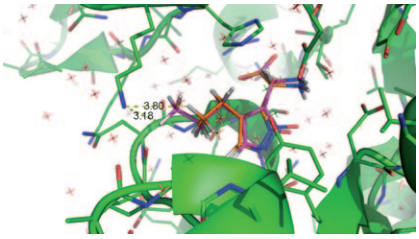
CONTENTS

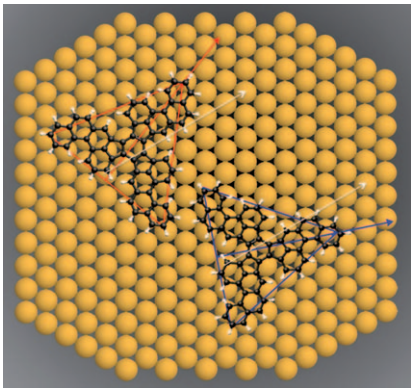
MINIREVIEWS

Subunit selectivity at NMDA receptors: Subunit-selective ligands for the glutamate receptors remain an area of interest, since glutamate is the major excitatory neurotransmitter in the brain and involved in a number of diseased states in the central nervous system. Few selective ligands are known, especially among the NMDA receptor class. Development of these ligands seems to be a difficult task because of the conserved region in the binding site of the NMDA receptor subunits. A scaffold developed by our group has shown potential to differentiate among the NMDA receptor subunits.

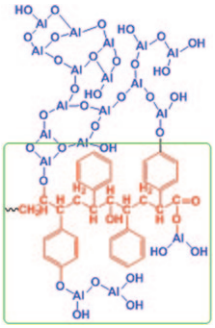


COMMUNICATIONS

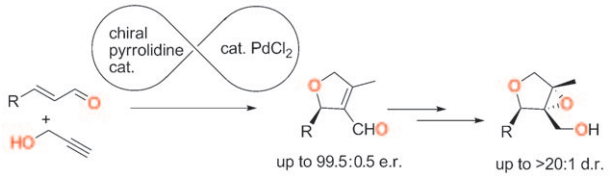
Surface control: Vacuum deposition of a planarized PAH ($C_{60}H_{30}$) on a Pt(111) surface induces chirality caused by the different landing side of the molecule, as shown by in situ STM images. The surface determines the landing side of individual molecules, which present different structural geometries that are shifted by about 35° (see figure). Large-scale calculations explain the atomistic mechanism of the process.



One layer at a time: A proposed growth mechanism of Al_2O_3 atomic layer deposition on a polystyrene surface is presented. The infiltration of trimethylaluminum and H_2O precursors may result in Al_2O_3 growth in the polystyrene matrix (subsurface), thus forming a hybrid interface (shown in the green box) of $C_8H_7O^-$ and $C_6H_4O_2Al^-$ ions.

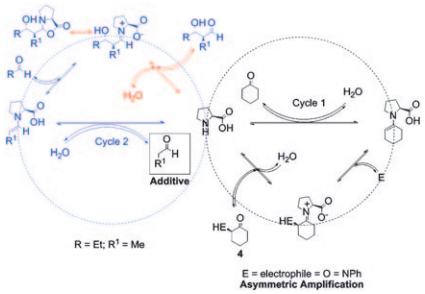


Asymmetric Catalysis



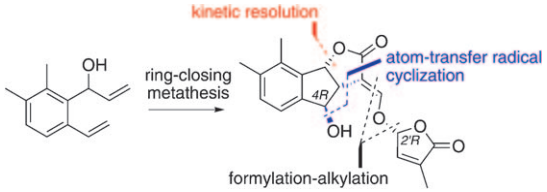
Into the pot: A one-pot highly chemo- and enantioselective catalytic domino oxa-Michael/carbocyclization between α,β-unsaturated aldehydes and propargylic alcohols is presented. This dynamic kinetic transformation requires a combination of transition-metal and amine catalysis to afford functionalized dihydrofurans in good to high yields and up to 99.5:0.5 e.r.

