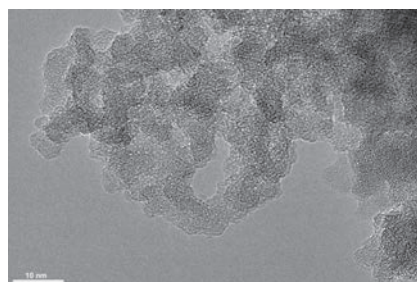
The luminescence of nanodiamond (ND) originates from nitrogen-vacancy (NV) color centers that can emit luminescence in two spectral regions, either from 570 to 620 nm or from 630 to 750 nm. Chemically induced surface changes enable switching between the two luminescence channels. The hole accumulation layer developed at the nanodiamond surface by hydrogen termination leads to quenching of the NV luminescence.



Nanoparticles

N. N. Tušar,* D. Maučec, M. Rangus,
I. Arčon, M. Mazaj, M. Cotman,
A. Pintar, V. Kaučič*820–826

Manganese Functionalized Silicate Nanoparticles as a Fenton-Type Catalyst for Water Purification by Advanced Oxidation Processes (AOP)

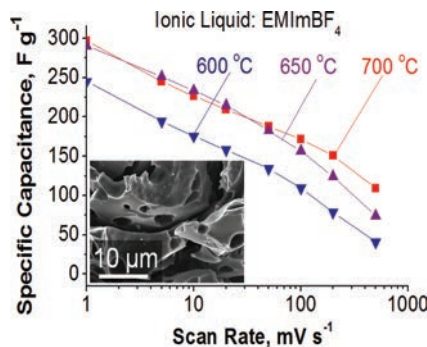


Manganese functionalized silicate nanoparticles with interparticle porosity act as a superior Fenton-type nanocatalyst in WHPCO (wet hydrogen peroxide catalytic oxidation) as they can decompose 80% of a test organic compound in 30 minutes at neutral pH and room temperature. By combined use of catalytic tests and X-ray absorption spectroscopic techniques (XANES, EXAFS) direct evidence is given that the superior activity of the nanocatalyst is uniquely attributed to framework manganese.

Electrodes

L. Wei, M. Sevilla, A. B. Fuertes,
R. Mokaya,* G. Yushin*827–834

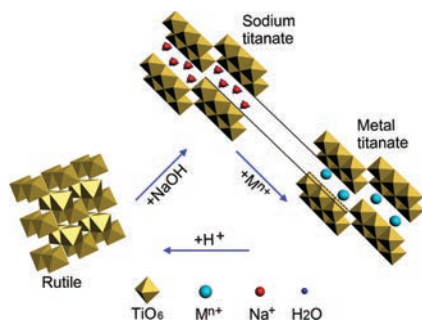
Polypyrrole-Derived Activated Carbons for High-Performance Electrical Double-Layer Capacitors with Ionic Liquid Electrolyte



A novel method of activated carbon (AC) synthesis for electrical double-layer capacitors (EDLCs) based on direct activation of synthetic polymers polypyrrole is proposed. ACs with high specific surface area are created. The specific capacitance of the produced carbons is very high when measured in a symmetric configuration in an ionic liquid electrolyte. Charge–discharge tests show excellent capacitance retention at an ultrahigh current density.

FULL PAPERS

Inorganic ion exchanger: An ion exchange induced structure collapse of sodium titanates immobilizes target metal cations tightly in the interlayer. These trapped cations are released through a phase transformation under strong acidic conditions. The titanates may find applications in the decontamination and safe disposal of radionuclides and heavy metals.

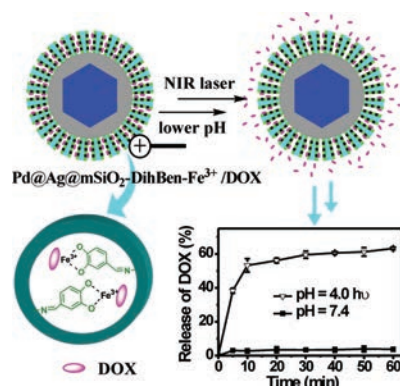


Ion Exchange

N. Li, L. D. Zhang,* Y. Z. Chen, M. Fang, J. X. Zhang, H. M. Wang835–841

Highly Efficient, Irreversible and Selective Ion Exchange Property of Layered Titanate Nanostructures

Based on mesoporous silica-coated Pd@Ag nanoparticles, a smart drug delivery system with anticancer drugs coordinated inside the mesopores is designed and developed. The release of the loaded anticancer drugs is triggered by pH and near infrared (NIR) light irradiation.

