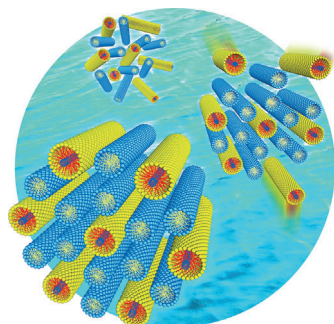
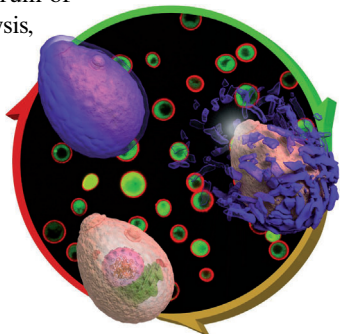


... in our everyday lives, from medicine and information storage to sunscreens and cosmetics. With so many applications, its risks also need to be considered. This issue, which starts with an Editorial by Y. Xia on page 12268, gives an overview of the most recent developments and challenges of nanotechnology. It contains five Reviews on current topics including nanosafety research, nanoparticles in the environment, inorganic nanoparticles, soot nanoparticles, and nanoparticles for drug delivery, as well as Communications that cover the whole spectrum of nanotechnology, from fundamental studies to catalysis, energy, and materials research.

Nanoshells

F. Caruso, Y. Lee, I. S. Choi, and co-workers show in their Communication on page 12420 that a cytoprotective nanoshell can be formed on individual yeast cells from a coordination complex of tannic acid and Fe^{III} ions.

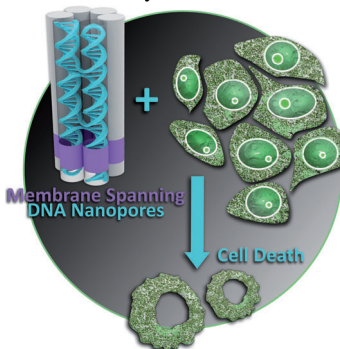


Binary Superlattices

In their Communication on page 12548 ff., S.-M. Choi et al. report highly ordered binary superlattices of 1D nano-objects obtained from single-walled carbon nanotubes and cylindrical surfactant micelles.

DNA Nanotechnology

S. Howorka et al. report in their Communication on page 12466 ff. how nanopores composed of folded DNA featuring a hydrophobic belt of ethyl phosphorothioate groups insert into bilayer membranes and kill cancer cells.



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"... As our synthetic capabilities for nanomaterials continue to evolve, we should not forget to channel those new creations into commercial applications ... Only when this relatively new and still seemingly bizarre realm of nano is able to make a positive and long-lasting impact on every aspect of our society, can we finally declare the arrival of the nano era ..."

Read more in the Editorial by Younan Xia.

Editorial

Y. Xia* ————— 12268 – 12271

Are We Entering the Nano Era?

Front Cover



Spotlight on Angewandte's Sister Journals

12290 – 12293

Service

Author Profile

Masatake Haruta ————— 12294 – 12295



"My favorite painter is Johannes Vermeer, who drew the Art of Painting.

If I had one year of paid leave I would go to France and visit many small and beautiful villages ..."

This and more about Masatake Haruta can be found on page 12294.

News

Nobel Prizes 2014: E. Betzig, S. W. Hell, W. E. Moerner, J. M. O'Keefe, M.-B. Moser, E. I. Moser, I. Akasaki, H. Amano, and S. Nakamura ————— 12296



E. Betzig



S. W. Hell



W. E. Moerner

Books

Bridging Heterogeneous and
Homogeneous Catalysis

Can Li, Yan Liu

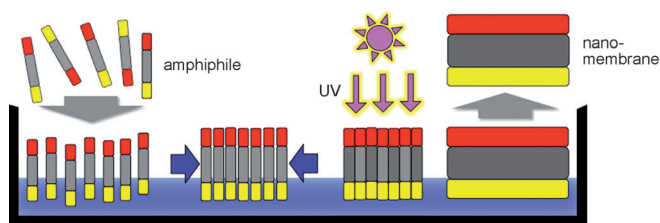
reviewed by J. M. Thomas _____ 12297

Highlights

Nanomembranes

D. Anselmetti,*
A. Götzhäuser* _____ 12300 – 12302

Converting Molecular Monolayers into
Functional Membranes



Carbon nanomembranes are constructed from monolayers of molecular amphiphiles assembled on a water surface. The floating molecular film is cross-linked to form a mechanically stable nanomem-

brane. By varying the type of molecules, the surface area, and the exposure condition, the membrane's stiffness, thickness, and permeability can be tailored.

Reviews

Nanotoxicology



H. F. Krug* _____ 12304 – 12319



Nanosafety Research—Are We on the
Right Track?

A question of safety: This Review discusses how far the human toxicological evaluation of synthetic nanomaterials has come, for which over 10000 publications have appeared since 2000. Four core themes have been analyzed: the uptake of nanomaterials by the three main pathways of the lungs, gastrointestinal tract, and skin as well as the assessment of the methods for lung exposure studies.

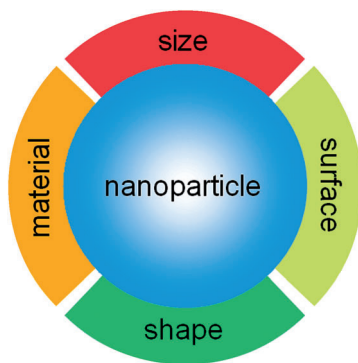


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electronic delivery); for individuals who are personal members of a national chemical society prices are available on request. Postage and handling charges included. All prices are subject to local VAT/sales tax.

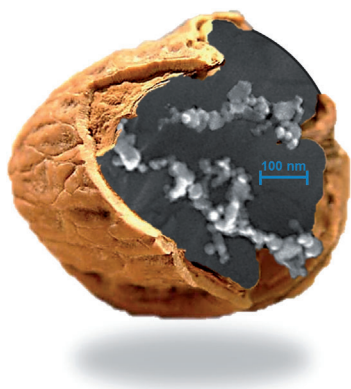


On the way to nanomedicine: Considerable advances in the development of nanoparticles for cancer therapy have been made in recent years. Nanoparticle-based drug-delivery systems offer advantages with regard to multidrug resistance, systemic delivery, and clearance, and enable for example specific tumor targeting and controlled release of therapeutic agents.

Nanomedicine

T. Sun, Y. S. Zhang, B. Pang, D. C. Hyun, M. Yang, Y. Xia* — 12320–12364

Engineered Nanoparticles for Drug Delivery in Cancer Therapy

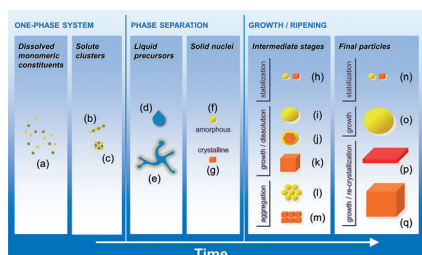


What is soot? Soot nanoparticles produced by engines are a threat to human health. The comprehensive characterization of soot will be essential to meet future low-emission standards. This Review describes the many properties of soot nanoparticles and the possibilities to characterize them, from analysis of its morphology and biological reactivity, to its simple combustion, photoacoustic spectroscopy, and Raman scattering.

