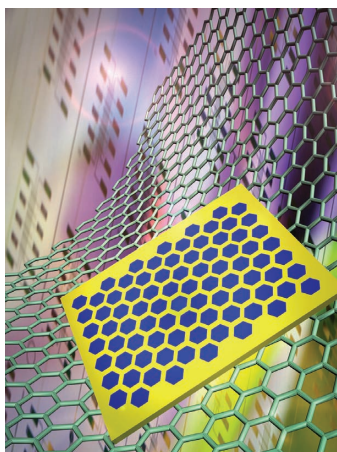


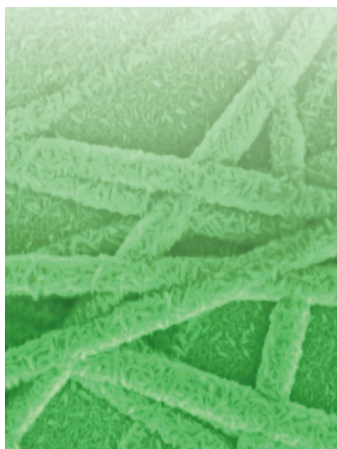
ADVANCED FUNCTIONAL MATERIALS

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Graphene

Self-aligned graphene grains are precisely controlled on liquid Cu by G. Yu and co-workers, using ambient pressure chemical vapor deposition. Large-scale monolayer graphene arrays are modulated by varying the growth conditions such as the flow rate of the carbon source, growth temperature, and growth time. On page 1664, the as-grown graphene arrays show reasonable mobility and high current density, showing great potential for graphene-based electronics.

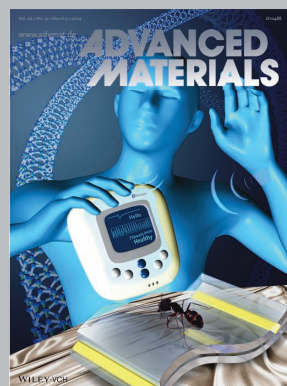
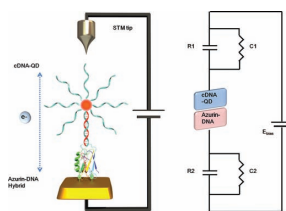


Hybrid Electronics

To overcome the limits of indium-based transparent conductive materials, transparent conductive layers based on a composite of silver nanowires embedded in a conductive metal-oxide are a promising alternative presented on page 1671 by T. Riedl and co-workers. The metal-oxide conductively joins the wires at their junctions and also 'glues' them to the substrate. A record-low sheet resistance down to 5.2 Ohm/sq. is achieved with a concomitant average transmission of 87% for a composite prepared at room-temperature.

Bioprocessing Devices

Single molecule-based computing systems need complex functionalities developed at the single-molecule level. Toward this goal, a bioprocessing device is demonstrated by J.-W. Choi and co-workers on page 1781 that consists of a recombinant azurin/DNA/inorganic hybrid, with a metalloprotein exhibiting redox behavior as a biomemory source. The redox property could be controlled with command materials to perform 'information reinforcement,' 'information regulation,' and 'information amplification' functions.



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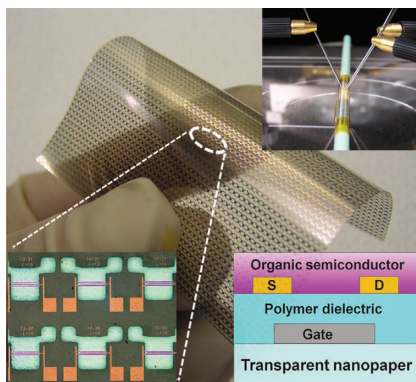
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FULL PAPERS

Flexible Electronics

Y. Fujisaki,* H. Koga, Y. Nakajima,
M. Nakata, H. Tsuji, T. Yamamoto,
T. Kurita, M. Nogii,
N. Shimidzu1657–1663

Transparent Nanopaper-Based Flexible Organic Thin-Film Transistor Array



Optically transparent paper is an attractive candidate for the substrate of eco-friendly and low-cost flexible electron devices. Here, a high-mobility organic thin-film transistor (TFT) array is demonstrated on a 20- μm -thick transparent cellulose nanofibers paper. The fabricated short channel TFTs exhibit a high mobility of up to $1\text{ cm}^2\text{ V}^{-1}\text{ s}^{-1}$ and air stability. The nanopaper-based structure also has mechanical flexibility.

