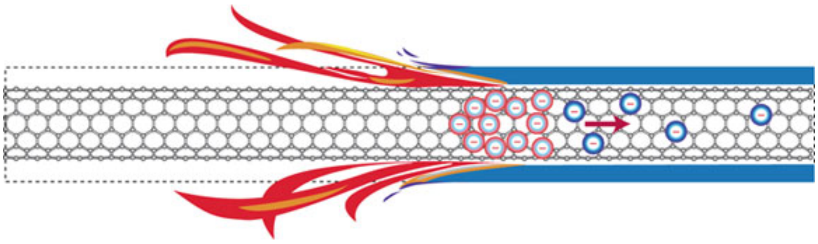
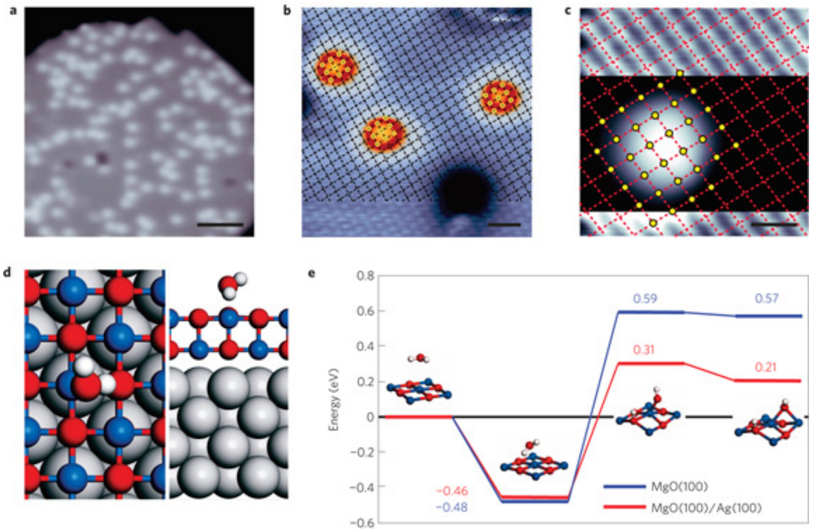
- CARBON NANOTUBES : An explosive thrust for nanotubes
  Aliev, A. E.; Baughman, R. H. *Nature Materials* **2010**, *9*, 385-386.
  <u>Abstract:</u>



Carbon nanotubes direct chemically produced thermal waves, providing propulsion and thermopower waves that create electrical energy. Carbon nanotubes are efficient guides for electrons and phonons, enabling along their lengths both bullet-like electron flight for micrometre distances and a thermal conductivity that is ten times higher than that of copper. They also guide carbon atom addition at one end of the nanotube during nanotube growth, so that high-perfection nanotubes over 10 cm in length can be produced.

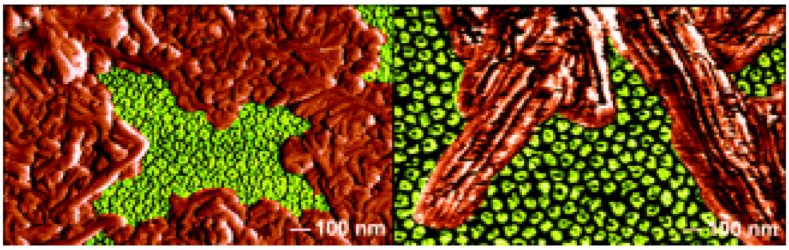
- State-selective dissociation of a single water molecule on an ultrathin MgO film
  Shin, H.-J.; Jung, J.; Motobayashi, K.; Yanagisawa, S.; Morikawa, Y.; Kim, Y.; Kawai, M. *Nature Materials* **2010**, *9*, 442-447.
  <u>Abstract:</u>



The interaction of water with oxide surfaces has drawn considerable interest, owing to its application to problems in diverse scientific fields. Atomic-scale insights into water molecules on the oxide surface have long been recognized as essential for a fundamental understanding of the molecular processes occurring there. Here, we report the dissociation of a single water molecule on an ultrathin MgO film using low-temperature scanning tunnelling microscopy. Two types of dissociation pathway—vibrational excitation and electronic excitation—are selectively achieved by means of injecting tunnelling electrons at the single-molecule level, resulting in different dissociated products according to the reaction paths. Our results reveal the advantage of using a MgO film, rather than bulk MgO, as a substrate in chemical reactions.