Asymmetric Catalysis



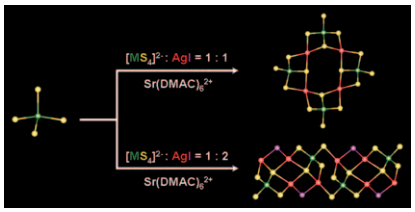
A fine line: The generation of significant positive nonlinear effects in asymmetric amino acid catalysis under homogeneous conditions, which can be explained by the model for cooperative catalytic stereoselective pathways, is reported. The addition of an achiral aldehyde generated the multiple interconnected stereoselective catalytic network.

Natural Products



The first total synthesis of solanacol, a member of the strigolactone family, features ring-closing metathesis, enzymatic kinetic resolution, and atom-transfer radical cyclization. This defines the stereostructure of the natural product. The best hormonal activity is revealed by an acetylated derivative at O4 (see scheme).

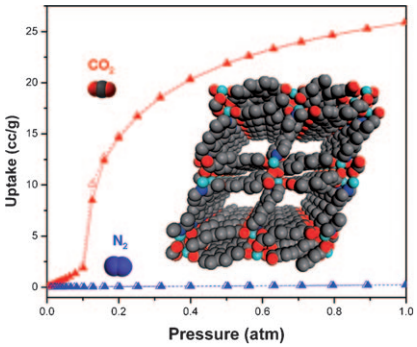
Cluster Compounds



A not-so-innocent counterion: A facile synthetic method has been successfully developed to construct two unusual discrete, octanuclear planar "open" distorted-square M/S/Ag clusters $\{[Sr(DMAC)_6]_2[M_4S_{16}Ag_4]\}$ (M = Mo, W; DMAC = *N*,*N*′-dimethylacetylamide) and a unique 1D double-chain W/S/Ag cluster $\{[Sr(DMAC)_6][W_2S_8Ag_4I_2]\}_n$ (see figure). *Z*-scan experiments show that $\{[Sr(DMAC)_6]_2[Mo_4S_{16}Ag_4]\}$ exhibits strong third-order non-linear optical properties and a large optical limiting capability.

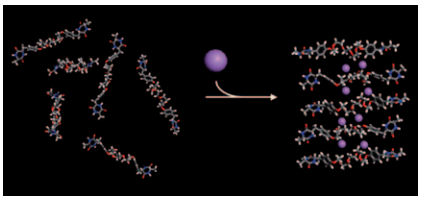
CONTENTS

Caught in a CO_2 trap: A highly flexible microporous metal–organic framework material exhibits a remarkable ability to capture and separate carbon dioxide from other small gases, such as N_2, H_2, CH_4, CO, and O_2, with separation ratios of 294, 190, 257, and 441 for CO_2/N_2, CO_2/H_2, CO_2/CH_4, and CO_2/CO, respectively, at 0.16 atm and 25 °C, and 768 for CO_2/O_2 at 0.2 atm and 25 °C.

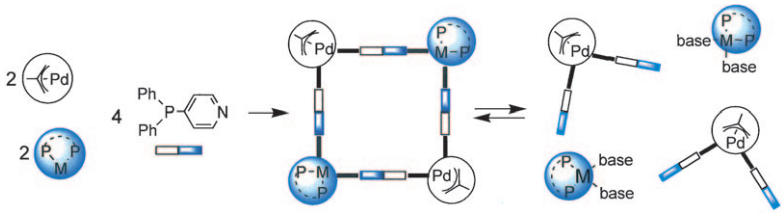


Microporous Materials

Stuck Li-ke glue: Oligo(ethylene oxide)-bridged bis(cyclodipeptides) exhibited remarkable enhancement of gelation ability by the addition of Li^+ (see figure). By coordination of metal ions to the oligo(ethylene oxide) chain, terminal cyclodipeptides may move closer and more easily form the hydrogen-bonded-sheet structure of cyclodipeptides.

