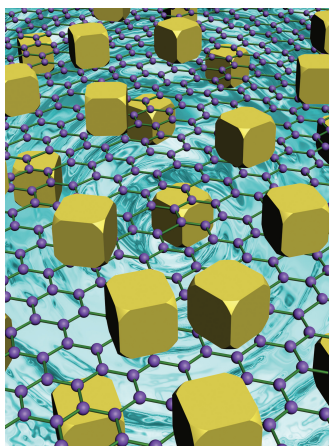


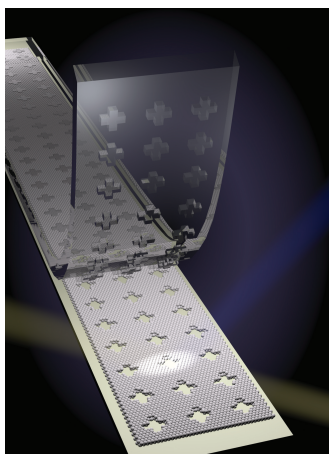
# ADVANCED FUNCTIONAL MATERIALS

[www.afm-journal.de](http://www.afm-journal.de)



## Nanomaterials

The homogeneous attachment of well-shaped metal nanoparticles (metal-NPs) on pristine graphene surfaces to construct pristine graphene/metal-NP hybrids is required for applications such as transparent electrodes and conductive composites. On page 5771, G. Meng and co-workers present an environmentally friendly generic synthetic approach to such large-scale hybrids by attaching pre-synthesized metal-NPs (silver nanocubes, yellow) on the pristine graphene surface (green hexagonal grid with purple joints) in ethanol by exploiting van der Waals interactions between the metal-NPs and the pristine graphene.

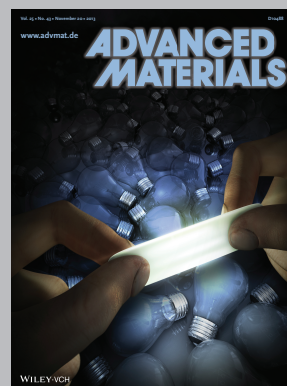
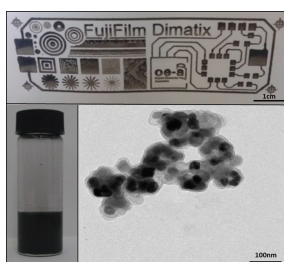


## Colloidal Crystals

Y.-S. Kim, K. Y. Cho, and co-workers fabricate crack-free 3D silica colloidal assemblies on elastomeric polydimethylsiloxane stamps using a lift-up method. On page 5700, surface relief structures on the substrate enable the formation of the assemblies. Control over the lift-up rate and colloid suspension concentration result in 10  $\mu\text{m}$  thick (height of surface relief) flat colloidal assemblies. This strategy not only provides a means to assemble crack-free colloidal crystals on a soft hydrophobic surface, but also enables transfer of the crack-free colloidal crystals onto a curved surface.

## Conductive Ink

Conductive patterns are deposited on different substrates by A. Gedanken and co-workers by directly inkjet printing conductive inks based on metal@carbon and bimetal@carbon core-shell nanoparticles. The particles are synthesized on page 5794 using the reaction under autogenic pressure at elevated temperatures technique, with various co-solvents and additives being examined for the production of a stable conductive ink. The conductivity of the deposited layers is close to that of bulk metals, and the protective carbon layer is demonstrated to prevent metal oxidation.



*Advanced Materials* has been bringing you the best in materials research for over twenty years.

With its increased ISI Impact Factor of 14.829, *Advanced Materials* is one of the most influential journals in the field. Publishing every week, *Advanced Materials* now brings you even more of the latest results at the cutting edge of materials science.

[www.advmat.de](http://www.advmat.de)



*Small* is the very best interdisciplinary forum for all experimental and theoretical aspects of fundamental and applied research at the micro and nano length scales.

With an ISI impact Factor of 7.823 and publishing every two weeks in 2013 with papers online in advance of print, *Small* is your first-choice venue for top-quality communications, detailed full papers, cutting-edge concepts, and in-depth reviews of all things micro and nano.

