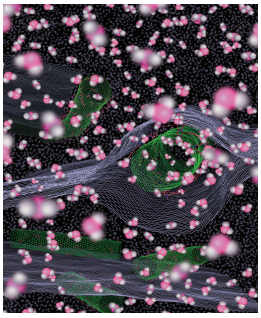
ADVANCED FUNCTIONAL MATERIALS

www.afm-journal.de

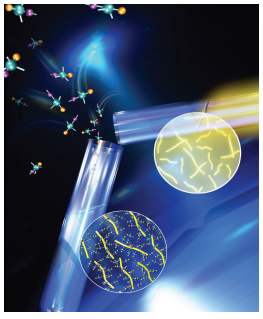


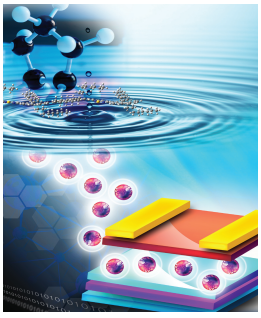
Carbon Nanohybrids

Water dispersible graphene functionalized with hydrophilic carbon nanotubes. The image demonstrates molecules of water, which surround carbon superstructures providing various modes of graphene-nanotube interaction. On page 1481, V. Georgakilas, R. Zbořil, and co-workers show that such a graphene hybrid is dispersible in many polar solvents and displays excellent electrical conductivity, offering a great potential in highly conductive polymers or inkjet printing technologies.

Colorimetric Sensors

The detection of anions in water phase with colorimetric sensors is a long standing academic challenge. The work by X. Zhang and team on page 1506 detects F^{-1} in pure water phase by taking advantage of the strong specific binding between F and Si, as well as the color change property of Si nanowires. It shows ultra-sensitivity, high selectivity, and good stability.



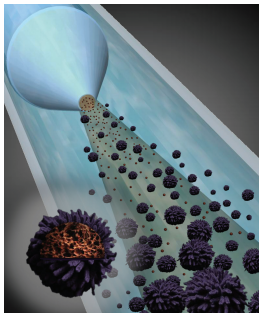


Organic Electronics

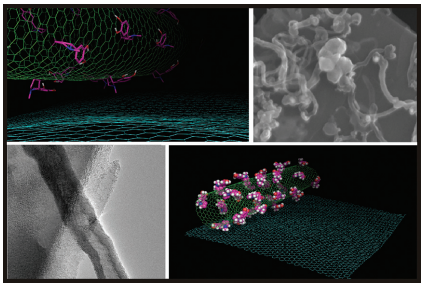
A molecular nano-floating gate approach using conjugated polymer nanoparticles is developed on page 1511 by W.-C. Chen and colleagues for achieving high performance transistor memory devices. The transistor memory device using discrete polyfluorene and poly(fluorene-alt-benzo[2,1,3]thiadiazole nanoparticles as the floating gates can effectively trap the electrons and lead to a large memory window, long retention time, and a high ON/OFF ratio of $>10^4$.

Drug Delivery

On page 1488, B. Herranz-Blanco, H. A. Santos, and co-workers fabricate a multistage drug delivery nanocomposite, comprising porous silicon nanoparticles and micellar pH-responsive polymers, by microfluidic nanoprecipitation. The drug-loaded multistage platform shows high cytocompatibility, pH-dependent cell growth inhibition capacity, and reduced internalization by phagocytic macrophage cells. This nanocomposite is a good candidate for further development as a platform for cancer drug delivery.



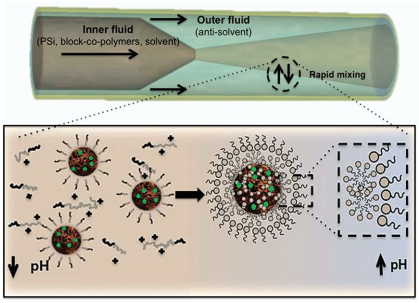
FULL PAPERS



In this work, hydrophilic functionalized carbon nanotubes can stabilize a large amount of pristine graphene nanosheets in pure water without surfactant assistance, affording a stable dispersion at concentrations as high as 15 mg mL^{-1}. The graphene/carbon nanotube hybrid dispersion shows high electrical conductivity with potential application as a conductive ink for inkjet printing.