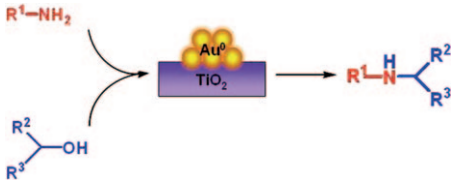


Supramolecular Gels



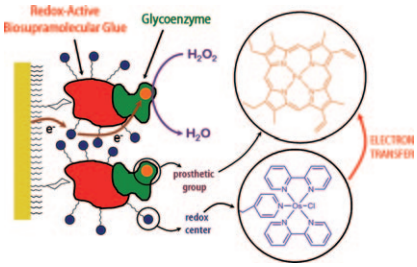
Hip to be square: Tetranuclear metallamacrocycles containing Pd–allyl and either Pd(dppp) or Pt(dppp) moieties (dppp = 1,3-bis(diphenylphosphino)-propane) have been obtained from the selective combination of three different building blocks. The study of their unusual dynamic behavior demonstrated the equilibrium between the self-assembled supramolecules and their components (see scheme).

Supramolecular Chemistry

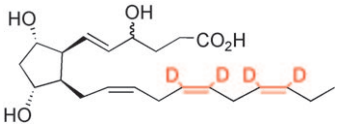


Atom-efficient direct N-alkylation: An environmentally clean one-pot selective N-alkylation of amines with an equimolar amount of alcohols via a hydrogen autotransfer pathway was achieved over a titania-supported gold catalyst system in good to excellent yields without additive (see scheme).

Heterogeneous Catalysis

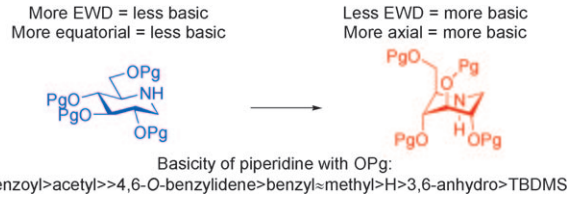


It has to be glue! The use of redox-active concanavalin A as a bifunctional building block enables the recognition-directed assembly of HRP layers on bioelectronic platforms and the communication of the prosthetic group of the enzyme to the electrode surface (see figure).

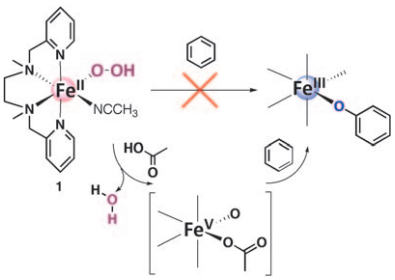


Brown's P2-Ni does the job: An efficient synthesis of tetradeuterated neuroprostane (see structure) has been accomplished by using an ene–diyne stereoselective deuteration strategy.

FULL PAPERS



Carbohydrates at arms: How great an influence protecting groups have on the reactivity of carbohydrates has been determined. The protecting groups in a "disarmed" saccharide are more than 300 times more electron withdrawing (EWD) than those in an "armed" saccharide and those of a "superarmed" saccharide are 300 times less EWD (see scheme, TBDMS = *tert*-butyldimethylsilyl).



Iron out the rough spots: [Fe(bpmen)-$(CH_3CN)_2$][ClO_4]$_2$ (**1**), an excellent catalyst for organic oxidations with hydrogen peroxide, is found to efficiently promote hydroxylation of benzene. This new reaction revealed mechanistic pathways in hydrogen peroxide activation with complex **1**. Detailed kinetic and mechanistic studies showed that Fe^{III}(OOH) produces the reactive species in the rate-limiting, acid-assisted heterolytic cleavage of the O–O bond in the iron–peroxo intermediate.

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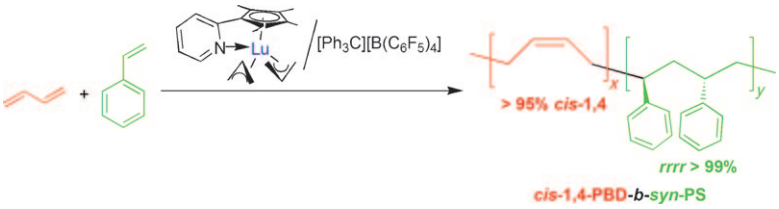
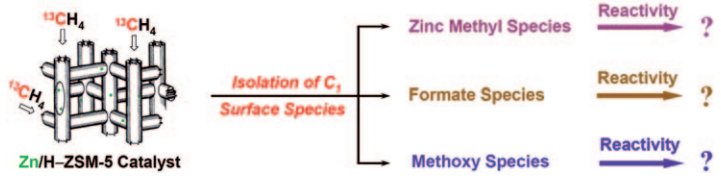


Challenge to a dual: Under the activation of $[Ph_3C][B(C_6F_5)_4]$, a pyridyl-functionalized cyclopentadienyl lutetium–bis(allyl) complex exhibited unprecedented dual behavior for syndiotactic (*rrrr* > 99%) styrene polymerization and *cis*-1,4-selective (99%) butadiene polymerization.