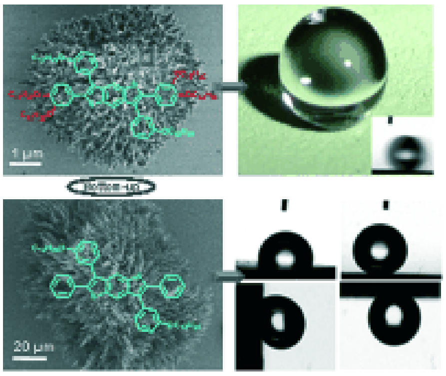
- Compression of Self-Assembled Nano-Objects: 2D/3D Transitions in Films of (Perfluoroalkyl)Alkanes - Persistence of an Organized Array of Surface Micelles

de Gracia Lux, C.; Gallani, J.-L.; Waton, G.; Krafft, M. P. *Chem. Eur. J.* **2010**, *16*, 7186-7198.
Abstract:



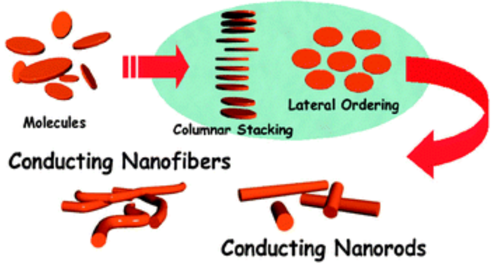
Understanding and controlling the molecular organization of amphiphilic molecules at interfaces is essential for materials and biological sciences. When spread on water, the model amphiphiles constituted by $C_nF_{2n+1}C_mH_{2m+1}$ (*FnHm*) diblocks spontaneously self-assemble into surface hemimicelles. Therefore, compression of monolayers of *FnHm* diblocks is actually a compression of nanometric objects. Langmuir films of *F*8*H*16, *F*8*H*18, *F*8*H*20, and *F*10*H*16 can actually be compressed far beyond the "collapse" of their monolayers at ~30 Å^2. For molecular areas *A* between 30 and 10 Å^2, a partially reversible, 2D/3D transition occurs between a monolayer of surface micelles and a multilayer that coexist on a large plateau. For *A*<10 Å^2, surface pressure increases again, reaching up to ~48 mN m^{-1} before the film eventually collapses. Brewster angle microscopy and AFM indicate a several-fold increase in film thickness when scanning through the 2D/3D coexistence plateau. Compression beyond the plateau leads to a further increase in film thickness and, eventually, to film disruption. Reversibility was assessed by using compression-expansion cycles. AFM of *F*8*H*20 films shows that the initial monolayer of micelles is progressively covered by one (and eventually two) bilayers, which leads to a hitherto unknown organized composite arrangement. Compression of films of the more rigid *F*10*H*16 results in crystalline-like inflorescences. For both diblocks, a hexagonal array of surface micelles is consistently seen, even when the 3D structures eventually disrupt, which means that this monolayer persists throughout the compression experiments. Two examples of pressure-driven transformations of films of self-assembled objects are thus provided. These observations further illustrate the powerful self-assembling capacity of perfluoroalkyl chains.

- Solution-Processable Flower-Shaped Hierarchical Structures: Self-Assembly, Formation, and State Transition of Biomimetic Superhydrophobic Surfaces
  Yin, J.; Yan, J.; He, M.; Song, Y.; Xu, X.; Wu, K.; Pei, J. *Chem. Eur. J.* **2010**, *16*, 7309-7318.
  Abstract:



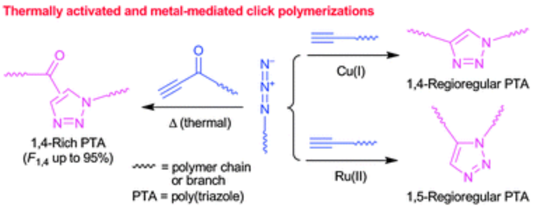
The reaction of U-shaped, bimetallic, Cu^I complexes, assembled from a heteroditopic pincer, with cyano-capped π-conjugated linkers gives a straightforward access to π-stacked metallocyclophanes in good yields. In these assemblies, the π-walls have an almost face-to-face arrangement. The versatility of this rational supramolecular synthesis is demonstrated with the use of linkers that have nanoscale lengths (up to 27.7 Å), different chemical compositions (oligo(*para*-phenylenevinylene)s OPVs, oligo(phenylene)s, oligo(phenylethynylene)s), and alternative geometries (linear, angular). Linkers that incorporate an internal pyridyne moiety can also be employed. X-ray diffraction studies revealed that the metallocyclophanes based on linear linkers self-organize into infinite π-stacked columns in the solid state with intermolecular distances of about 3.6 Å. This approach, based on coordination-driven self-assembly, provides a novel and rational strategy for the stacking of extended π-systems in the solid state.

- Conducting supramolecular nanofibers and nanorods
  Hasegawa, M.; Iyoda, M. *Chem. Soc. Rev.* **2010**, *39*, 2420 – 2427.
  Abstract:



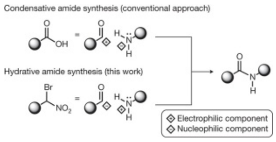
Recent progress in the study of electroconducting nanomaterials such as nanofibers, nanorods and other nanostructures based on the supramolecular self-assembly of hexabenzocoronenes, oligo(thiophene)s, tetrathiafulvalenes and perylene-3,4,9,10-tetracarboxylic diimides is described in this *tutorial review*. Conducting nanofibers and nanorods are constructed by doping π-donors or π-acceptors with oxidants or reductants before/after the formation of such nanostructures; however, some nanofibers show electric conductivity without any doping in the neutral state. Although cation radicals and anion radicals seem to be difficult to form nanofibers and nanorods, a limited number of cation radicals produce conducting nanofibers. For nanofibers and nanorods composed of weak π-donors and π-acceptors, their conductivities are measured by time-resolved microwave conductivity techniques.