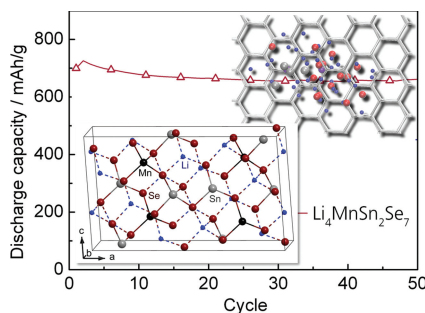
[www.small-journal.com](http://www.small-journal.com)

## FULL PAPERS

## Lithium-Ion Batteries

T. Kaib, S. Haddadpour, H. F. Andersen,  
L. Mayrhofer, T. T. Järvi, M. Moseler,  
K.-C. Möller, S. Dehnen\* .....5693–5699

**Quaternary Diamond-Like  
Chalcogenidometalate Networks as  
Efficient Anode Material in Lithium-Ion  
Batteries**



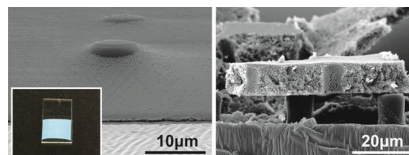
Two novel quaternary lithium-chalcogenidometalate phases,  $\text{Li}_4\text{MnGe}_2\text{S}_7$  and  $\text{Li}_4\text{MnSn}_2\text{Se}_7$ , represent very promising anode materials for lithium-ion cells, in that they achieve specific lithium storage capacities higher than that of the commercially used graphite, and display an excellent stability during cycling. Wurtzite-related topologies and structural flexibility of the metal chalcogen bonds are pre-requisites for a large ion accessible volume.

## Colloidal Crystals

M. R. Kim, S. H. Im, Y.-S. Kim,\*  
K. Y. Cho\* .....5700–5705

**Transferable Crack-Free Colloidal  
Crystals on an Elastomeric Matrix with  
Surface Relief**

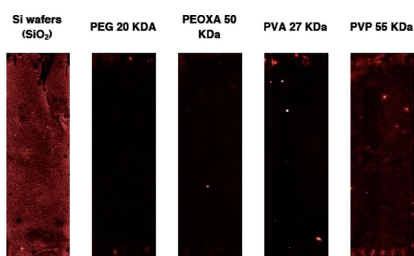
3D Crack-free colloidal assembly onto soft hydrophobic surface via the lift-up method is demonstrated. A surface relief structure on a PDMS substrate enables the formation of colloidal crystal assemblies that cannot be achieved on a plane PDMS substrate owing to the hydrophobic nature of its surface. Different relief patterns (cylindrical, cross-shaped, and long rectangular) and different sizes of uniform silica particles from 190 to 300 nm are investigated.



## Polymers

Å. Serrano, O. Sterner, S. Mieszkun,  
S. Zürcher, S. Tosatti, M. E. Callow,  
J. A. Callow, N. D. Spencer ... 5706–5718

**Nonfouling Response of Hydrophilic  
Uncharged Polymers**

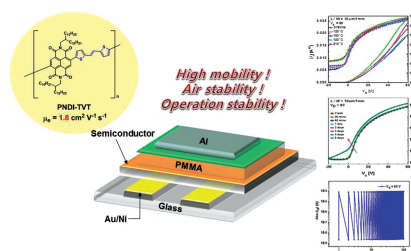


Surface functionalization with 5 different hydrophilic uncharged polymers, their characterization, and a direct comparison of their resistance against biofouling are achieved by means of a photochemical grafting method using a perfluorophenylazide (PFPA)-based adhesion promoter. The fouling response is determined on different length scales from proteins to cells (nano- to micro-meter for proteins and bacteria/spores, respectively).

## Transistors

R. Kim, P. S. K. Amegadze, I. Kang,  
H.-J. Yun, Y.-Y. Noh,\* S.-K. Kwon,\*  
Y.-H. Kim\* .....5719–5727

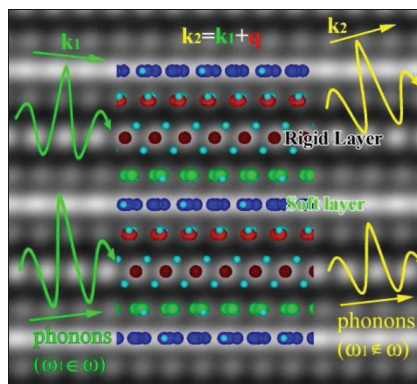
**High-Mobility Air-Stable Naphthalene  
Diimide-Based Copolymer Containing  
Extended  $\pi$ -Conjugation for n-Channel  
Organic Field Effect Transistors**



High-performance naphthalene diimide (NDI)-based conjugated polymer is developed as the active layer of n-channel organic field-effect transistors (OFETs). The solution-processable n-channel top gated OFET shows remarkably high electron charge-carrier mobility of up to  $1.8 \text{ cm}^2 \text{ V}^{-1} \text{ s}^{-1}$  with poly(methyl methacrylate) (PMMA) dielectrics.