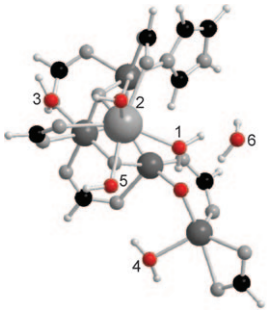
Polymerization



Reactivity of C_1 surface species: Zinc methyl species, formate species, and methoxy species were identified as C_1 surface species formed in methane activation on the zeolite Zn/H-ZSM-5 catalyst at $T \leq 573$ K (see graphic). We successfully isolated each surface species and investigated their chemical nature on the working catalyst by solid-state NMR spectroscopy.

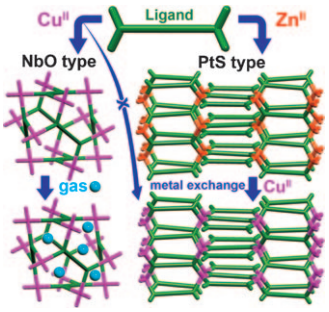
Methane Activation

Water ways: Density functional calculations are reported on a set of three model structures of the Mn_4Ca cluster in the water-oxidizing complex of Photosystem II (see figure). The preferred hydration sites across five oxidation states and all feasible magnetic-coupling arrangements have been explored to identify the most likely substrate–water binding sites.



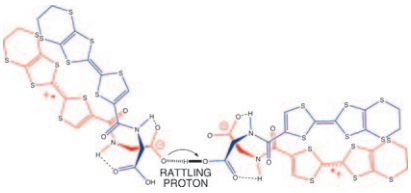
Photosystem II

Unprecedented oxygen capacity: Synthesis of a Cu^{II}-based metal–organic framework (MOF) with NbO-type net structure that shows high adsorption capacities for N_2, H_2, O_2, CO_2, and CH_4 is reported. A similar reaction with Zn^{II} afforded a PtS-type net. Post-synthetic metal-ion exchange of a Zn^{II} MOF with Cu^{II} resulted in a Cu^{II} MOF with a PtS-type net that could not be obtained from direct synthesis (see figure).



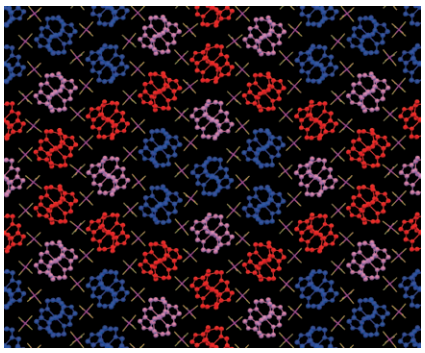
Metal–Organic Frameworks

Organic Electronics



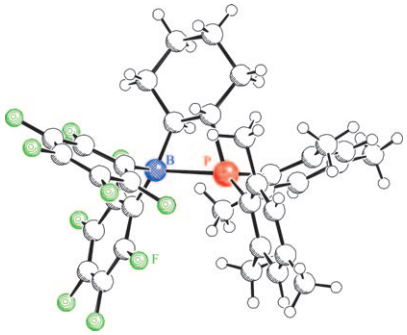
Electrostatic envelope: Two neutral chemical objects with ionizable residues, one of which is a π-conjugated zwitterion, self-assemble in a two-dimensional array (see picture). It is predicted that the carriers are probably localized, yet the system is highly conducting. Although not part of the conducting network, a rattling proton deeply impinges on the collective behavior of the holes.