Graphene

D. C. Geng, B. R. Luo, J. Xu,
Y. L. Guo, B. Wu, W. P. Hu, Y. Q. Liu,
G. Yu*1664–1670

Self-Aligned Single-Crystal Graphene Grains

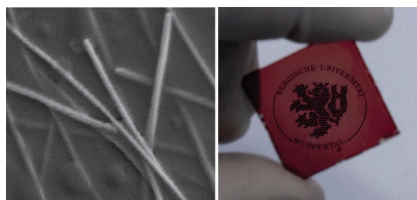
Self-aligned single-crystal graphene grains are controllably prepared on liquid Cu using ambient pressure chemical vapor deposition by controlling methane flow rate. The growth mechanism of the graphene arrays is discussed. Further, bilayer graphene is also fabricated under optimized growth conditions. The self-aligned graphene grains with high-quality should exhibit wide applications in graphene-based electronics for further scale-up production.



Hybrid Electronics

K. Zilberberg, F. Gasse, R. Pagui,
A. Polywka, A. Behrendt, S. Trost,
R. Heiderhoff, P. Görrn,
T. Riedl*1671–1678

Highly Robust Indium-Free Transparent Conductive Electrodes Based on Composites of Silver Nanowires and Conductive Metal Oxides

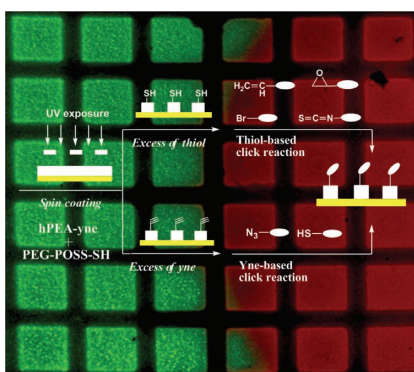


Solution processed, In-free transparent conductive layers based on a composite of silver nanowires and a conductive metal-oxide are demonstrated. Room temperature processing affords electrodes with a low sheet resistance of $5.2\ \Omega\ \text{sq}^{-1}$ and an average transmission of 87%. These hybrid electrodes are successfully implemented in efficient all-solution-processed semitransparent organic solar cells. This approach will generally be applicable in devices which require transparent electrodes.

Hydrogels

Y. L. Xu, H. J. Xu, X. S. Jiang,*
J. Yin.....1679–1686

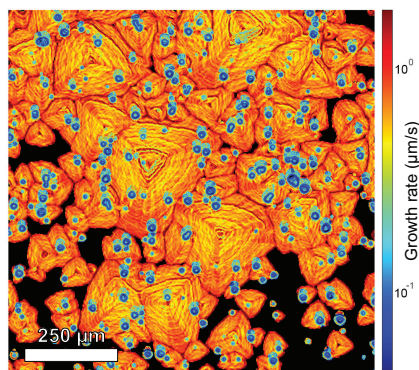
Versatile Functionalization of the Micropatterned Hydrogel of Hyperbranched Poly(ether amine) Based on “Thiol-yne” Chemistry



Versatile functionalization of the micropatterned hydrogel of hyperbranched poly(ether amine) (hPEA) is demonstrated through a series of thiol- or yne-based click chemistry. FTIR, UV-vis spectra, and confocal laser scanning microscopy (CLSM) are used to trace these click reactions. Due to the selective adsorption to the hydrophilic dyes, the obtained patterned hydrogel of hPEA modified with fluorescence dye is further demonstrated in application for recognition of guest molecules.

FULL PAPERS

Two competing crystal growth modes occur in thin films composed of $\text{Ge}_8\text{Sb}_{92}$, $\text{Ge}_9\text{Sb}_{91}$ and $\text{Ge}_{10}\text{Sb}_{90}$: an initial isotropic slow growth mode is followed by a fast dendritic-like growth mode producing crystals with an overall triangular shape. The present findings are relevant for phase-change materials used in memory applications employing the fast reversible amorphous–crystal-line phase change.

