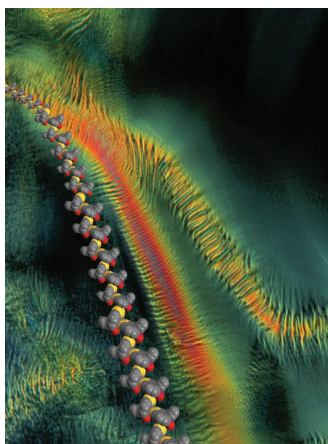


ADVANCED FUNCTIONAL MATERIALS

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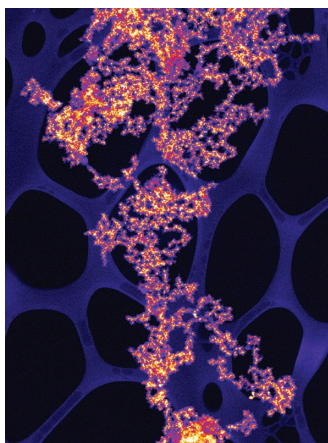
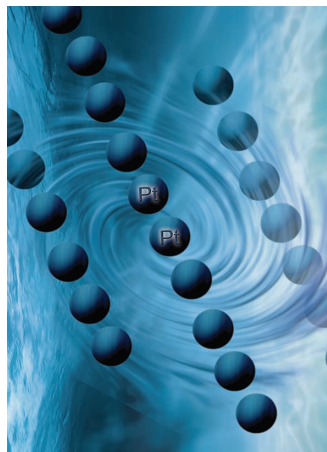


Phospholes

T. Baumgartner and co-workers report the design of organophosphorus-based soft materials on page 897. The self-assembly of these materials can be engineered on the molecular level using simple phosphorus-chemical approaches, giving rise to organogels and liquid crystals. The cover image shows the polarized optical micrograph of a dried gel exhibiting highly ordered layered features that reflect the supramolecular organization of a single-crystalline model compound.

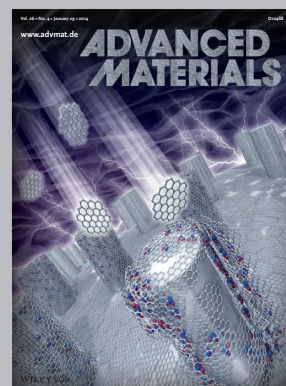
Ferromagnetism

Unique chain-like networks of platinum (Pt) nanocrystals can be self-organized spontaneously in a polyol solution. On page 916, S. H. Yu and co-workers find that in situ-formed magnetic dipoles originating from the alterant Pt electronic structure and modified by the capped polyvinylpyrrolidone (PVP) molecules are found to be the driving force of this self-assembled structures.



Nanocomposites

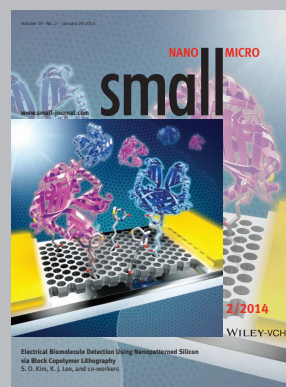
On page 907, a gold-titanium dioxide (Au/TiO_2) hybrid prepared by L. Fruk and co-workers using a bifunctional bridging linker is shown on this cover image. The bright yellow spots are gold nanoparticles stabilized by a dopamine-lipoic acid derivative, which are then bound to titanium dioxide matrix (purple). This hybrid material shows remarkable catalytic activity towards activation of heme containing enzyme upon light irradiation.



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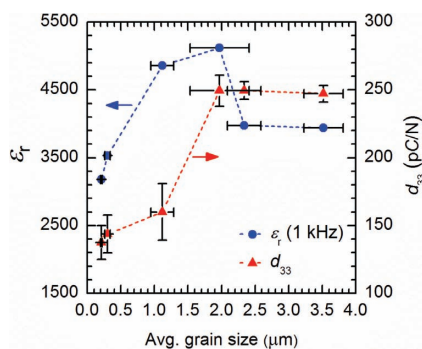
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FULL PAPERS

Ferroelectric Materials

D. Ghosh, A. Sakata, J. Carter,
P. A. Thomas, H. Han, J. C. Nino,
J. L. Jones* 885–896

**Domain Wall Displacement is the
Origin of Superior Permittivity
and Piezoelectricity in BaTiO₃ at
Intermediate Grain Sizes**



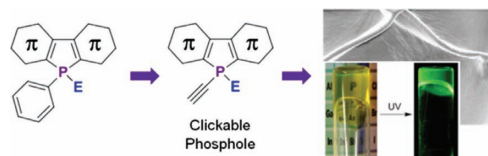
Domain wall displacement is proven to be the origin of the superior dielectric and piezoelectric properties at intermediate ($\approx 1 \mu\text{m}$) grain sizes in polycrystalline BaTiO₃. The results obtained using high-energy, in situ X-ray diffraction during electric field application, suggest that domain wall displacement can be used to achieve superior properties in ferroelectric materials.