## FULL PAPERS

**Accurate measurement of local disorder and lattice vibration** is the key to the understanding of thermoelectric mechanisms. A new method is developed to advance such measurement in layered thermoelectric  $(\text{Ca}_2\text{CoO}_3)_{0.62}\text{CoO}_2$ , revealing significant local atomic vibration and long-range incommensurate disorder within its soft sublayers that effectively scatter phonons. Such atomic displacements are responsible to low thermal conductivity of the material.

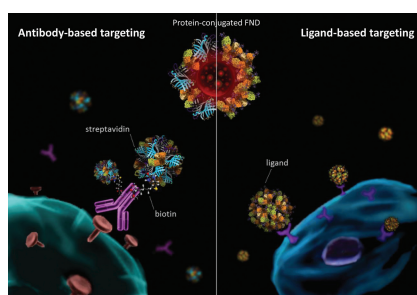


### Layered Materials

L. Wu, Q. Meng, C. Jooss, J.-C. Zheng, H. Inada, D. Su, Q. Li, Y. Zhu\* .....5728–5736

### Origin of Phonon Glass–Electron Crystal Behavior in Thermoelectric Layered Cobaltate

**Strategies are developed to functionalize fluorescent nanodiamond (FND)** with proteins of various types for biological applications. In the first approach, ligand-based targeting, FND is noncovalently coated with (neo)glycoproteins to target hepatocytes via their carbohydrate-specific receptors. In the second approach, antibody-based targeting, FND is conjugated with antibodies for high specific targeting of antigens on human breast cancer cell surfaces. These two approaches are expected to be widely applicable for specific targeting and labeling of live cells.

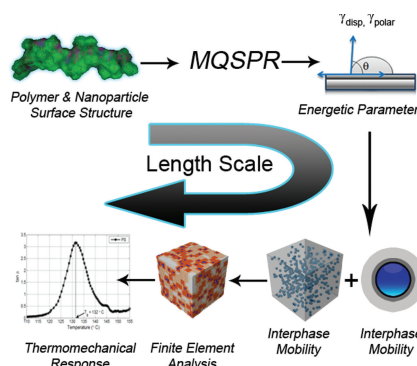


### Nanodiamond

B.-M. Chang, H.-H. Lin, L.-J. Su, W.-D. Lin, R.-J. Lin, Y.-K. Tzeng, R. T. Lee, Y. C. Lee, A. L. Yu,\* H.-C. Chang\* .....5737–5745

### Highly Fluorescent Nanodiamonds Protein-Functionalized for Cell Labeling and Targeting

**A paradigm for the effective virtual design of spherical nanoparticle-filled polymer composites** is presented. Materials Quantitative Structure-Property Relationship (MQSPR) models trained on atomic-level features of the constituents are used to predict polar and dispersive components of the surface energies which are correlated with the nanofiller dispersion morphology and interphase properties to predict thermomechanical properties of nanocomposites by numerical analysis.

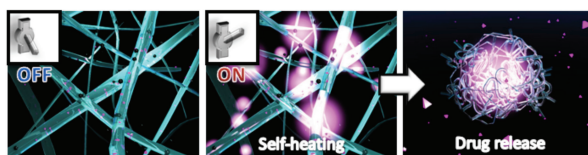


### Nanocomposites

C. M. Breneman,\* L. C. Brinson,\* L. S. Schadler,\* B. Natarajan, M. Krein, K. Wu, L. Morkowchuk, Y. Li, H. Deng, H. Xu .....5746–5752

### Stalking the Materials Genome: A Data-Driven Approach to the Virtual Design of Nanostructured Polymers

**A smart hyperthermia nanofiber with dynamically and reversibly tunable properties** demonstrates the ability to generate heat and release an anticancer drug in response to simple 'on' and 'off' switching of the alternating magnetic field. This smart nanofiber effectively induces the apoptosis of cancer cells by a synergistic effect of the anticancer drug and hyperthermia.