Soot Nanoparticles

R. Niessner* — 12366–12379

The Many Faces of Soot: Characterization of Soot Nanoparticles Produced by Engines

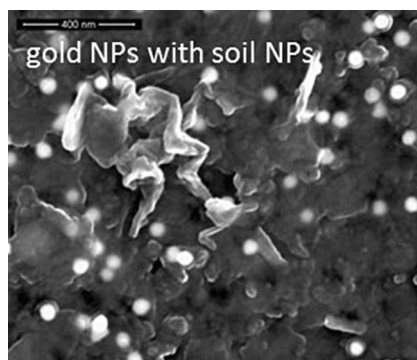


Intermediate nanostructures occurring during crystallization reactions play an important role in understanding and controlling the formation of particles and hybrid materials. The use of polymers allows the range of achievable properties to be broadened through their specific effects at the nanoscale—as is exemplified in this Review with calcium carbonate, zinc oxide, and cementitious systems.

Nanostructures

J. Rieger,* M. Kellermeier, L. Nicoleau — 12380–12396

Formation of Nanoparticles and Nanostructures—An Industrial Perspective on CaCO_3 , Cement, and Polymers



Does nano = risk? This Review critically compares the existing knowledge about naturally observed nanoparticles and the processes they undergo in natural aquatic systems with those found for engineered or manufactured nanoparticles to identify the new “nanospecific” properties of manufactured particles and describe critical knowledge gaps relevant for the risk assessment of manufactured nanomaterials in the environment.

Environmental Chemistry

S. Wagner, A. Gondikas, E. Neubauer, T. Hofmann, F. von der Kammer* — 12398–12419

Spot the Difference: Engineered and Natural Nanoparticles in the Environment—Release, Behavior, and Fate

Communications

Artificial Spores

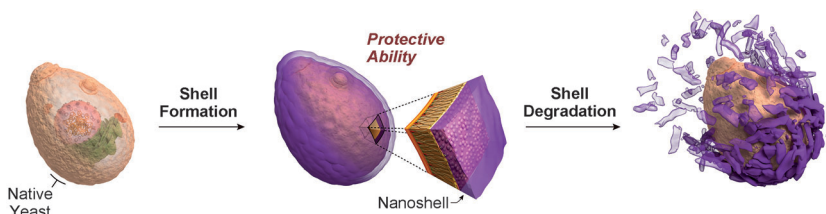
J. H. Park, K. Kim, J. Lee, J. Y. Choi,
D. Hong, S. H. Yang, F. Caruso,* Y. Lee,*
I. S. Choi* 12420–12425



A Cytoprotective and Degradable Metal–
Polyphenol Nanoshell for Single-Cell
Encapsulation



Frontispiece



Cell shells: A cytoprotective tannic acid/
 Fe^{III} nanoshell was formed on individual
yeast cells. Cell division was halted by
formation and restarted by degradation of

the nanoshell. The shell protected the cell
from lytic enzymes, silver nanoparticles,
and UV-C (λ : 100 to 280 nm) irradiation.



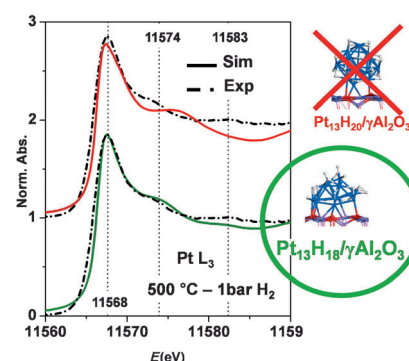
Supported Nanoparticles

A. Gorczyca, V. Moizan,* C. Chizallet,*
O. Proux, W. Del Net, E. Lahera,
J.-L. Hazemann, P. Raybaud,
Y. Joly* 12426–12429



Monitoring Morphology and Hydrogen
Coverage of Nanometric Pt/ $\gamma\text{-Al}_2\text{O}_3$
Particles by In Situ HERFD–XANES and
Quantum Simulations

Identifying the morphology of platinum
nanoclusters supported on γ -alumina and
the hydrogen coverage at a given temper-
ature and hydrogen pressure is possible.
The use of state-of-the-art methodologies
combining high-resolution X-ray absorp-
tion near edge structure (XANES) in situ
experiments, quantum molecular dynam-
ics calculations, and XANES simulations
gives unrivalled insights into catalyst
characterization.

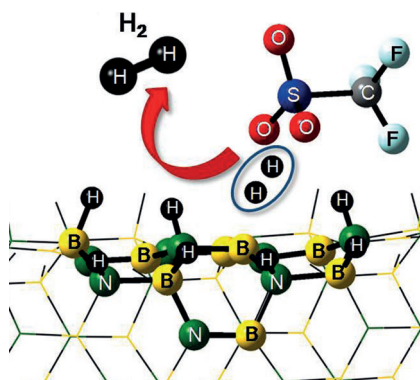


Hydrogen Storage

L. Roy, S. Bhunya,
A. Paul* 12430–12435



A Metal-Free Strategy to Release
Chemisorbed H_2 from Hydrogenated
Boron Nitride Nanotubes



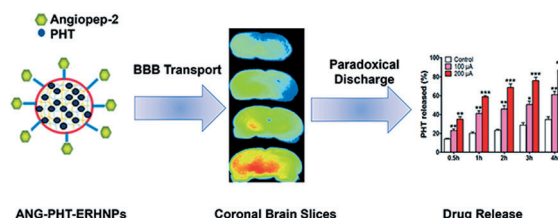
Metal-Free H_2 release: Theoretical inves-
tigations unveil a first example of a metal-
free catalytic strategy to release H_2 mole-
cules (chemisorbed hydrogens) from
hydrogenated boron nitride nanotubes
under mild conditions using a Brønsted
acid catalyst.

Smart Therapeutic Nanoparticles

X. Ying, Y. Wang, J. Liang, J. Yue, C. Xu,
L. Lu, Z. Xu, J. Gao, Y. Du,*
Z. Chen* 12436–12440



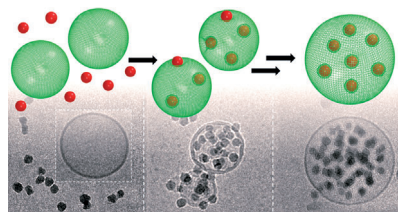
Angiopep-Conjugated Electro-Responsive
Hydrogel Nanoparticles: Therapeutic
Potential for Epilepsy



Smart vesicles: Electro-responsive hydro-
gel nanoparticles (ERHNPs) modified
with angiopep-2 (ANG) were loaded with
the antiepileptic drug phenytoin sodium
(PHT). The complex ANG-PHT-ERHNPs

can easily transport the drug into the brain
and a fast release could be achieved by the
application of an electric field, leading to
a reduction of the severity of the seizure
onset.

Hybrid colloids: The internalization of silica nanoparticles (SiNPs) into fluid liposomes was followed under conditions under which the process proceeds slowly allowing for the observation of the different steps of the mechanism (see picture). The finally formed well-defined SiNP-filled vesicles are long-time stable hybrid colloids, controlled by the initial mixing ratio of nanoparticles and liposomes.