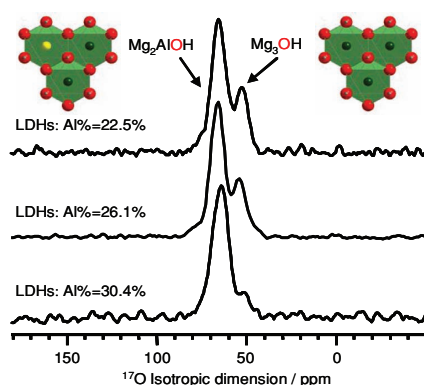


Crystallization

G. Eising,* B.-J. Niebuur, A. Pauza, B. J. Kooi* 1687–1694

Competing Crystal Growth in Ge–Sb Phase-Change Films

Efficient and economical ^{17}O enrichment of layered double hydroxides (LDHs) for NMR investigations can be realized via the “memory effect”. The ^{17}O resonances due to the different oxygen ions in the LDHs structure can be resolved at intermediate magic angle spinning (MAS) speeds and fields with better resolution than the results obtained from ^1H ultrafast MAS NMR spectroscopy. The results show clear evidence for Al–O–Al avoidance.

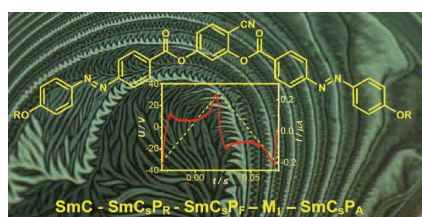


Supramolecular Materials

L. Zhao, Z. Qi, F. Blanc, G. Yu, M. Wang, N. Xue, X. Ke, X. Guo, W. Ding, C. P. Grey, L. Peng* 1696–1702

Investigating Local Structure in Layered Double Hydroxides with ^{17}O NMR Spectroscopy

Development of polar order in tilted smectic liquid crystalline phases (SmC) of bent-core mesogens is found to take place with increasing polar domain size in a series of distinct phases via a paraelectric and a new randomized polar SmC phase (SmC_sP_R) to a ferroelectric phase, which then becomes modulated and finally changes to an antiferroelectric phase.

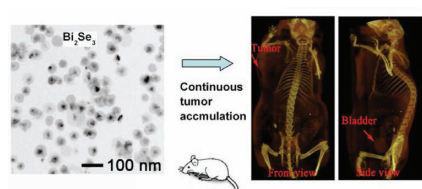


Liquid Crystals

M. Alaasar,* M. Prehm, K. May, A. Eremin,* C. Tschierske* 1703–1717

4-Cyanoresorcinol-Based Bent-Core Mesogens with Azobenzene Wings: Emergence of Sterically Stabilized Polar Order in Liquid Crystalline Phases

The Bi_2Se_3 nanoplates for cancer radiation therapy are designed. 50 nm PVP-protected Bi_2Se_3 nanoplates induce long blood circulation. The Bi_2Se_3 nanoplates are metabolizable and show low in vivo toxicity. The tumor accumulation of the Bi_2Se_3 nanoplates exhibit strong enhancement of cancer radiotherapy.



Cancer Therapy

X.-D. Zhang, J. Chen, Y. Min, G. B. Park, X. Shen, S.-S. Song, Y.-M. Sun, H. Wang, W. Long, J. Xie, K. Gao, L. Zhang, S. Fan, F. Fan, U. Jeong* 1718–1729

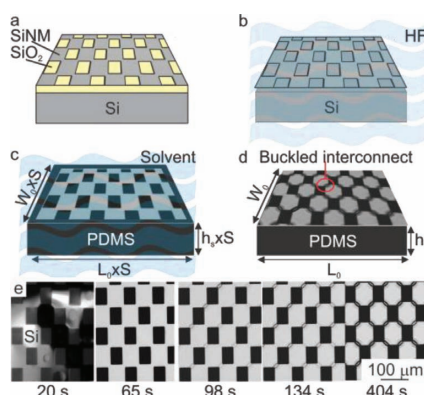
Metabolizable Bi_2Se_3 Nanoplates: Biodistribution, Toxicity, and Uses for Cancer Radiation Therapy and Imaging

FULL PAPERS

Nanomembranes

F. Cavallo,* K. T. Turner,
M. G. Lagally 1730–1737

Facile Fabrication of Ordered Crystalline-Semiconductor Microstructures on Compliant Substrates

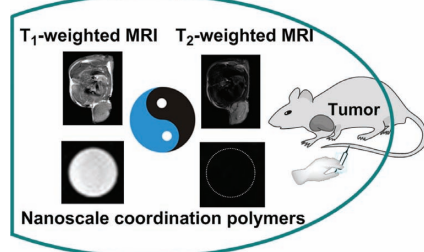


Versatile fabrication of large-area ordered arrays of buckled structures on compliant substrates. Buckling of nanomembranes on compliant substrates occurs by isotropic volume expansion of compliant substrates in solvents and their subsequent contraction after exposure to air. A combination of this guided self-assembly with top-down patterning of the nanomembranes yields ordered 2D and linear arrays of 3D microstructures.