### Magnetic Nanoparticles

Y.-J. Kim, M. Ebara, T. Aoyagi\* .....5753–5761

### A Smart Hyperthermia Nanofiber with Switchable Drug Release for Inducing Cancer Apoptosis

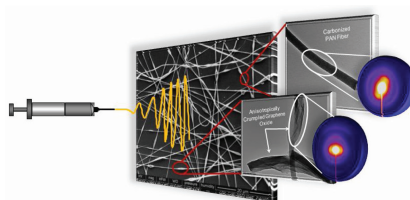


## FULL PAPERS

## Graphene

D. Papkov, A. Goponenko,  
O. C. Compton, Z. An, A. Moravsky,  
X.-Z. Li, S. T. Nguyen,  
Y. A. Dzenis\* .....5763–5770

### Improved Graphitic Structure of Continuous Carbon Nanofibers via Graphene Oxide Templating

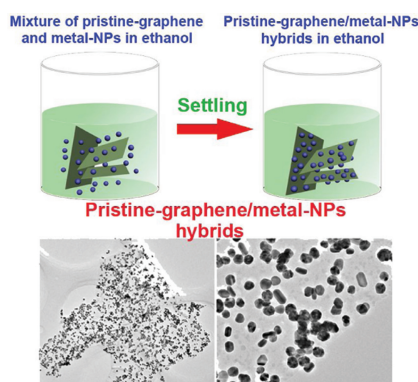


The addition of a small amount of graphene oxide nanoparticles into electro-spun poly(acrylonitrile) (PAN)-based precursor nanofibers significantly increases the graphitic order and preferred orientation in the subsequently carbonized nanofibers with larger improvements observed at higher carbonization temperatures. The apparent global templating effects are expected to lead to improved mechanical and transport properties of nanofibers.

## Nanomaterials

X. Wang, G. Meng,\* C. Zhu, Z. Huang,  
Y. Qian, K. Sun, X. Zhu .....5771–5777

### A Generic Synthetic Approach to Large-Scale Pristine-Graphene/Metal-Nanoparticles Hybrids

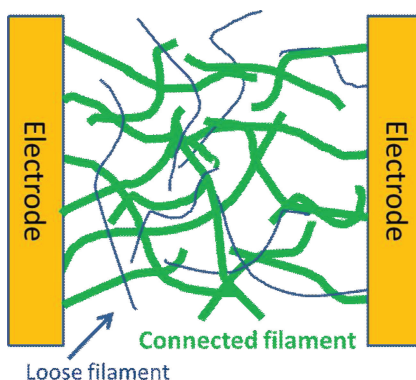


An environmentally friendly generic synthetic approach to large-scale pristine-graphene/metal-NPs hybrids via van der Waals interactions between the pristine-graphene and the metal-NPs is presented. Nanoparticles of different metals with various morphologies can be homogeneously attached on the defect-free pristine-graphene. The as-synthesized pristine-graphene/Ag-NPs hybrids show high surface-enhanced Raman scattering (SERS) sensitivity and can serve as ultra-sensitive SERS substrates.

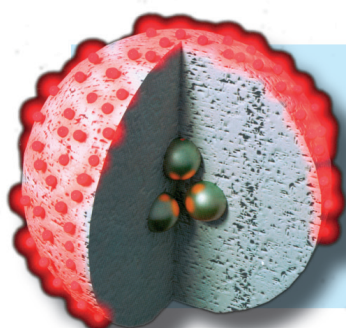
## Conducting Polymers

K. van de Ruit, R. I. Cohen,  
D. Bollen, A. M. B. van Mol,  
R. Yerushalmi-Rozen, R. A. J. Janssen,  
M. Kemerink\* .....5778–5786

### Quasi-One Dimensional in-Plane Conductivity in Filamentary Films of PEDOT:PSS



In-plane conductivity in PEDOT:PSS takes place via filaments. This conclusion is based on charge transport measurements that indicate quasi-one dimensional variable range hopping and is supported by transmission electron microscopy. At higher PEDOT to PSS ratios the number of connected filaments drastically increases, causing an orders of magnitude increase in conductivity, in good agreement with percolation theory.