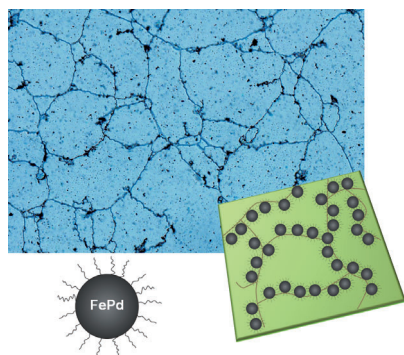
Phospholipid Membranes

R. Michel,* E. Kesselman, T. Plostica,
D. Danino,
M. Gradzielski* _____ 12441–12445

Internalization of Silica Nanoparticles into
Fluid Liposomes: Formation of
Interesting Hybrid Colloids



Inside Cover

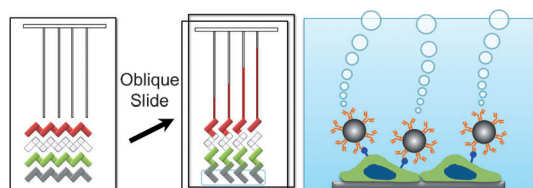


Hybrid soft magnet: Liquid crystals were used as molecular templates to organize superparamagnetic FePd nanoparticles into two-dimensional arrays. The anisotropy of the liquid crystal can be transferred to the network of nanoparticles, enabling the formation of a hybrid soft magnet.

Liquid Crystals

B. Matt, K. M. Pondman, S. J. Asshoff,
B. ten Haken, B. Fleury,*
N. Katsonis* _____ 12446–12450

Soft Magnets from the Self-Organization
of Magnetic Nanoparticles in Twisted
Liquid Crystals



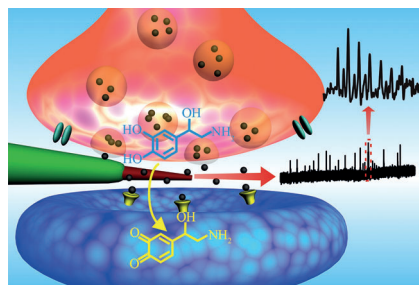
No more (or less) than meets the eye: Platinum nanoparticles (PtNPs) efficiently catalyze the reaction of H_2O_2 to form oxygen gas, the generation of which can be measured by microfluidics technology. Thus, when integrated with ELISA, a volu-

metric bar-chart chip (see picture) enabled the quantitative visual detection of cancer biomarkers in serum and on the cell surface on the basis of the catalase-like activity of PtNPs.

Microfluidic Chips

Y. Song, X. Xia, X. Wu, P. Wang,
L. Qin* _____ 12451–12455

Integration of Platinum Nanoparticles
with a Volumetric Bar-Chart Chip for
Biomarker Assays



Chemical neurotransmission occurs at chemical synapse, but up to now there was no means for direct monitoring of neurotransmitter exocytosis and its precise kinetics from inside individual infinitesimal synapse. A novel finite conical nanoelectrode is fabricated and used in a newly developed amperometric method (see picture) for probing inside what appears to be single synapses.

Nanobioanalysis

Y. T. Li, S. H. Zhang, L. Wang, R. R. Xiao,
W. Liu, X. W. Zhang, Z. Zhou, C. Amatore,
W. H. Huang* _____ 12456–12460

Nanoelectrode for Amperometric
Monitoring of Individual Vesicular
Exocytosis Inside Single Synapses

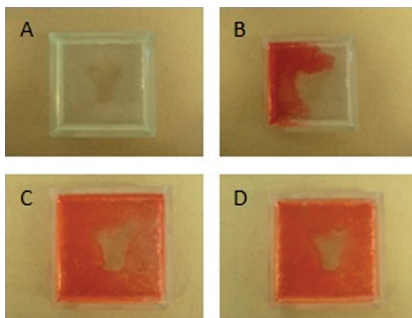


Multidomain Gels

D. J. Cornwell, B. O. Okesola,
D. K. Smith* 12461 – 12465



Multidomain Hybrid Hydrogels: Spatially Resolved Photopatterned Synthetic Nanomaterials Combining Polymer and Low-Molecular-Weight Gelators



The best of both worlds: Forming polymer gel networks embedded within a low-molecular-weight gel matrix using photo-irradiation allows the generation of multicomponent nanoscale soft materials. The different gel domains have different properties, for example, with regard to the diffusion of small molecules, such as dyes, depending on which nanoscale networks they contain (see picture).

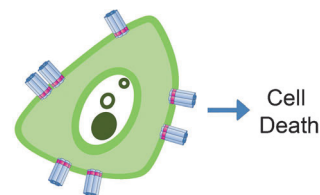
DNA Nanotechnology

J. R. Burns, N. Al-Juffali, S. M. Janes,
S. Howorka* 12466 – 12470



Membrane-Spanning DNA Nanopores with Cytotoxic Effect

DNA-based cytotoxic agents: Nanopores composed of folded DNA featuring a hydrophobic belt of ethyl phosphorothioate groups insert into bilayer membranes and kill cancer cells (see picture). The mode by which the pores achieve cell killing is elucidated with confocal microscopy.



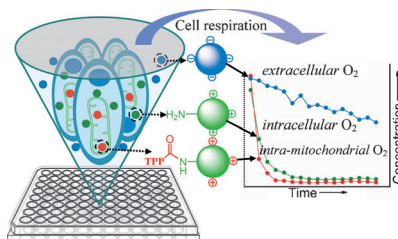
Back Cover

Oxygen Sensing

X.-H. Wang, H.-S. Peng,* L. Yang,
F.-T. You, F. Teng,* L.-L. Hou,
O. S. Wolfbeis 12471 – 12475



Targetable Phosphorescent Oxygen Nanosensors for the Assessment of Tumor Mitochondrial Dysfunction By Monitoring the Respiratory Activity



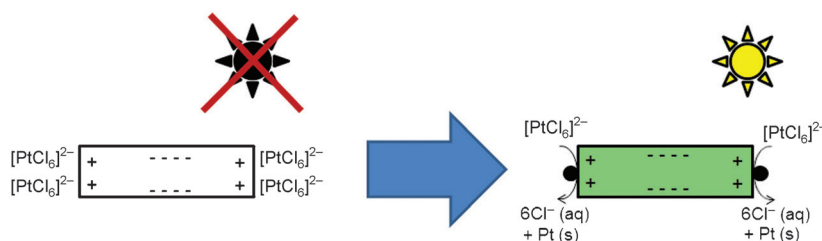
Three phosphorescent oxygen nanosensors with specifically modified surface are targetable for extracellular, intracellular, and intramitochondrial O_2 . The cell respiration is studied with a time-resolved fluorescence microplate reader and expressed in terms of the O_2 consumption rates and (intra)cellular O_2 gradients. Thereby, the status of the mitochondrial function can be accurately assessed.