Carbon Nanohybrids

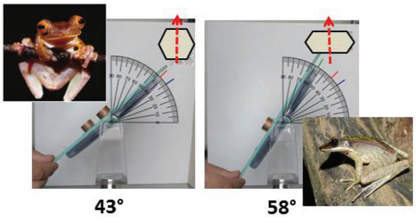
Hydrophilic Nanotube Supported Graphene–Water Dispersible Carbon Superstructure with Excellent Conductivity



A multistage drug delivery nanocomposite, comprising porous silicon nanoparticles and micellar pH-responsive polymers, is fabricated by microfluidic nanoprecipitation. The drug-loaded multistage platform shows high cytocompatibility, pH-dependent cell growth inhibition capacity, and reduced internalization by phagocytic macrophage cells. This nanocomposite is a good candidate for further development as a platform for cancer drug delivery.

Drug Delivery

On-Chip Self-Assembly of a Smart Hybrid Nanocomposite for Antitumoral Applications

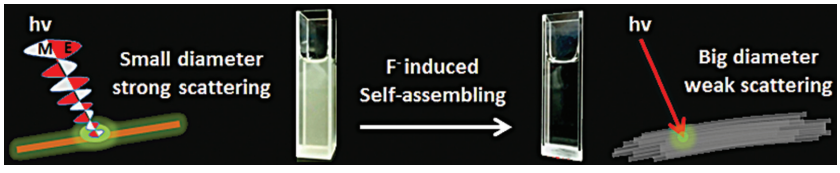


The friction of artificial hexagonal arrays of polydimethylsiloxane pillars in the presence of water is studied. Arrays consisting of elongated pillars, resembling the structure of the toe pads of torrent frogs, are compared with arrays of hexagonal pillars as found in the toe pads of tree frogs. Elongated pillar patterns show significantly higher friction in a direction perpendicular to the long axis and favor orientation-dependent friction.

Wet Adhesion

Torrent Frog-Inspired Adhesives: Attachment to Flooded Surfaces

A colorimetric sensor for F^{-1} detection in pure water is investigated by taking advantage of the strong specific binding between F and Si, as well as the color change property of SiNWs with their diameter. The sensor demonstrates ultrasensitivity, high selectivity, and good stability.



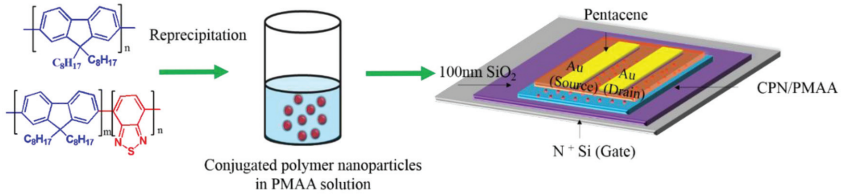
Colorimetric Sensors

Hydrogen-Terminated Si Nanowires as Label-Free Colorimetric Sensors in the Ultrasensitive and Highly Selective Detection of Fluoride Anions in Pure Water Phase

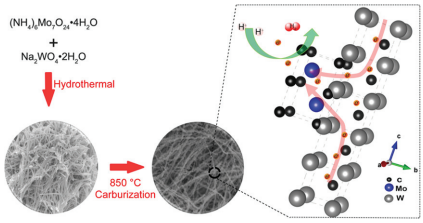
FULL PAPERS

Organic Electronics

A molecular nano-floating gate approach using conjugated polymer nanoparticles is developed for achieving high performance transistor memory devices. The transistor memory device using discrete polyfluorene and poly(fluorene-alt-benzo[2,1,3]thiadiazole nanoparticles as the floating gates can effectively trap the electrons and lead to a large memory window, long retention time, and a high ON/OFF ratio of $>10^4$.