Phospholes

X. M. He, J.-B. Lin, W. H. Kan,
P. Dong, S. Trudel,
T. Baumgartner* 897–906

**Molecular Engineering of “Click”-
Phospholes Towards Self-Assembled
Luminescent Soft Materials**

The molecular engineering of novel “click”-phospholes toward functional phosphole-lipid soft materials is reported. Appropriate modification of the conjugated head group results in balanced intermolecular interactions and a tailored molecular arrangement that provides access to luminescent organogels and liquid crystals. Efficient energy transfer and vapochromism using one species are also demonstrated.

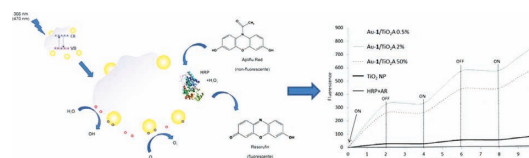


Nanocomposites

M. Miljevic, B. Geiseler, T. Bergfeldt,
P. Bockstaller, L. Fruk* 907–915

**Enhanced Photocatalytic Activity of Au/
TiO₂ Nanocomposite Prepared Using
Bifunctional Bridging Linker**

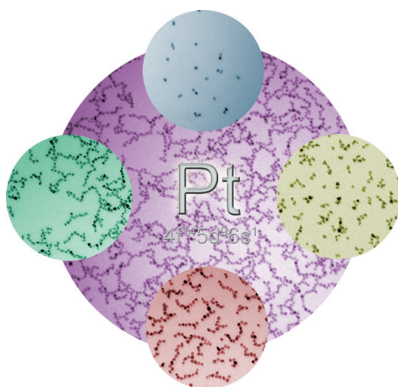
Hybrid photo-switch: Enhanced photocatalytic activity of TiO₂/Au hybrid nanocomposite is observed, enabling photo-switchable activation of peroxidase enzyme. A nanocomposite is prepared using bifunctional bridging linker containing both TiO₂ and Au NP binding groups affording precise control over the size and shape of Au NPs and their ratio to TiO₂.



Ferromagnetism

M.-R. Gao, S.-R. Zhang, Y.-F. Xu,
Y.-R. Zheng, J. Jiang,
S.-H. Yu* 916–924

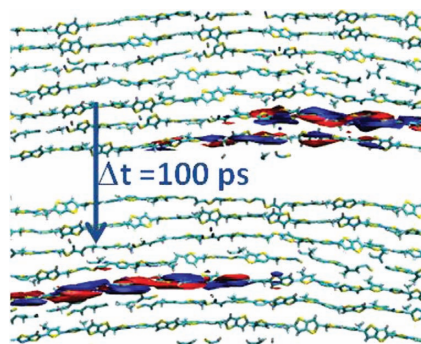
**Self-Assembled Platinum Nanochain
Networks Driven by Induced Magnetic
Dipoles**



Unique chain-like networks of platinum (Pt) nanocrystals can be self-organized spontaneously in a polyol solution. In-situ formed magnetic dipoles originated from the alterant Pt electronic structure modified by the capped polyvinylpyrrolidone (PVP) molecules are found to be the driving force of this self-assembled structures.

FULL PAPERS

Shallow traps for the holes in semicrystalline PBTTT are healed by thermal conformational motions as revealed by large scale electronic structure calculations coupled with classical molecular dynamics. This phenomenon, not observed in other semicrystalline polymers, is possibly at the origin of the superior charge mobility measured in thin film transistors based on PBTTT.

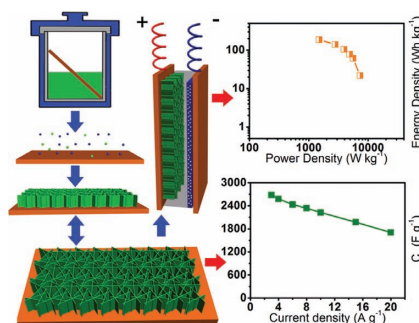


Polymer Semiconductors

T. Liu, A. Troisi*925–933

Understanding the Microscopic Origin of the Very High Charge Mobility in PBTTT: Tolerance of Thermal Disorder

Ni–Co LDH electrode materials with ultrahigh capacitive performance are prepared. The capacitive performances of as-obtained Ni–Co LDHs for pseudocapacitors and asymmetric supercapacitors significantly exceed those of most similar reported materials. This synthesis method can also be extended to synthesize other bimetallic LDHs with high electrochemical activity.