Metal Deposition

K. Wenderich, A. Klaassen, I. Siretanu,
F. Mugele, G. Mul* 12476 – 12479

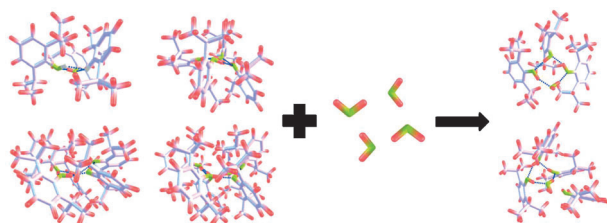


Sorption-Determined Deposition of Platinum on Well-Defined Platelike WO_3



Positioned for action: Understanding of the mechanism behind the structure-directed photodeposition of metals is highly relevant for the optimization of photocatalysts. The preferential deposition of Pt on WO_3 was found to be the

result of intrinsic surface-charge differences of specific facets, rather than of the illumination-induced preferred spatial separation of electrons and holes (see picture).



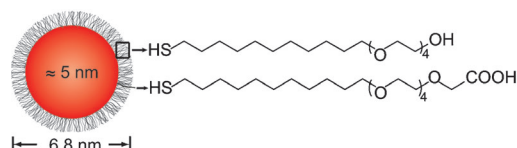
Caught! The hydration of nanomicelles in the gas phase is observed by spectroscopic methods and quantum chemical calculations. The trimer of propofol with

a water molecule forms cyclic hydrogen-bond networks but, the tetramer encapsulates the water molecule within the hydrophilic core.

Supramolecular Chemistry

I. León,* J. Millán, E. J. Cocinero, A. Lesarri, J. A. Fernández* _____ **12480–12483**

Water Encapsulation by Nanomicelles



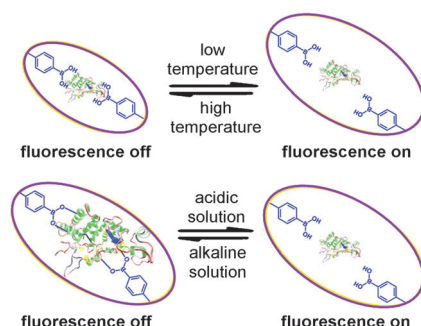
Small quantum dots (sQDs; see picture) as fluorescent probes enable AMPA receptors better access to neuronal synaptic region than commercially available quantum dots. Combined with three-

dimensional super-resolution imaging of the postsynaptic density, AMPA receptors labeled with sQDs can be investigated by single-particle tracking for their diffusion patterns at the synaptic cleft.

Fluorescence Spectroscopy

E. Cai, P. Ge, S. H. Lee, O. Jeyifous, Y. Wang, Y. Liu, K. M. Wilson, S. J. Lim, M. A. Baird, J. E. Stone, K. Y. Lee, M. W. Davidson, H. J. Chung, K. Schulten, A. M. Smith, W. N. Green, P. R. Selvin* _____ **12484–12488**

Stable Small Quantum Dots for Synaptic Receptor Tracking on Live Neurons

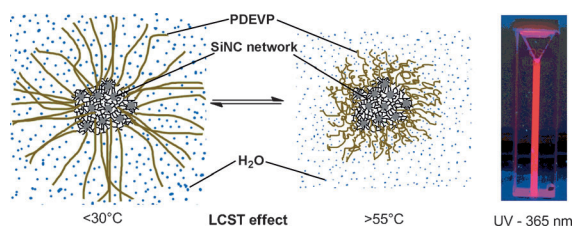


An excellent fit: A fluorescence nanosensor based on the boronate affinity of the target was developed for the quantitative detection of glycoproteins. The recognition performance of the nanosensor, which was successfully used for the detection of horseradish peroxidase in biological fluids, was regulated by controlling the pH value and the temperature (see scheme).

Molecular Recognition

W. Zhang, W. Liu, P. Li,* H. Xiao, H. Wang, B. Tang* _____ **12489–12493**

A Fluorescence Nanosensor for Glycoproteins with Activity Based on the Molecularly Imprinted Spatial Structure of the Target and Boronate Affinity



Polymer–nanoparticle hybrids are synthesized using a rare earth metal catalyst. Applying surface-initiated group transfer polymerization, poly(diethyl vinylphosphonate) (PDEVP) is grafted from the silicon nanoparticle surface. The obtained

products exhibit the coexistence of the bright photoluminescence of the silicon nanocrystals under UV irradiation and the thermoresponsive behavior of the PDEVP in water.

Functional Nanoparticles

J. Kehrle, I. M. D. Höhle, Z. Yang, A.-R. Jochem, T. Helbich, T. Kraus, J. G. C. Veinot,* B. Rieger* _____ **12494–12497**

Thermoresponsive and Photoluminescent Hybrid Silicon Nanoparticles by Surface-Initiated Group Transfer Polymerization of Diethyl Vinylphosphonate

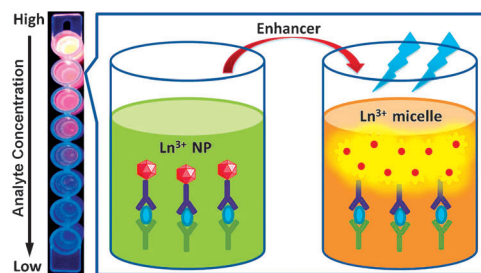


Lanthanide Nano-Bioprobes

S. Y. Zhou, W. Zheng, Z. Chen, D. T. Tu,
Y. S. Liu, E. Ma, R. F. Li, H. M. Zhu,
M. D. Huang,*
X. Y. Chen* 12498 – 12502



Dissolution-Enhanced Luminescent
Bioassay Based on Inorganic Lanthanide
Nanoparticles



An ultrasensitive bioassay, based on the dissolution-enhanced luminescence of inorganic lanthanide (Ln^{3+}) nanoparticles (NPs), was developed for the detection of carcinoembryonic antigen in human serum samples. As a result of the high

Ln^{3+} labeling ratio, the detection limit is improved with a record-low value of 0.1 pg mL^{-1} (0.5 fM) compared to a commercial dissociation-enhanced Ln^{3+} fluoroimmunoassay.

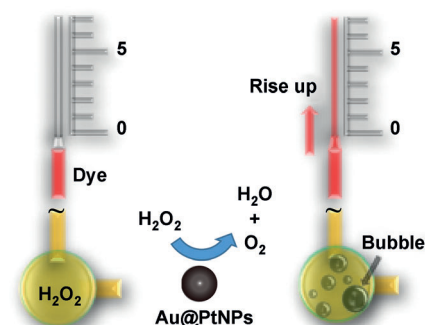
Point-of-Care Testing

Z. Zhu, Z. Guan, S. Jia, Z. Lei, S. Lin,
H. Zhang, Y. Ma, Z. Tian,
C. Yang* 12503 – 12507



Au@Pt Nanoparticle Encapsulated
Target-Responsive Hydrogel with
Volumetric Bar-Chart Chip Readout for
Quantitative Point-of-Care Testing

Seeing is believing: A simple and general quantitative method has been developed by integration of target-responsive hydrogels, Au core/Pt shell nanoparticles to catalyze the decomposition of H_2O_2 to O_2 , and a volumetric bar-chart chip for a visual quantitative readout. A wide range of targets can be detected without any external electronic devices, as demonstrated for cocaine, with a detection limit of $0.33 \text{ } \mu\text{M}$ in urine.