Imaging

H. Yang, C. Y. Qin, C. Yu, Y. Lu,
H. W. Zhang, F. F. Xue, D. M. Wu,
Z. G. Zhou, S. P. Yang* 1738–1747

RGD-Conjugated Nanoscale Coordination Polymers for Targeted T_1 - and T_2 -weighted Magnetic Resonance Imaging of Tumors in Vivo

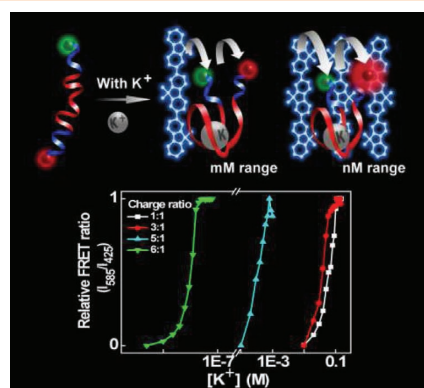


Gadolinium-based nanoscale coordination polymers (NCPs) are obtained using a nanoprecipitation method. The arginine-glycine-aspartic acid (RGD) peptide-functionalized NCPs, which show good targeted properties, have a longitudinal relaxivity (r_1) of $5.1 \text{ mM}^{-1} \text{ s}^{-1}$ and transverse relaxivity (r_2) of $21.7 \text{ mM}^{-1} \text{ s}^{-1}$, suggesting a possibility to use them as both T_1 positive and T_2 negative contrast agents.

Biosensors

B. L. Nguyen, J.-E. Jeong, I. H. Jung,
B. Kim, V. S. Le, I. Kim, K. Kyhm,
H. Y. Woo* 1748–1757

Conjugated Polyelectrolyte and Aptamer Based Potassium Assay via Single- and Two-Step Fluorescence Energy Transfer with a Tunable Dynamic Detection Range



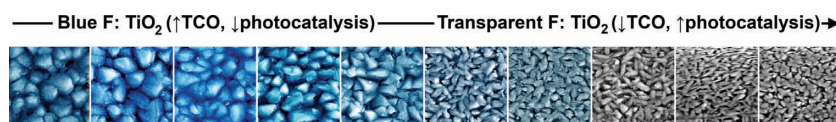
A conformational change in the K^+ -specific aptamer to form a G-quadruplex produces a clear turn on and off signal in the presence or absence of K^+ ions. Highly sensitive and selective K^+ detection is observed via single- and two-step FRET processes with a tunable sensing range and limit of detection.

Transparent Conductive Oxides

A. Kafizas, N. Noor, P. Carmichael,
D. O. Scanlon, C. J. Carmalt,
I. P. Parkin* 1758–1771

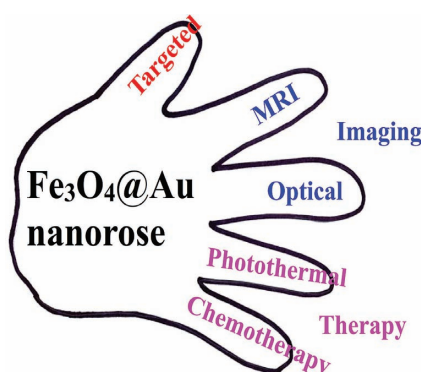
Combinatorial Atmospheric Pressure Chemical Vapor Deposition of F:TiO₂; the Relationship between Photocatalysis and Transparent Conducting Oxide Properties

Anatase TiO₂ with a graded level of F-dopant is grown by combinatorial atmospheric pressure chemical vapor deposition (cAPCVD). The functional properties of 200 positions across the film are rapidly screened. A blue region is singled out for containing the lowest electrical resistivities of any previously reported TiO₂-based system grown by APCVD.