Molecular Spin-States



Nanoscale self-hosting of spin-state: Thermally induced spin crossover associated with symmetry breaking yields an unprecedented long-range ordering in the intermediate (INT) phase (supercell structure of 30 molecules) of a novel molecular material based on an iron complex. A remarkable lozenge pattern is produced, including 12 predominantly high-spin (HS), 8 predominantly low-spin (LS), and 10 purely LS molecular crystallographic sites (red, purple, and blue, respectively, in figure).

Frustrated Lewis Pairs



The cyclohexylene-anellated frustrated Lewis pair was obtained by hydroboration of di(mesityl)cyclohexenylphosphine with $[HB(C_6F_5)_2]$. The X-ray crystal structure analysis (see picture) revealed a puckered four-membered heterocyclic core. The compound splits dihydrogen heterolytically and adds to the C=O bond of phenyl isocyanate.

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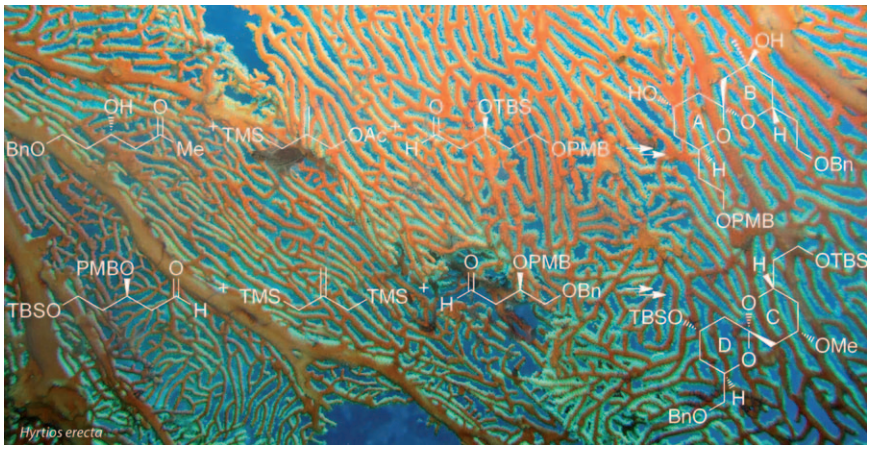
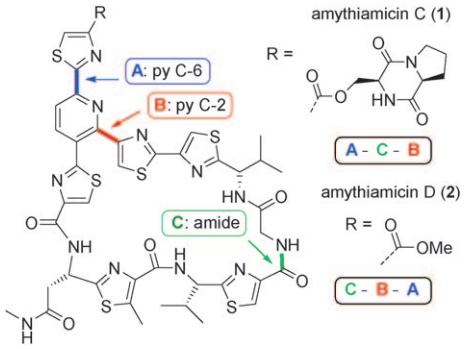


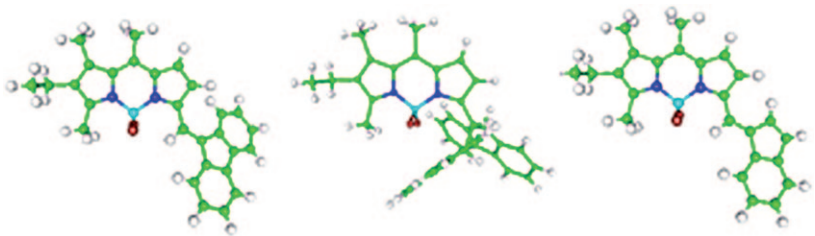
Spiroacetal out of control! A unique and practical synthetic sequence to allow rapid access to polyketides and further to the spiroacetals derived from them is reported (see scheme). The synthesis utilizes a bidirectional Hosomi–Sakurai allylation approach around key allylsilanes in the synthesis of the AB and CD ring systems of spongistatin 1 and 2.

Spiro Compounds



Cross-coupling reactions paved the way to two short syntheses of amythiamicin C (**1**) and D (**2**; see scheme). In the former synthesis, the sequence A–C–B was followed to give access to the title compound **1**. In the latter synthesis, the sequence C–B–A was probed and led successfully to amythiamicin D (**2**) in an extremely short, but less selective, synthetic sequence.