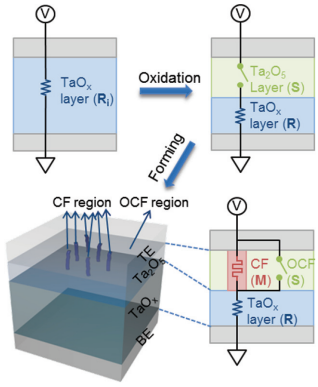


Electrocatalysts

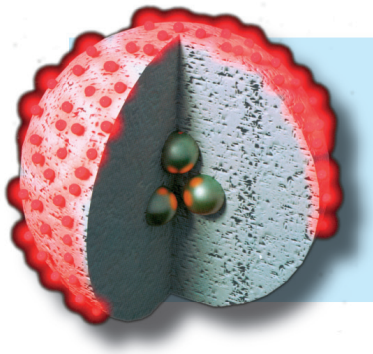


A well-defined nanowire structure of complex molybdenum carbide–tungsten carbide is realized by a pseudomorphic transformation and exhibits high activity towards hydrogen evolution reaction after electrochemical activation.

Memristors



A self-limited switching circuit for uniformly regulating the resistance states is first suggested. This circuit, which is composed of memristor, switch, and resistor, is successfully established in a Ta_2O_5/TaO_x structure. In this device, low- and high-resistance states, and their intermediate resistance states are precisely regulated, and thus, multilevel switching is successfully achieved.



How to contact us:

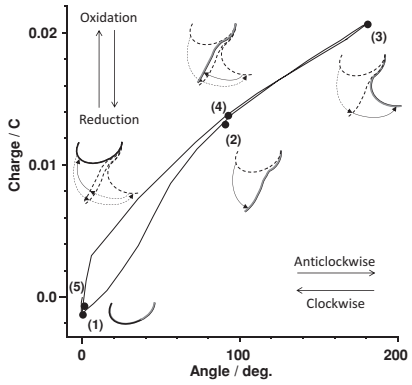
Editorial Office:
Phone: (+49) 6201-606-286/531
Fax: (+49) 6201-606-500
Email: afm@wiley-vch.de

Reprints:
cherth@wiley-vch.de

Copyright Permission:
Fax: (+49) 6201-606-332
Email: rights@wiley-vch.de

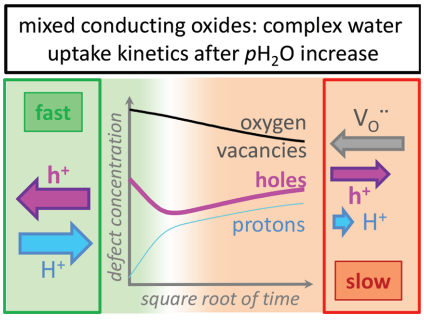
FULL PAPERS

Polypyrrole asymmetric bilayer (PPy_1/PPy_2) bending muscles with asymmetric volume changes under reaction driven ionic exchanges originate cooperative electro-chemo-mechanical effects. Osmotic and electro-osmotic processes, following ionic entrance or preceding conformational compaction processes, complement the muscle actuation.



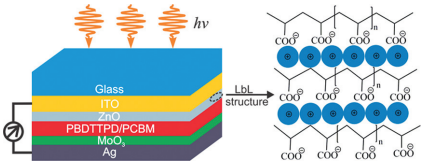
Biomimicry

Mixed conducting oxides containing oxygen vacancies, protons, and electron holes exhibit a complex kinetic behavior for water uptake: fast proton uptake at expense of holes (=reduction) followed by slow oxygen incorporation (reoxidation). Exact analytical relations are derived and this complex kinetics is illustrated by numerical simulations, which naturally explain a number of intriguing experimental observations.