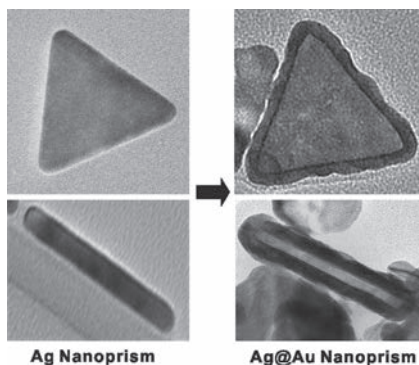


Drug Delivery

W. J. Fang, J. Yang, J. W. Gong, N. F. Zheng*842–848

Photo- and pH-Triggered Release of Anticancer Drugs from Mesoporous Silica-Coated Pd@Ag Nanoparticles

Core-shell Ag@Au nanoprisms are successfully synthesized through a surfactant-free seed-mediation approach by direct gold coating of silver nanoprisms with controllable Au shell thickness. The clean gold shell surface and tunable surface plasmon resonance of these core-shell nanoprisms enable straightforward further functionalization for a variety of applications.

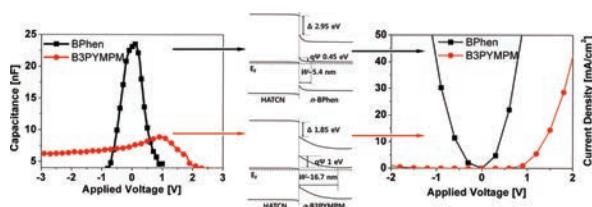


Nanostructured Materials

M. M. Shahjamali, M. Bosman, S. Cao, X. Huang, S. Saadat, E. Martinsson, D. Aili, Y. Y. Tay, B. Liedberg, S. C. J. Loo, H. Zhang, F. Boey, C. Xue*849–854

Gold Coating of Silver Nanoprisms

The rate limiting step of charge generation in the charge-generation units (CGUs) composed of a p-doped hole-transporting layer (HTL)/1,4,5,8,9,11-hexaazatriphenylene hexacarbonitrile (HATCN)/n-doped electron-transporting layer (ETL) is reported. Energy level alignment and the current density–voltage characteristics of the structure show that the electron injection at the HATCN/n-ETL junction limits the charge generation in the CGUs.



Organic Light-Emitting Diodes

S. Lee, J.-H. Lee, J.-H. Lee, J.-J. Kim*855–860

The Mechanism of Charge Generation in Charge-Generation Units Composed of p-Doped Hole-Transporting Layer/HATCN/n-Doped Electron-Transporting Layers

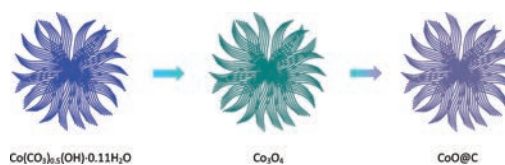
FULL PAPERS

Batteries

S. L. Xiong, J. S. Chen, X. W. Lou,
H. C. Zeng*861–871

**Mesoporous Co_3O_4 and CoO@C
Topotactically Transformed
from Chrysanthemum-Like
 $\text{Co}(\text{CO}_3)_{0.5}(\text{OH})\cdot 0.11\text{H}_2\text{O}$ and Their
Lithium-Storage Properties**

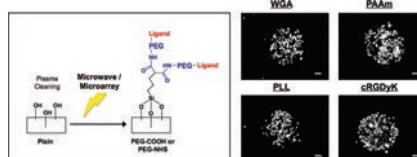
The controlled, NaCl-mediated synthesis of chrysanthemum-like $\text{Co}(\text{CO}_3)_{0.5}(\text{OH})\cdot 0.11\text{H}_2\text{O}$ is demonstrated. The effects of the synthetic conditions are investigated in detail. The $\text{Co}(\text{CO}_3)_{0.5}(\text{OH})\cdot 0.11\text{H}_2\text{O}$ is converted to Co_3O_4 nanowire arrays by direct thermal decomposition and then to carbon-coated CoO (CoO@C) under the reducing ambience of C_2H_2 . These CoO@C nanowire arrays are promising candidates for lithium-ion-battery applications.



Functionalized Surfaces

J. H. Lee, H. Hyun, C. J. Cross,
M. Henary, K. A. Nasr, R. Oketokoun,
H. S. Choi,*
J. V. Frangioni*872–878

**Rapid and Facile Microwave-Assisted
Surface Chemistry for Functionalized
Microarray Slides**



Microwave-assisted surface func-tion-ization and ligand imprinting using an automated robotic chemistry system for high-throughput live cell screening is developed. Using microwave irradiation, complete silanization and PEGylation are obtained in 18.4 min, which is characterized by water contact angle and fluorescence measurements. Cell binding ligands are incorporated into 300- μm circular spots providing adequate space for up to 230 living cell interactions.