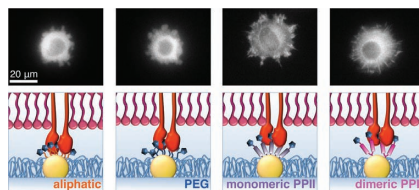


Supercapacitors

H. Chen, L. F. Hu, M. Chen, Y. Yan, L. M. Wu*934–942

Nickel–Cobalt Layered Double Hydroxide Nanosheets for High-performance Supercapacitor Electrode Materials

Self-organized spatial positioning of cRGD patches on glass via a gold nanopattern as a biomimetic approach to engineer cellular environments. Regulation of integrin-mediated cellular responses is achieved by tuning the length and chemical nature of the cRGD-presenting molecule. Fibroblasts exhibit higher affinity towards surfaces coated with cRGD containing a polyproline spacer compared with alkane- and polyethylene glycol-based spacers.

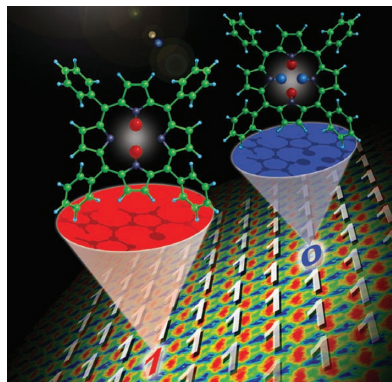


Biomimetics

D. Pallarola, A. Bochen, H. Boehm, F. Rechenmacher, T. R. Sobahi, J. P. Spatz,* H. Kessler*943–956

Interface Immobilization Chemistry of cRGD-based Peptides Regulates Integrin Mediated Cell Adhesion

Frozen tautomers at room temperature are exploited in a first logic device prototype. Following a newly proposed growth strategy, a purely 2D ordered array of metal-free porphyrins shows all the tautomers aligned along a direction settled a priori. This occurrence characterizes the anisotropic optical property of the system. The quenching/renewing of the porphyrin anisotropy defines two distinct logic states (0/1) easily readable by optics.



Organic Electronics

G. Bussetti,* M. Campione, M. Riva, A. Picone, L. Raimondo, L. Ferraro, C. Hogan, M. Palummo, A. Brambilla, M. Finazzi, L. Duò, A. Sassella, F. Ciccacci958–963

Stable Alignment of Tautomers at Room Temperature in Porphyrin 2D Layers

FULL PAPERS

Graphene

Z. Han, A. Kimouche, D. Kalita,
A. Allain, H. Arjmandi-Tash,
A. Reserbat-Plantey, L. Marty,
S. Pairis, V. Reita, N. Bendiab,
J. Coraux, V. Bouchiat*964–970

Homogeneous Optical and Electronic Properties of Graphene Due to the Suppression of Multilayer Patches During CVD on Copper Foils

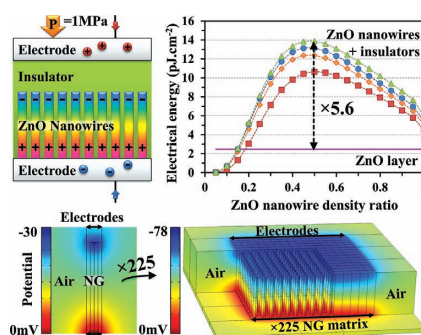


A pulsed chemical vapor deposition (CVD) process for graphene growth on copper foils is introduced. The pulsed injection of carbon precursor efficiently prevents the formation of multilayer patches that is found to affect optical and electronic properties of graphene and leads to homogenous macroscopic graphene sheets.

Piezoelectrics

R. Hinchet, S. Lee, G. Ardila,*
L. Montès, M. Mouis,
Z. L. Wang*971–977

Performance Optimization of Vertical Nanowire-based Piezoelectric Nanogenerators

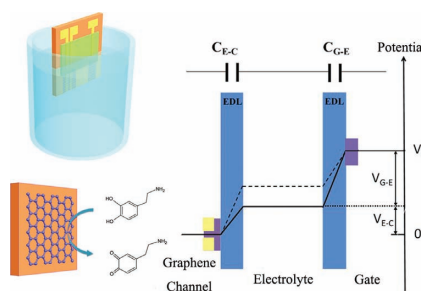


Simulations of nanogenerator (NG) based on ZnO vertical nanowire (NW) arrays are developed to understand NG operation and evaluate its performances in terms of energy and efficiency. The structure is optimized and strategies are developed to increase the force sensitivity. Moreover, the influence of NW length and diameter is investigated. The optimization results in a piezoelectric nanocomposite material where global performances are improved by a factor 6.