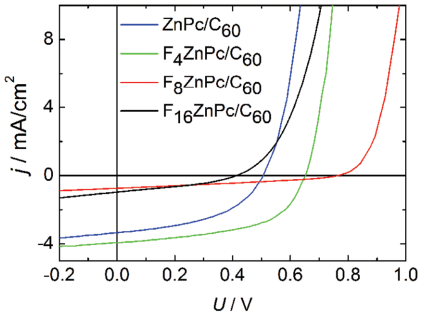
Electrochemistry

A unique approach to fabricating bulk heterojunction polymer solar cells consisting of an electron transport layer of ZnO nanoparticles and polyacrylic acid prepared by a layer-by-layer technique is described. With spin-coated active layers of poly(benzo[1,2-b:4,5-b′]dithiophene-thieno[3,4-c]pyrrole-4,6-dione and [6,6]-phenyl C_{61} butyric acid methyl ester on a 25-nm-thick ZnO/polyacrylic acid layer, the power-conversion efficiency of the solar cell is ≈6%, exceeding that of ZnO interlayers formed by sputtering.



Thin Films

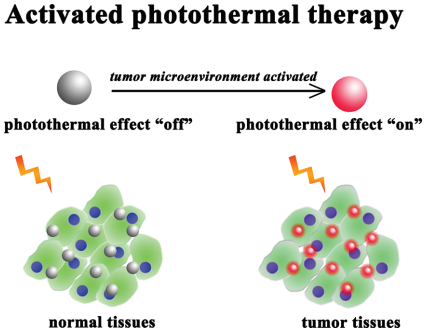
The impact of gradually fluorinated zinc phthalocyanine molecules on the photophysical properties of F_nZnPc/C_{60} solar cells is investigated. Upon increasing fluorination, distinct variations of the cell parameters such as the open circuit voltage are observed. By combining complementary structural and electron spectroscopy analyses, this yields a detailed picture of the relevant D/A interface energetics and processes on microscopic length scales.



Solar Cells

FULL PAPERS

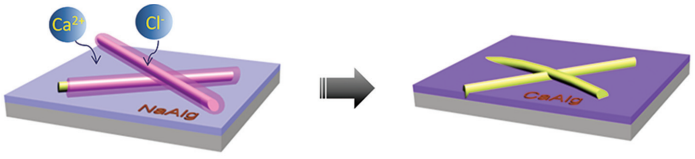
Photothermal Therapy



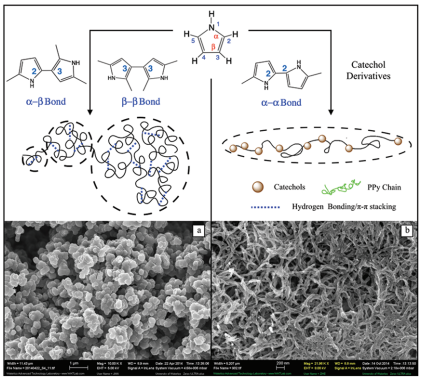
A tumor microenvironment activated photothermal strategy is presented based on pH-dependent light-heat conversion property of Au@PANI nanoparticles. The tumor acidic microenvironment-activated photothermal effect exhibits highly discriminating photo-induced damage to tumor region while leaving normal tissues intact. With the benefit of the control to switch on the photothermal ablation, technical difficulty to precisely operate laser irradiation on tumor cells can be circumvented.

Alginate Gels

Flexible Ag nanowire (NW)/Ca alginate composite transparent electrodes with cohesively improved adhesion and conductivity are prepared without high-temperature annealing. The bivalent calcium ions cross-link the alginate under the AgNW networks to form water-resist alginate gel to bond the AgNWs tightly on the substrate; the chloride ions detach the stabilizer on the surface of the Ag nanowire to trigger the sintering.



Catechols



A benign one-step approach to synthesize novel catechol-polypyrrole (PPy) nanocomposties with a fibrous structure, good water dispersibility, enhanced film adhesion, and improved electrical conductivity is reported. Such functionalized PPy nanofibers can be uniformly dispersed into polyvinyl alcohol polymer matrix and casted into thin-film coating; as-prepared coating exhibits high scratch resistance, biocompatibility, and conductivity, could find broad industrial applications.

Hydrogels

A new design strategy is proposed and demonstrated for a new type of double network hydrogels with both networks being fully physically linked. Agar/hydrophobically associated polyacrylamide double network gels exhibit high toughness, remarkable fatigue resistance, and notable self-healing performance, which can be achieved by tuning the second network.