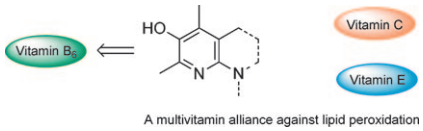
Natural Products



It's all under control: A strategy to modulate the photophysical and optical properties of BODIPYs by using asymmetric substitution effects has been developed. New asymmetric BODIPY–indene and BODIPY–fluorene dyes have been synthesized (see figure) by a simple protocol.

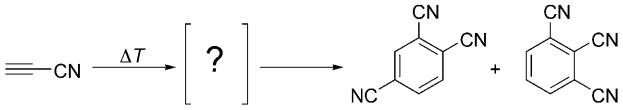
Fluorescent Molecules

Antioxidants



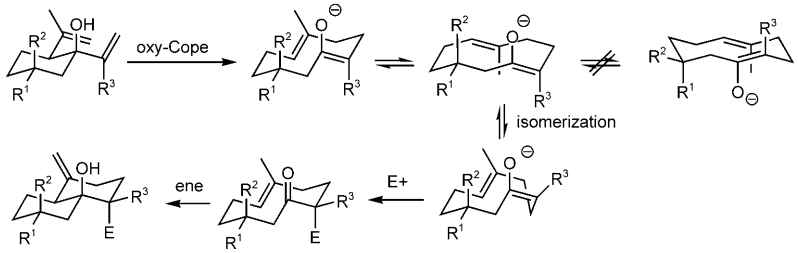
Oxidatively stressed? Take a vitamin! An efficient and highly practical synthetic route for pyridinol-based antioxidants from vitamin B_6 is reported. Antioxidant properties for new members of this family of radical scavengers have been investigated. It was discovered that these amino-pyridinols are able to not only inhibit lipid peroxidation in direct reaction with peroxyradicals but also act as co-antioxidants in the presence of vitamin E as previously reported for vitamin C (see scheme).

Cyanoacetylene



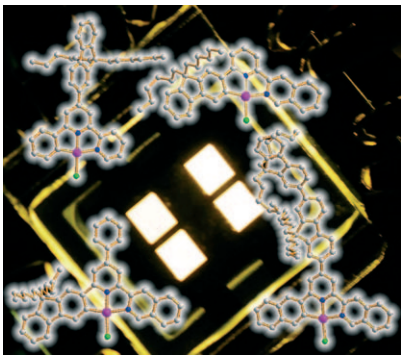
The final frontier: To better understand the chemistry of cyanoacetylene—a known constituent of planetary atmospheres and interstellar space—theoretical and spectroscopic studies address the mechanism of its di- and trimerization, and provide high-resolution rotational spectra of two of the trimers: 1,2,3- and 1,2,4-tricyanobenzene (see picture).

Cope Reaction



Carbanions at play: A sequential oxy-Cope/ene reaction, engineered to produce decalin skeleton structures for further applications in natural product synthesis, was found to give altered product distributions under anionic conditions. With DFT calculations and ab initio molecular dynamics simulations, its altered diastereoselectivity is shown to be the result of a hitherto unexpected isomerization of the enolate olefin (see scheme).

Organic Light-Emitting Diodes



Molecularly doped PLEDs, based on poly(9-vinylcarbazole) (PVK) blended with phosphorescent fluorene-substituted cyclometalated platinum(II) complexes as dopants (see figure), exhibit excellent performance and good efficiency. A polymer light-emitting diode (PLED) containing 5% fluorene-based platinum(II) complex shows a high current efficiency of 9.2 cd A^{-1} with a brightness of 3500 cd m^{-2}.

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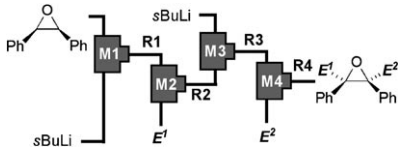
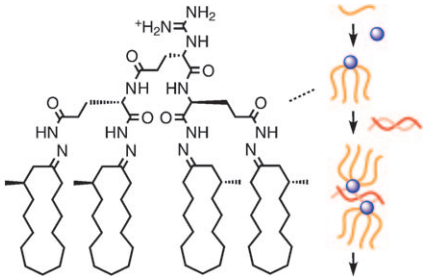
Go catalytic! It has been shown that peroxidases are able to cleave selected C=C double bonds adjacent to activated phenyl moieties at the expense of molecular oxygen at an acidic pH as a promiscuous activity (see scheme). We could unambiguously prove that exclusively the hemin moiety present in the enzyme is responsible for this activity.