Sensors

M. Zhang, C. Z. Liao, Y. L. Yao, Z. K. Liu,
F. Gong, F. Yan*978–985

High-Performance Dopamine Sensors Based on Whole-Graphene Solution-Gated Transistors



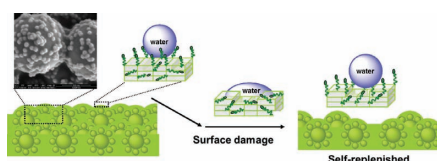
Whole graphene solution-gated transistors with graphene as both channel and gate are fabricated for the first time and used as dopamine sensors with a detection limit down to 1 nM and excellent selectivity. The sensing mechanism is attributed to the change of effective gate voltage applied on the transistors induced by the electro-oxidation of dopamine at the graphene gate.

Functional Coatings

A. C. C. Esteves,* Y. Luo,
M. W. P. van de Put, C. C. M. Carcouët,
G. de With*986–992

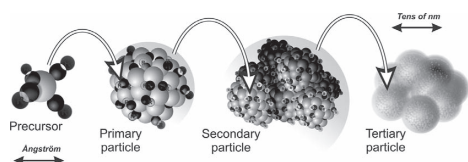
Self-Replenishing Dual Structured Superhydrophobic Coatings Prepared by Drop-Casting of an All-In-One Dispersion

Robust surface-structured superhydrophobic coatings with raspberry-like morphology prepared from all-in-one dispersions and a simple drop-cast method, self-replenish their surface chemical composition on new multi-scale topographic surfaces, self-regenerated upon damage. The surface repair occurs spontaneously using intrinsic elements of the coating. Design principles for functional materials perform at high level all through their life-cycle, with low cost and energy demand for maintenance and repair.



FULL PAPERS

A detailed control of the aggregation behavior in a three-step preparative process allows to produce water-dispersible anatase nanoparticles with a ligand-free surface and dimensions <10 nm.

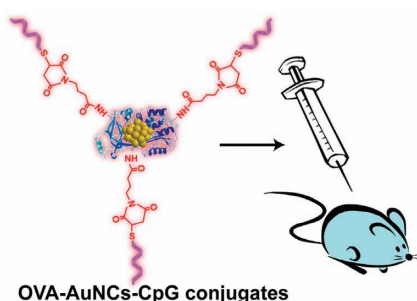


Nanocrystals

C. J. Cadman, A. Pucci, F. Cellesi,*
N. Tirelli*993–1003

Water-Dispersible, Ligand-Free, and Extra-Small (<10 nm) Titania Nanoparticles: Control Over Primary, Secondary, and Tertiary Agglomeration Through a Modified “Non-Aqueous” Route

A facile one-pot synthesis of fluorescent AuNCs by using ovalbumin-CpG oligodeoxynucleotides (ODNs) conjugates as the templates, which can elicit specific immunological responses, is demonstrated. Through dual-delivery of protein antigen and CpG ODNs, the as-prepared AuNCs can act as smart self-vaccines to assist in generation of high immunostimulatory activity while simultaneously act as an imaging agent.

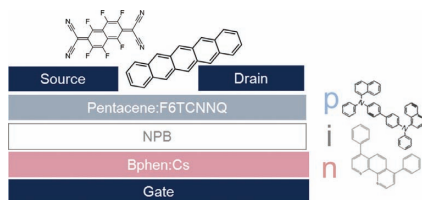


Self-Vaccines

Y. Tao, E. Ju, Z. Li, J. Ren,*
X. Qu*1004–1010

Engineered CpG-Antigen Conjugates Protected Gold Nanoclusters as Smart Self-Vaccines for Enhanced Immune Response and Cell Imaging

An organic junction field-effect transistor (OJFET) is realized. The JFETs rely on the modulation of the depletion width in a reversely biased pin junction, which depletes a transistor channel and turns the transistor off. The transistors are discussed in terms of a numerical model describing the depletion layer thickness in organic pin heterostructures, and an experimental proof of concept is given.

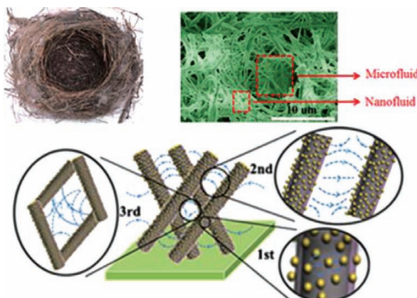


Organic Transistors

B. Lüssem,* H. Kleemann,
D. Kasemann, F. Ventsch,
K. Leo*1011–1016

Organic Junction Field-Effect Transistor

Surface-enhanced Raman scattering-active 3D nest-like networks with a large contact surface area and excellent structural stability are fabricated via a facile, template-free, continuous fluid construction process directly in confined microchannels.



Microfluidics

G. Wang, G. Y. Shi, H. Z. Wang,*
Q. H. Zhang, Y. G. Li*1017–1026

In Situ Functionalization of Stable 3D Nest-Like Networks in Confined Channels for Microfluidic Enrichment and Detection