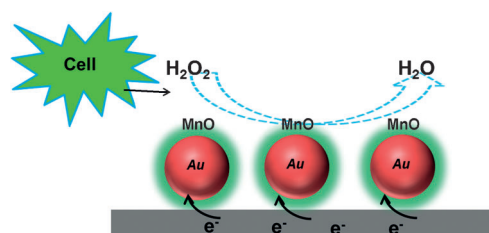


Electrocatalysis

H. Zhu, A. Sigdel, S. Zhang, D. Su, Z. Xi,
Q. Li, S. Sun* 12508 – 12512



Core/Shell Au/MnO Nanoparticles
Prepared Through Controlled Oxidation of
AuMn as an Electrocatalyst for Sensitive
 H_2O_2 Detection



Cell sensing: AuMn alloy nanoparticles were synthesized through hydride reduction of manganese acetylacetonate in the presence of Au nanoparticles and were subsequently converted into Au/MnO nanoparticles through air annealing. The

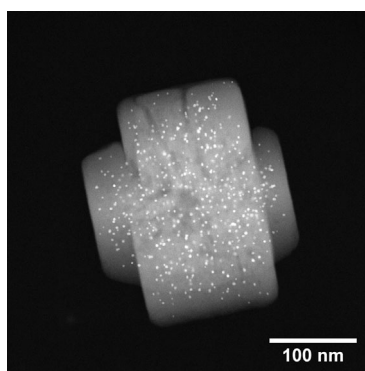
Au/MnO nanoparticles are active catalysts for the electrochemical reduction of H_2O_2 and can be used to measure the H_2O_2 levels from different types of cells for cancer detection.

Catalytic Oxidation

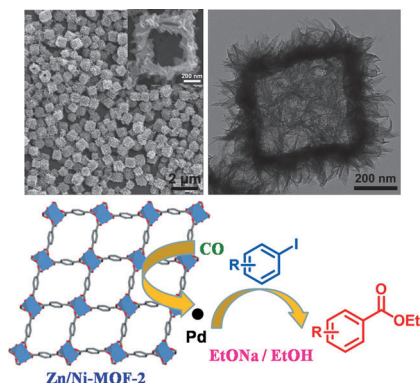
J. Mielby, J. O. Abildstrøm, F. Wang,
T. Kasama, C. Weidenthaler,
S. Kegnæs* 12513 – 12516



Oxidation of Bioethanol using Zeolite-
Encapsulated Gold Nanoparticles



Gold nanoparticles were encapsulated inside recrystallized silicalite-1 crystals using a simple and cost-effective method that results in a narrow size distribution of the nanoparticles, which remain readily accessible through the inherent microporous structure. The encapsulated nanoparticles were demonstrated to be stable, highly active, and selective for the gas-phase oxidation of bioethanol to acetaldehyde.



Cubed route: A facile surfactant-free solvothermal approach gives nanostructures that undergo a crystal-structure transformation from Zn/Ni-MOF-5 nanocubes to Zn/Ni-MOF-2 nanosheets. The nanosheets retain the cubic shape suggesting that the in situ synthesized nanocubes may act as a template. Immobilization of palladium in the nanosheet structure gives a catalyst for the alkoxybenzylation of aryl iodides.

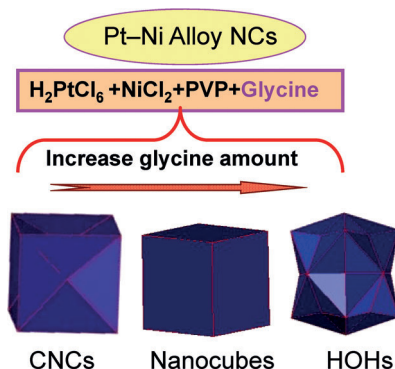
Hollow Nanostructures

Z. C. Zhang, Y. F. Chen, S. He, J. C. Zhang, X. B. Xu, Y. Yang, F. Nosheen, F. Saleem, W. He, X. Wang* — 12517 – 12521

Hierarchical Zn/Ni-MOF-2 Nanosheet-Assembled Hollow Nanocubes for Multicomponent Catalytic Reactions



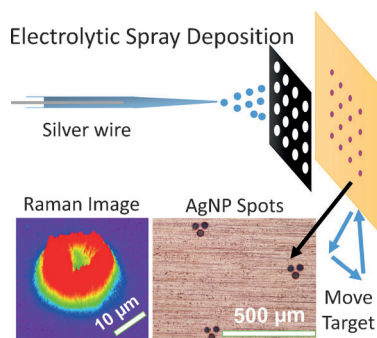
In good shape: By varying the amount of glycine present, the shape of Pt–Ni alloy nanocrystals could be tuned from concave nanocubes (CNCs) to nanocubes and hexoctahedra (HOHs; see picture). Glycine was used to manipulate the nucleation and growth rates of the Pt–Ni alloy NCs for the formation of CNCs by self-assembly and HOHs by control of crystal growth. Pt–Ni CNCs and HOHs showed excellent electrocatalytic properties. PVP = polyvinylpyrrolidone.



Nanocrystal Catalysts

X. Xu, X. Zhang,* H. Sun, Y. Yang, X. Dai, J. Gao, X. Li, P. Zhang, H.-H. Wang, N.-F. Yu, S. G. Sun* — 12522 – 12527

Synthesis of Pt–Ni Alloy Nanocrystals with High-Index Facets and Enhanced Electrocatalytic Properties



Electrolytic spray deposition was employed for the formation of nanoparticle spots on various substrates in air. These materials are rugged, versatile substrates for surface-enhanced Raman spectroscopy, in which they lead to good enhancements. Lithographic applications of this method of ion deposition were also investigated.

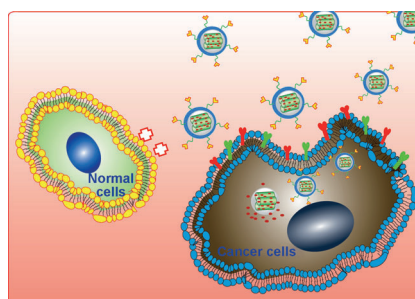
Nanoparticle Spots

A. Li,* Z. Baird, S. Bag, D. Sarkar, A. Prabhath, T. Pradeep,* R. G. Cooks* — 12528 – 12531

Using Ambient Ion Beams to Write Nanostructured Patterns for Surface Enhanced Raman Spectroscopy



Au gets carried away: Cancer-targeted mesoporous silica nanoparticles for delivery of cytotoxic gold(III) porphyrin complexes are prepared. Encapsulation of the metal complex minimizes its toxic side effects on normal human cells and enhances its anticancer efficacy through inhibition of thioredoxin reductase activity and activation of signaling pathways mediated by reactive oxygen species.



