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VIP ***The following Communications have been judged by at least two referees to be "very important papers" and will be published online at www.angewandte.org soon:***

News

Books

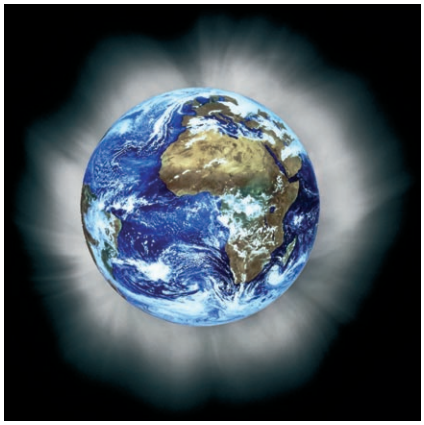
Essays

History of Science

Far-reaching influence: How did the cultural atmosphere in the Anglo-Saxon world shape the sciences and in particular chemistry at the beginning of the 19th century? Who were the most important figures, and what role did they play in academia as well as in the public? Impressions regarding these themes are given in this Essay.

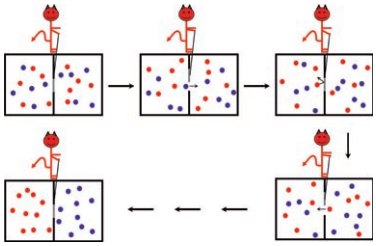
Renewable Energies

Energy for everybody? The ever increasing world energy demand cannot be satisfied much longer with fossil fuels; alternatives are required to limit the chance of a climate collapse and the spreading of wars for natural resources. The 21st century will be largely defined by the way we face and resolve the energy crisis. This is an intricate and fascinating scientific challenge, in which chemistry will play a fundamental role, and also an unprecedented opportunity to shape a more peaceful world.

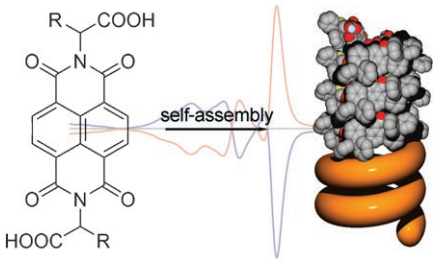


Reviews

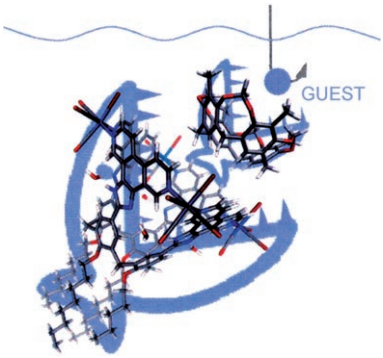
Exercising demons: Although the notion of synthetic molecular-level motors and machines has been around for 150 years (for example, Maxwell's demon, see picture), it is only recently that research in this area has flourished. The current state of the art in regard to how the components of molecular-level structures can be switched, rotated, speeded up, slowed down, and directionally driven in response to stimuli is described in the Review.



Communications



Twist your tubes: The self-assembly of small organic molecules is an entirely new approach to the synthesis of nanotubular structures possessing helical chirality. Amino acid derivatives of naphthalenediimide form such assemblies both in solution and in the solid state. The chirality of the nanotubes is determined by the constituent amino acid but is independent of the nature of the side chains.



A hunter hunted! A highly preorganized, deep metallocavitand of nanoscale dimensions containing rhenium atoms at the four corners can be readily synthesized from a simple formyl-substituted calix[4]arene and 3,8-phenanthroquinone. Unsubstituted calix[4]arenes and cavitands without substituents on the lower rim are the ideal guests for such an expanded calixarene (see picture), and are included with binding constants of 10^3–10^5 M^{-1}.

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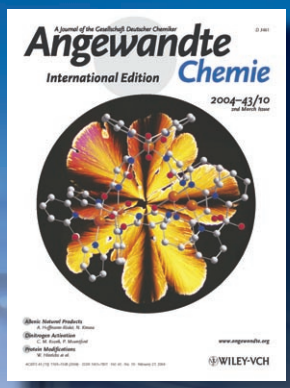