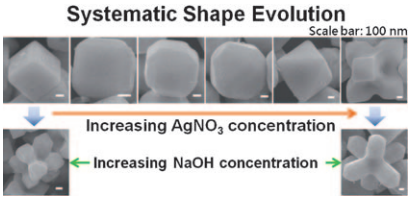
Flow microreactor system: An integrated flow microreactor system serves as a powerful method for the stereoselective synthesis of substituted epoxides (see figure).

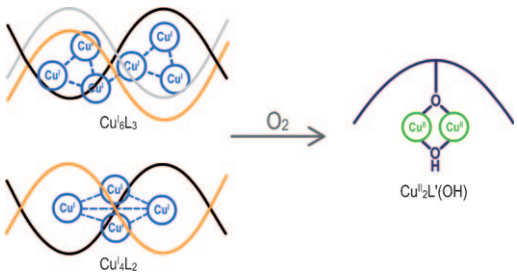


Fragrant multitail amphiphiles: The in situ product of hydrophobic odorant analytes, such as muscone (see figure), and cationic multihydrazide peptide dendrons are introduced as powerful activators of DNA transporters for application indifferential sensing, cellular uptake, slow release, and fluorescent labeling.



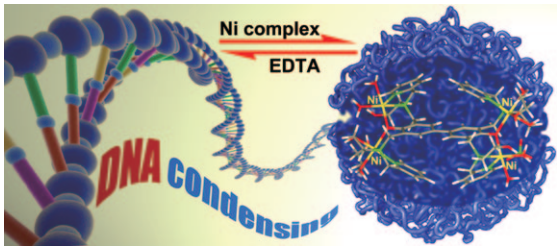
Shaping the future: Ag_2O crystals with shapes from cubic to edge- and corner-truncated cubic, rhombicuboctahedral, edge- and corner-truncated octahedral, octahedral, and hexapod structures have been synthesized. By adjusting the reaction conditions, octapods and elongated hexapods can be prepared. Octahedra and hexapods with {111} facets are sensitive to the molecular charges in the solution.





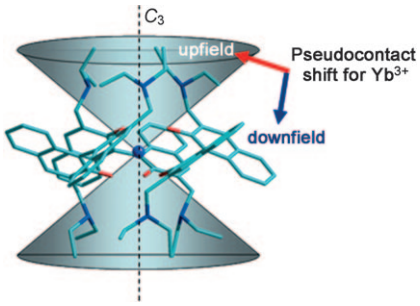
Capable presence: Copper(I) cluster helicates derived from a thiosemicarbazone ligand can hydroxylate the arene linker of their supporting ligand strands in the presence of O_2. The kinetic studies show values of $\Delta H^{\neq} = -70\ kJ\,mol^{-1}$, similar to those mediated by the tyrosinase enzymes.

DNA Condensation



Nonviral vector: A tetranuclear nickel(II) complex has been designed and prepared as a nonviral vector for gene therapy. The complex can induce the condensation of DNA into nanoparticles through electrostatic interactions. The release of DNA from the compact state has been realized using the chelator ethylenediaminetetraacetic acid (EDTA) for the first time (see graphic). Along with biocompatibility and nuclease-inactivity, the complex meets most of the prerequisites for a gene vector.

Lanthanide Complexes



A class of their own: The solution structure (see picture) and dynamics of lanthanide–binaphthol amine compounds bearing Lewis acid, Brønsted acid and Brønsted base groups are determined with paramagnetic NMR spectroscopy and circular dichroism. The complexes are active as enantioselective catalysts in the nitroaldol reaction.

* Author to whom correspondence should be addressed

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

VIP Full Papers labeled with this symbol have been judged by two referees as being "very important papers".

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

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