Drug Delivery

L. He, T. F. Chen,* Y. You, H. Hu, W. J. Zheng, W.-L. Kwong, T. Zou, C.-M. Che* — 12532 – 12536

A Cancer-Targeted Nanosystem for Delivery of Gold(III) Complexes: Enhanced Selectivity and Apoptosis-Inducing Efficacy of a Gold(III) Porphyrin Complex



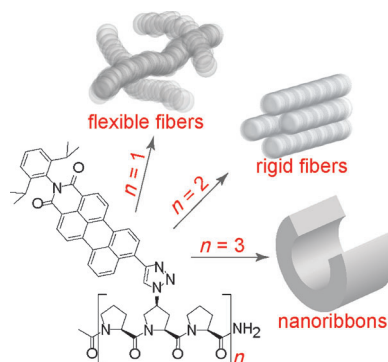
Supramolecular Structures

U. Lewandowska, W. Zajaczkowski,
L. Chen, F. Bouillière, D. Wang, K. Koyanov,
W. Pisula, K. Müllen,*
H. Wennemers* ————— 12537 – 12541



Hierarchical Supramolecular Assembly of
Sterically Demanding π -Systems by
Conjugation with Oligoproline

A perfect marriage: Sterically demanding chromophores conjugated with oligoproline of increasing length and rigidity form supramolecular structures with increasing order, whereas the individual building blocks do not self-assemble. Subtle structural modifications tune the supramolecular morphologies.

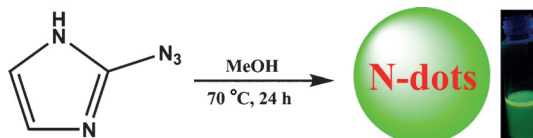


Quantum Dots

X. Chen, Q. Jin, L. Wu, C. Tung,
X. Tang* ————— 12542 – 12547



Synthesis and Unique Photoluminescence
Properties of Nitrogen-Rich Quantum
Dots and Their Applications



A new member of the family: Nitrogen-rich quantum dots were serendipitously synthesized at low temperature. These N-dots contain a high percentage of the element nitrogen and have unique photoluminescence properties. The photolu-

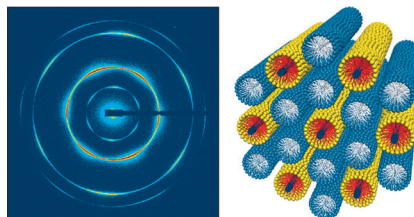
minescence behavior of N-dot solutions can be adjusted from blue to green simply by variation of reaction temperature. These N-dots show promising applications as fluorescent ink and biocompatible staining.

Binary Superlattices

S.-H. Lim, H.-S. Jang, J.-M. Ha, T.-H. Kim,
P. Kwasniewski, T. Narayanan, K. S. Jin,
S.-M. Choi* ————— 12548 – 12554



Highly Ordered and Highly Aligned
Two-Dimensional Binary Superlattice of
a SWNT/Cylindrical-Micellar System



Binary superlattice of 1D nanoobjects: A highly ordered intercalated hexagonal binary superlattice was formed when hydrophilically functionalized SWNTs were added to a hexagonally packed $C_{12}E_5$ cylindrical-micellar system. In this binary superlattice, a hexagonal array of SWNTs is embedded in a honeycomb lattice of $C_{12}E_5$ cylinders (see picture), thus maximizing the free-volume entropies for both types of cylinders.

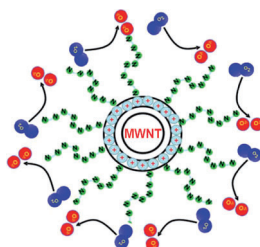
Inside Back Cover

Electrocatalysts

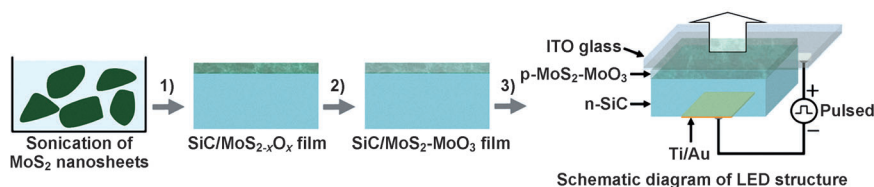
Z. Wu, E. M. Benchafia, Z. Iqbal,*
X. Q. Wang* ————— 12555 – 12559



N_8^- Polynitrogen Stabilized on Multi-Wall
Carbon Nanotubes for Oxygen-Reduction
Reactions at Ambient Conditions



Putting the N into energy: A N_8^- polynitrogen stabilized on the positively charged sidewalls of multi-walled carbon nanotubes (MWNTs) is synthesized by cyclic voltammetry under ambient conditions. ORR experiments using $MWNT+N_8^-$ as the cathodic catalyst (see picture; N green, O_2 blue, O^{2-} red) show that it is very active, giving an even higher current density than that of a commercial Pt/carbon.



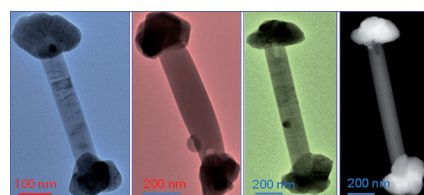
LED's glow: MoS₂-MoO₃ hybrid nanomaterials are prepared by the heat-assisted partial oxidation of MoS₂ nanosheets in air (1) followed by a thermal-annealing-driven crystallization (2). The obtained hybrid nanomaterial exhibits

p-type conductivity and is employed in a heterojunction of n-type SiC/p-type MoS₂-MoO₃ for light-emitting diodes (3), from which multi-wavelength electroluminescent emission is detected.

Hybrid Nanomaterials

Z. Y. Yin, X. Zhang, Y. Q. Cai, J. Z. Chen, J. I. Wong, Y. Y. Tay, J. W. Chai, J. Wu, Z. Y. Zeng, B. Zheng, H. Y. Yang, H. Zhang* 12560–12565

Preparation of MoS₂-MoO₃ Hybrid Nanomaterials for Light-Emitting Diodes

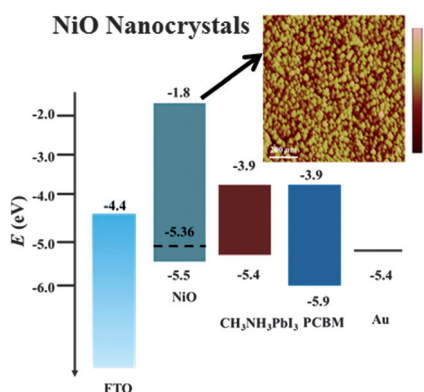


Access denied! Binary Sb₂S₃ nanotubes were sealed with ternary AgSbS₂ semiconductors by simply annealing the nanotubes in the presence of Ag⁰ particles (see structures). In this way, unique dumbbell-shaped hollow nanocapsules were formed.

Nanocapsules

S. Sarkar, A. K. Guria, B. K. Patra, N. Pradhan* 12566–12570

Chemical Sealing of Nanotubes: A Case Study on Sb₂S₃



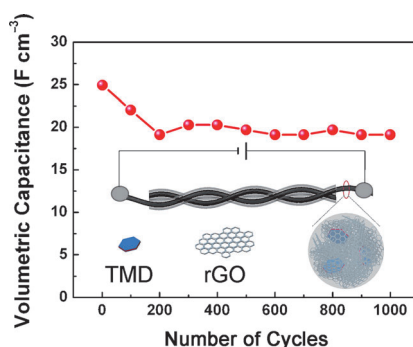
The advantages are crystal clear: A transparent layer of NiO nanocrystals fabricated by a simple sol-gel processing method acted as an efficient hole-transport layer in an inverted perovskite solar cell. With the NiO film (see picture), a cell efficiency of 9.11% was observed: by far the highest for a planar perovskite solar cell based on an inorganic hole-extraction layer.