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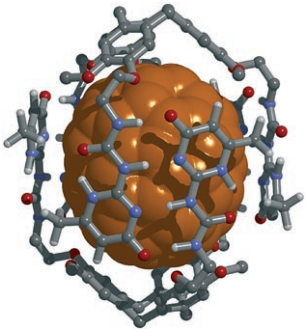
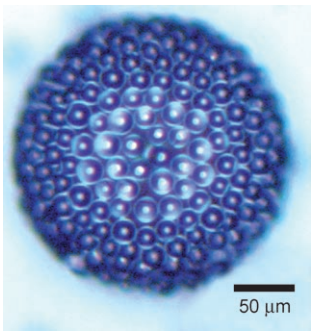
All wrapped up: An easy, highly selective separation of C_{70} and the higher fullerenes has been achieved by solid–liquid extraction with a 2-ureido-4-[1*H*]-pyrimidinone-based scaffold which wraps around the guest as a dimeric capsule (see picture), thereby solubilizing it in THF. Acidification disrupts the hydrogen-bonding network and allows easy recovery of the guest and recycling of the receptor without chromatography or tedious procedures.



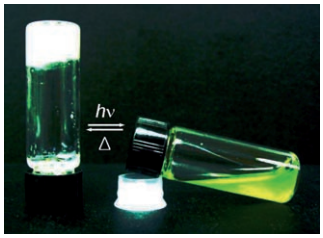
Molecular Recognition



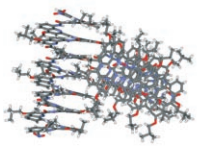
Stick with me: Electrostatic charges can be induced in functionalized polystyrene beads. Oppositely charged beads then aggregate to form superstructures. A coat of small beads can self-assemble around a large bead (see optical microscopy image). After annealing, another layer of beads can be added. The technique, based on contact electrification, avoids the use of expensive equipment and enables the use of large quantities of material.

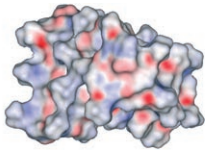
Self-Assembly

Without modification of its periphery, cucurbit[7]uril (a macrocyclic cavitand comprising seven glycoluril units) forms a hydrogel. The gelation is thermoreversible and sensitive to pH, but is inhibited by the presence of alkali-metal ions and shows guest-induced stimuli-responsive behavior: upon addition of a small amount of a guest, it undergoes a reversible gel–sol transition with alternating UV irradiation and heat treatment (see picture).



Hydrogels





Big is beautiful: A folded synthetic molecule with a conformation that compares in size with the tertiary folds of a small protein and yet only consist of non-natural units is described. By not controlling the helical handedness allows the effect of tertiary interactions between helical modules through helix–helix side-by-side induction of handedness to be observed.

Helical Structures

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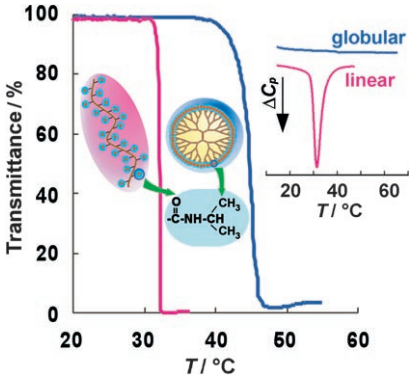
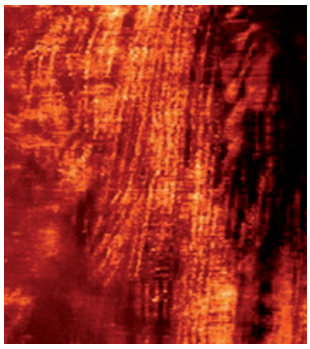


The sensitive type: A lower critical solution temperature (LCST) is observed for dendrimers with *N*-isopropylamide (NIPAM) groups at all chain terminals and for poly(*N*-isopropylacrylamide) (PNIPAAm; see picture). A much smaller endothermic peak occurs around the LCST for NIPAM-terminated dendrimers. The globular structure of the dendrimers may cause inefficient hydration and dehydration around NIPAM groups below and above the LCST, respectively.

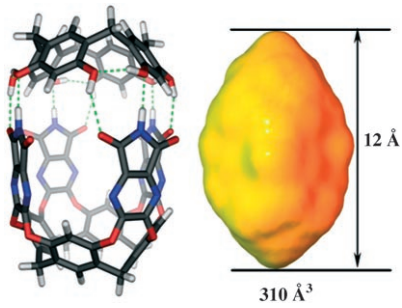
Thermosensitive Polymers

Doped and wired: The organization of the π functional units in amide-functionalized tetrathiafulvalene in a gel by hydrogen-bonding interactions has given rise to nanofibers. Doping with iodine generates a conducting material, which upon annealing gives rise to nanowires with metal-like conductivity (see current-sensing AFM image).