## How to contact us:

## Editorial Office:

Phone: (+49) 6201-606-286/531  
Fax: (+49) 6201-606-500  
Email: [afm@wiley-vch.de](mailto:afm@wiley-vch.de)

## Reprints:

[cherth@wiley-vch.de](mailto:cherth@wiley-vch.de)

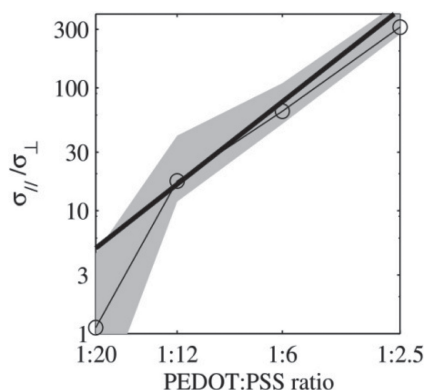
## Copyright Permission:

Fax: (+49) 6201-606-332  
Email: [rights@wiley-vch.de](mailto:rights@wiley-vch.de)



## FULL PAPERS

Reported measurements of the anisotropy in the conductivity of spin coated films of PEDOT:PSS vary widely. A systematic study of the out-of-plane charge transport in thin films of PEDOT:PSS with varying PSS content is presented. It is suggested that the orders of magnitude change in anisotropy can be quantitatively explained on the basis of a percolating cluster model.

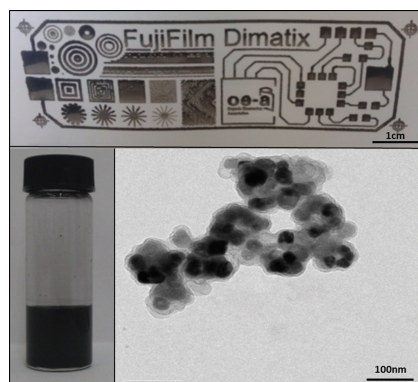


## Conducting Polymers

K. van de Ruit, I. Katsouras, D. Bollen,  
A. M. B. van Mol, R. A. J. Janssen,  
D. M. de Leeuw,  
M. Kemerink\* .....5787–5793

## The Curious Out-of-Plane Conductivity of PEDOT:PSS

Metal@carbon and bimetal@carbon core-shell nanoparticles are synthesized by the RAPET (reaction under autogenic pressure at elevated temperatures) technique. Stable inks are prepared by using various co-solvents and additives. The conductive layers are deposited by inkjet printing on different substrates and high conductivity is obtained.

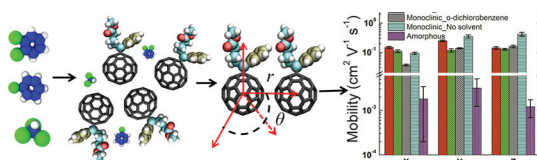


## Conductive Ink

E. Butovsky, I. Perelshtein, I. Nissan,  
A. Gedanken\* .....5794–5799

## Fabrication, Characterization, and Printing of Conductive Ink Based on Multi Core-Shell Nanoparticles Synthesized by RAPET

The impact of trace solvents on the local ordering within PCBM domains is studied through molecular dynamics simulations. Varying the nature of the solvent is not only responsible for different materials-scale properties (crystalline packings, melting temperatures, surface energies, etc.) but also influences the electronic couplings and electron mobilities in the PCBM domains.

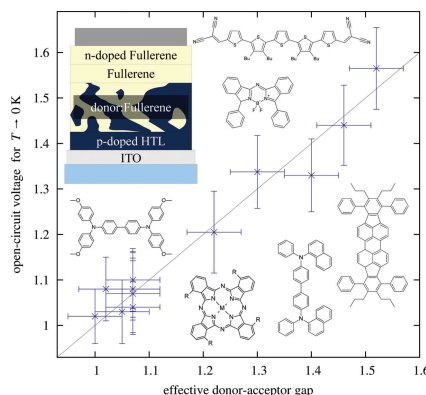


## Organic Photovoltaics

N. R. Tummala, S. Mehraeen, Y.-T. Fu,  
C. Risko,\* J. L. Brédas\* .....5800–5813

## Materials-Scale Implications of Solvent and Temperature on [6,6]-Phenyl-C61-butyric Acid Methyl Ester (PCBM): A Theoretical Perspective

The effective gap of a photovoltaic donor-acceptor system equals the open-circuit voltage extrapolated to temperature zero. The extrapolation is independent of the illumination intensity, and material variations in the doped transport layers do not affect the measurement result. This is shown for bulk-heterojunction devices with different mixing ratios and with small-molecular materials from various classes.



## Organic Solar Cells

J. Widmer,\* M. Tietze, K. Leo,\*  
M. Riede .....5814–5821

## Open-Circuit Voltage and Effective Gap of Organic Solar Cells