Perovskite Solar Cells

Z. L. Zhu, Y. Bai, T. Zhang, Z. K. Liu, X. Long, Z. H. Wei, Z. L. Wang, L. X. Zhang, J. N. Wang, F. Yan, S. H. Yang* 12571–12575

High-Performance Hole-Extraction Layer of Sol-Gel-Processed NiO Nanocrystals for Inverted Planar Perovskite Solar Cells

Two kinds of 2D materials, namely reduced graphene oxide (rGO) and transition-metal dichalcogenide (TMD) nanosheets, were used to prepare ultralong hybrid microfibers. As proof-of-concept application, supercapacitors were fabricated with these rGO-TMD hybrid fibers and showed greatly improved performance compared to those based on bare rGO fibers.



Supercapacitors

G. Z. Sun, J. Q. Liu, X. Zhang, X. W. Wang, H. Li, Y. Yu, W. Huang, H. Zhang,* P. Chen* 12576–12580

Fabrication of Ultralong Hybrid Microfibers from Nanosheets of Reduced Graphene Oxide and Transition-Metal Dichalcogenides and their Application as Supercapacitors

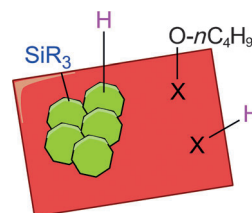
Graphene in Catalysis

J. F. Blandez, A. Primo,* A. M. Asiri,
M. Álvaro, H. García* — 12581 – 12586



Copper Nanoparticles Supported on Doped Graphenes as Catalyst for the Dehydrogenative Coupling of Silanes and Alcohols

Dehydrogenative coupling: Graphene and doped graphene materials have been obtained by pyrolysis of biomass wastes and have been used as support of copper nanoparticles (see picture). The system exhibits superior catalytic activity for the formation of siloxanes.

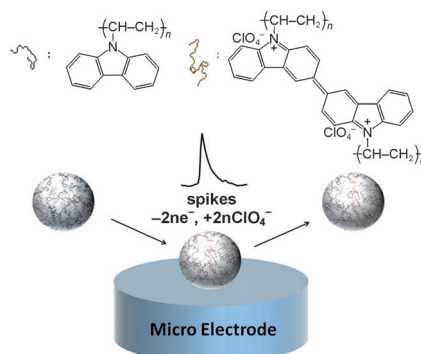


Polymeric Nanoparticles

X.-F. Zhou, W. Cheng,
R. G. Compton* — 12587 – 12589



Doping of Single Polymeric Nanoparticles



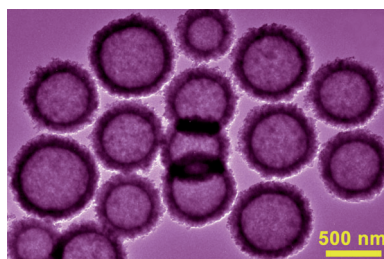
Making an impact: The oxidative doping and quantitative analysis of doping yield of single polymeric nanoparticles are demonstrated. This provides a simple and unique strategy to synthesize and characterize doped polymeric nanoparticles at the single-nanoparticle level.

Lithium Storage

G. Q. Zhang, H. B. Wu, T. Song, U. Paik,
X. W. Lou* — 12590 – 12593



TiO₂ Hollow Spheres Composed of Highly Crystalline Nanocrystals Exhibit Superior Lithium Storage Properties



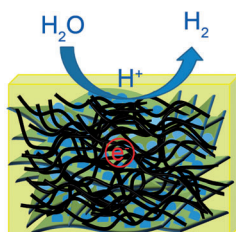
Empty vessels: Anatase TiO₂ hollow spheres composed of highly crystalline nanocrystals are prepared by a simple two-step template strategy. They exhibit superior lithium storage properties in terms of long-term cycling stability and an excellent rate capability which benefits from many structural features, including a hollow interior, small size, high crystallinity of primary nanocrystals, and shell robustness.

Electrocatalysis

S. Peng, L. Li, X. Han, W. Sun,
M. Srinivasan, S. G. Mhaisalkar,
F. Cheng,* Q. Yan,* J. Chen,
S. Ramakrishna* — 12594 – 12599

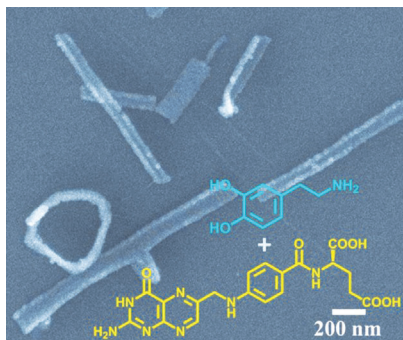


Cobalt Sulfide Nanosheet/Graphene/Carbon Nanotube Nanocomposites as Flexible Electrodes for Hydrogen Evolution



Hybrid composites: The fabrication of a flexible electrode based on cobalt sulfide/reduced graphene/carbon nanotube nanocomposite is reported. The CoS₂ nanosheets were self-assembled on a reduced graphene oxide matrix and then embedded in a porous network of carbon nanotubes. This conductive film showed a superior electrocatalytic activity for the hydrogen evolution reaction (see picture).

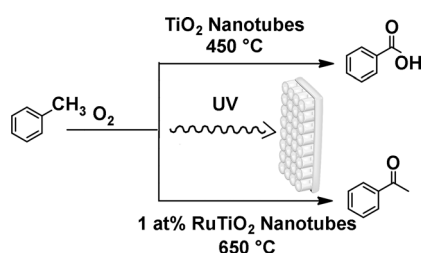
The magic of folic acid: When the oxidative self-polymerization of dopamine (turquoise) was conducted in the presence of folic acid (yellow), novel aggregated nanostructures of polydopamine (PDA) were generated: nanobelts and nanofibers (see SEM image). Supramolecular interactions between folic acid and protomolecules of PDA, such as π - π interactions and hydrogen bonding, appear to contribute to the formation of the nanobelts and nanofibers.



Nanostructures

X. Yu, H. L. Fan, L. Wang,
Z. X. Jin* 12600 – 12604

Formation of Polydopamine Nanofibers
with the Aid of Folic Acid

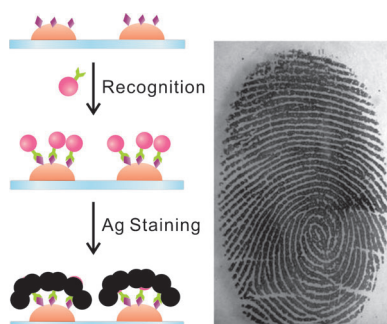


Game changers: Differently modified TiO_2 nanotubes were used to achieve a drastic change in the selectivity of a photocatalytic reaction. For the photocatalytic oxidation of toluene, depending on the electronic properties of TiO_2 (anatase, rutile, Ru-doped), a strong change in the main reaction product (namely benzoic acid versus acetophenone) can be achieved, and certain undesired reaction pathways can be completely shut down.