FULL PAPERS

Five functions in one probe: A gold-coated iron oxide ($\text{Fe}_3\text{O}_4@\text{Au}$) nanorose with five distinct functions, which integrate aptamer-based targeting, magnetic resonance imaging (MRI), optical imaging, photothermal and chemotherapy into one single probe is developed. This multifunctional nanoplatform is used for cancer cell targeting, dual molecular imaging, and dual therapy, with enhanced specific binding, improved cellular uptake, minimum nonspecific toxicity, and side effects.

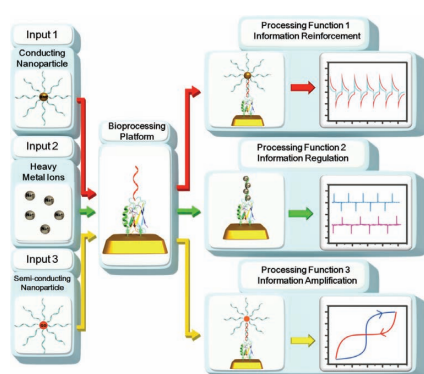


Bio-Nanotechnology

C. Li, T. Chen, I. Ocsoy, G. Zhu, E. Yasun, M. You, C. Wu, J. Zheng, E. Song, C. Z. Huang,*
W. Tan* 1772–1780

Gold-Coated Fe_3O_4 Nanoroses with Five Unique Functions for Cancer Cell Targeting, Imaging, and Therapy

A device based on a recombinant azurin/DNA hybrid material, defined as bioprocessor platform, is developed. Its unique properties are verified by various commanding input materials for three individual functions. This demonstration of the bioprocessing functions based on single hybrid biomolecules is a foundation for the development of environment-dependent biomolecular-based computing systems.

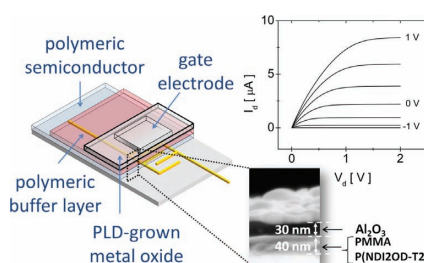


Bioprocessing Devices

T. Lee, A. K. Yagati, J. Min, J.-W. Choi* 1781–1789

Bioprocessing Device Composed of Protein/DNA/Inorganic Material Hybrid

Nanoscale hybrid double-layer dielectrics with high dielectric strength and capacitances up to $0.25 \mu\text{Fcm}^{-2}$ are demonstrated to be compatible with top-gate polymer field-effect transistors (FETs). The adopted strategy allows the optimization of semiconductor–dielectric interface in low-voltage n-type and p-type FETs operating at voltages as low as 1 V. Thanks to this technique, complementary-like inverters exhibiting ideal switching for supply voltages of 1–2 V can be obtained.

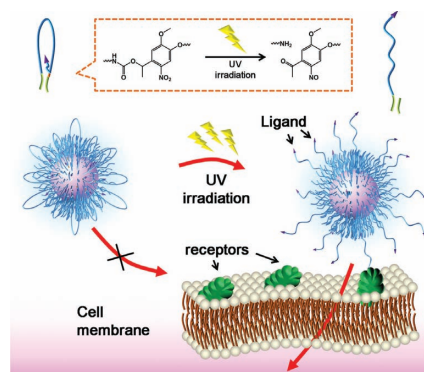


Organic Electronics

A. Luzio, F. García Ferré, F. Di Fonzo, M. Caironi* 1790–1798

Hybrid Nanodielectrics for Low-Voltage Organic Electronics

An ABA-typed polymeric accessory is synthesized to endow traditional micelle-based drug carriers with an illumination-activated tumor specific intracellular drug-delivery capacity. The targeting function of this accessory can be effectively suppressed due to the hiding of ligands. After photo-irradiation, the cleavage of o-nitrobenzyl groups in the functional accessory leads to the stretch of PEG chains, resulting in activated tumor-targeting functions.



Drug Delivery

Z. Yuan, D. Zhao, X. Yi, R. Zhuo, F. Li* 1799–1807

Steric Protected and Illumination-Activated Tumor Targeting Accessory for Endowing Drug-Delivery Systems with Tumor Selectivity