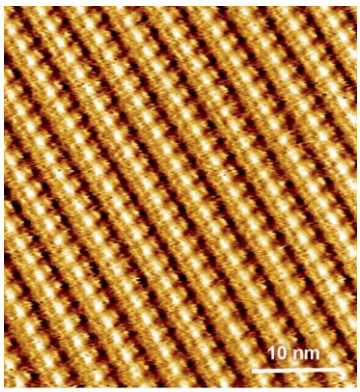


Electric Conductors

Different, yet compatible: A hybrid capsule is formed through hydrogen bonding between two different subunits, each of which is capable of self-assembly into homodimeric capsules. The hybrid forms in response to a guest that fills its space properly. Formation of the molecular capsule (see picture) is supported by ^{1}H NMR spectroscopy experiments.



Host–Guest Systems



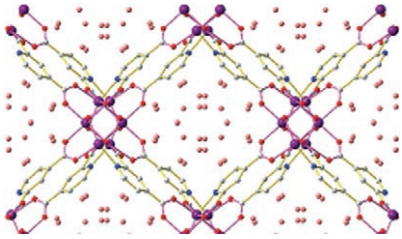
Nanopatterning of multifunctional architectures, that is, 1D or 2D arrays on surfaces, can be achieved through bottom-up fabrication of 1D coordination networks by self-assembly processes. A coordinating tecton bearing both monodentate and tridentate coordination poles is combined with suitable metal centers (see scanning tunneling microscopy image).

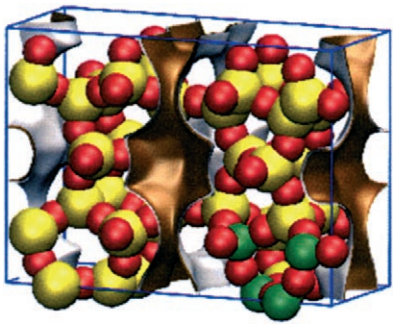
Supramolecular Chemistry

Contents

The counterion, not the binding pocket, shifts the absorption of the protonated Schiff base of 11-*cis*-retinal into the visible region. This conclusion was drawn from high-level CASPT2 calculations on the visual pigment rhodopsin (the optimized structure of the binding pocket is shown).

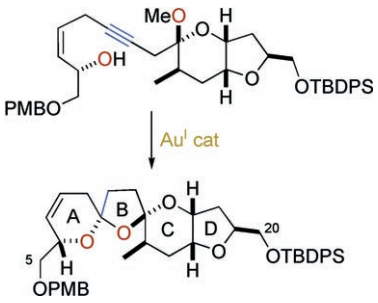
Resilient hosts: The porous coordination solids CUK-1 (see structure; Co purple, C gray, N blue, O red/pink) and CUK-2 are synthesized from unsymmetrical ligands and Co^{II} ions. Even after the removal of co-crystallized guests, the host frameworks are exceptionally stable. CUK-1 shows a high capacity for H_2 adsorption and is one of very few materials capable of separating N_2 from O_2.





Aluminum sites in zeolites are difficult to locate experimentally, and hence an indirect theoretical approach is proposed that identifies the most likely positions of the aluminum atoms by matching simulation results with available experimental data. The picture shows a model unit cell of FER-type zeolite with the four distinct T-sites for aluminum in green.

Au-dacious ring synthesis: An efficient synthesis of the A–D rings of azaspiracid has been developed by using a Co-catalyzed oxaetherification to form the fused 2,5-*trans*-configured trisubstituted tetrahydrofuran D ring, and an unprecedented Au-catalyzed bis-spiroketal formation wherein a bridging alkyne served as a surrogate for the C10 ketal (see scheme; PMB = *para*-methoxybenzyl, TBDPS = *tert*-butyldiphenylsilyl).



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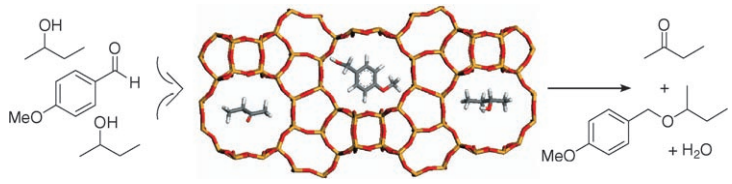

This most ethereal of cascades: Water-resistant single isolated Lewis acids within the framework of molecular sieves act as excellent general catalysts for the synthesis of ethers (see scheme). On this basis, an environmentally friendly process has been developed for the preparation of fine chemicals that involves a one-pot Meerwein–Ponndorf–Verley reduction/etherification cascade.

Supporting information is available on the WWW (see article for access details).

A video clip is available as Supporting Information on the WWW (see article for access details).

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