Photocatalysis

J. Tripathy, K. Lee,
P. Schmuki* 12605 – 12608

Tuning the Selectivity of Photocatalytic
Synthetic Reactions Using Modified TiO_2
Nanotubes

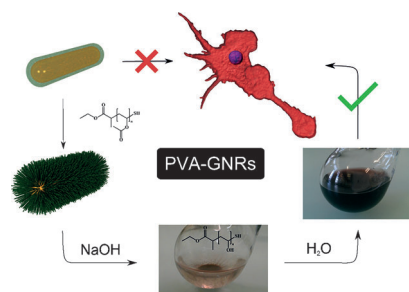


With bare eyes: The detection of latent fingerprints and biomolecules that are secreted by human eccrine sweat glands is possible by immunological multimetal deposition (iMMD). In this approach, gold nanoparticles serve as the nucleation sites for autometallographic deposition of silver particles from the silver staining solution and as the carriers of recognition molecules.

Fingerprints

Y. He, L. Xu, Y. Zhu, Q. Wei, M. Zhang,
B. Su* 12609 – 12612

Immunological Multimetal Deposition for
Rapid Visualization of Sweat Fingerprints



Polymer grafting: Gold nanorods can be functionalized with polyvinyl acetate, which hydrolyzes to polyvinyl alcohol. An aqueous dispersion of the resulting colloidally stable and nontoxic nanorods was tested by exposure to primary human blood monocyte derived macrophages.

Bio-Nanomaterials

C. Kinnear, D. Burnand, M. J. D. Clift,
A. F. M. Kilbinger B. Rothen-Rutishauser,
A. Petri-Fink* 12613 – 12617

Polyvinyl Alcohol as a Biocompatible
Alternative for the Passivation of Gold
Nanorods

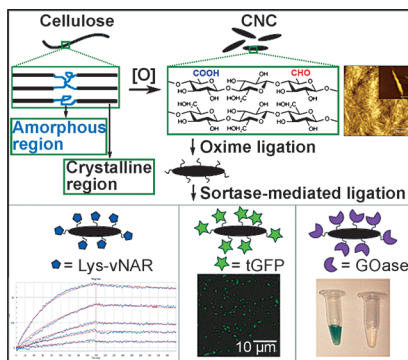


Bioconjugation

C. Uth, S. Zielonka, S. Hörner, N. Rasche,
A. Plog, H. Orelma, O. Avrutina,
K. Zhang,* H. Kolmar* — 12618–12623



A Chemoenzymatic Approach to Protein Immobilization onto Crystalline Cellulose Nanoscaffolds



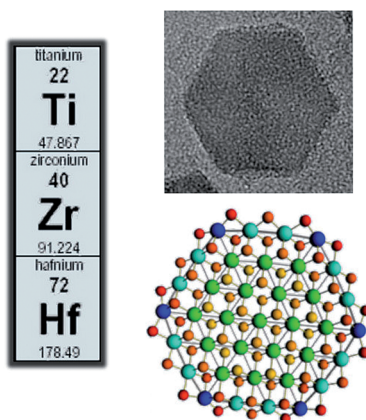
A **modular approach** was used for site-directed, bioorthogonal protein immobilization. The combination of enzyme-mediated ligation with highly efficient oxime ligation makes it possible to decorate sustainable nanocellulose platforms with fully functional proteins from different families.

Nanoflakes

P. Miró,* J. H. Han, J. Cheon,
T. Heine* — 12624–12628



Hexagonal Transition-Metal Chalcogenide Nanoflakes with Pronounced Lateral Quantum Confinement



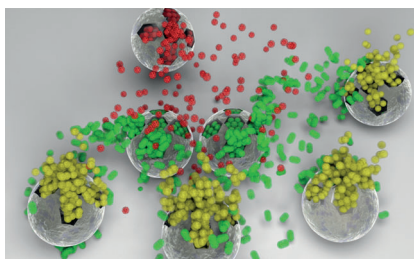
Six-sided flakes: Transition-metal dichalcogenide nanoflakes of composition MX_2 (where $M = Ti, Zr$ and Hf ; $X = S$ and Se) grow preferentially in equilateral hexagons and exhibit a pronounced lateral quantum confinement. The hexagonal shape arises from the charge location at the edges and vertices and the resulting Coulombic repulsion.

Chemical Communication

C. Giménez, E. Climent, E. Aznar,
R. Martínez-Mañez,* F. Sancenón,
M. D. Marcos, P. Amorós,
K. Rurack* — 12629–12633



Towards Chemical Communication between Gated Nanoparticles



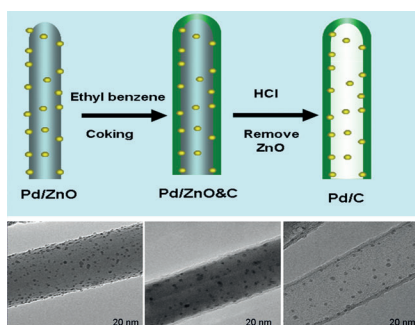
Talk to me! A hierarchically organized community of three different gated nanoparticles communicates with each other through the interchange of chemical messengers (see schematic representation).

Nanoparticle Catalysts

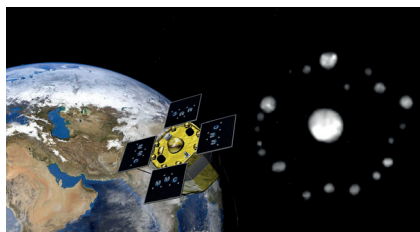
H. Y. Liu, L. Y. Zhang, N. Wang,
D. S. Su* — 12634–12638



Palladium Nanoparticles Embedded in the Inner Surfaces of Carbon Nanotubes: Synthesis, Catalytic Activity, and Sinter Resistance



Inside out: A facile and versatile synthesis using a template-based procedure gives Pd nanoparticles uniformly embedded in the inner surfaces of carbon nanotubes (see picture). The nanocomposite is catalytically more active and sinter-resistant, than traditional carbon-nanotube-supported Pd catalysts.



Small world: Gold nanoparticles decorated with RAFT star polymers of different molecular weights can be used as scaffolds for the attachment of functional units at defined distances from the central core. This approach can result in planet–satellite nanostructures.

Nanoparticle Architectures

C. Rossner, P. Vana* — 12639 – 12642

Planet–Satellite Nanostructures Made To Order by RAFT Star Polymers



Supporting information is available on www.angewandte.org (see article for access details).



This article is accompanied by a cover picture (front or back cover, and inside or outside).



A video clip is available as Supporting Information on www.angewandte.org (see article for access details).



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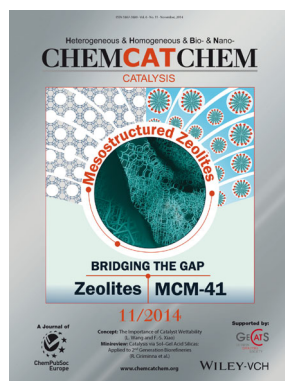


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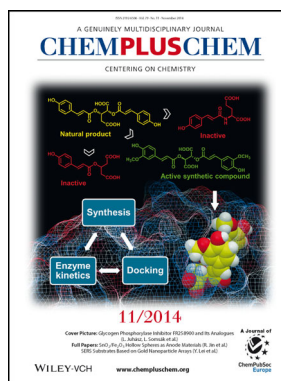
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