- Click polymerization
  Qin, A.; Lam, J. W. Y.; Tang, B. Z. *Chem. Soc. Rev.* **2010**, *39*, 2522 – 2544.
  Abstract:



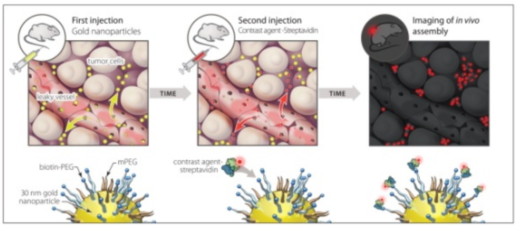
The development of new polymerization reactions is of critical importance to macromolecule science. In this *critical review*, we summarize the research efforts to incubate alkyne–azide click reactions into a versatile polymerization technique for the synthesis of poly(triazole)s (PTAs) with linear and hyperbranched structures. Cu(I)- and Ru(II)-catalyzed click polymerizations afforded 1,4- and 1,5-regioregular PTAs, respectively. Whereas traditional thermal cycloadditions normally generate regiorandom products, PTAs with 1,4-regioisomer contents up to 95% were created by utilizing the electronic effect involved in the thermal click polymerizations of aroylacetylenes with azides. The PTAs showed unique functional properties, such as luminescence, chromism, fluorescence imaging, emission superquenching, chain helicity, optical nonlinearity, light refractivity, photovoltaic effect, cytocompatibility and biodegradability (145 references).

- Umpolung reactivity in amide and peptide synthesis
  Shen, B.; Makley, D. M.; Johnston, J. N. *Nature* **2010**, *465*, 1027–1032.
  Abstract:



The amide bond is one of nature’s most common functional and structural elements, as the backbones of all natural peptides and proteins are composed of amide bonds. Amides are also present in many therapeutic small molecules. The construction of amide bonds using available methods relies principally on dehydrative approaches, although oxidative and radical-based methods are representative alternatives. In nearly every example, carbon and nitrogen bear electrophilic and nucleophilic character, respectively, during the carbon–nitrogen bond-forming step. Here we show that activation of amines and nitroalkanes with an electrophilic iodine source can lead directly to amide products. Preliminary observations support a mechanism in which the polarities of the two reactants are reversed (German, *umpolung*) during carbon–nitrogen bond formation relative to traditional approaches. The use of nitroalkanes as acyl anion equivalents provides a conceptually innovative approach to amide and peptide synthesis, and one that might ultimately provide for efficient peptide synthesis that is fully reliant on enantioselective methods.

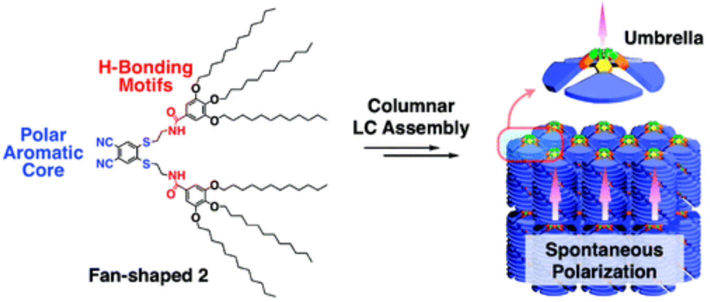
- In vivo assembly of nanoparticle components to improve targeted cancer imaging
  Perrault, S. D.; Chan, W. C. W. *Proc. Nat. Acad. Sci.* **2010**, *107*, 11194-11199.
  Abstract:



Many small molecular anticancer agents are often ineffective at detecting or treating cancer due to their poor pharmacokinetics. Using nanoparticles as carriers can improve this because their large size reduces clearance and improves retention within tumors, but it also slows their rate of transfer from circulation into the tumor interstitium. Here, we demonstrate an alternative strategy whereby a molecular contrast agent and engineered nanoparticle undergo in vivo molecular assembly within tumors, combining the rapid influx of the smaller and high retention of the larger component. This strategy provided rapid tumor accumulation of a fluorescent contrast agent, 16- and 8-fold faster than fluorescently labeled macromolecule or nanoparticle controls achieved. Diagnostic sensitivity was 3.0 times that of a passively targeting nanoparticle, and this improvement was achieved 3 h after injection. The advantage of the in vivo assembly approach for targeting is rapid accumulation of small molecular agents in tumors, shorter circulation time requirements, possible systemic clearance while maintaining imaging sensitivity in the tumor, and nanoparticle anchors in tumors can be utilized to alter the pharmacokinetics of contrast agents, therapeutics, and other nanoparticles. This study

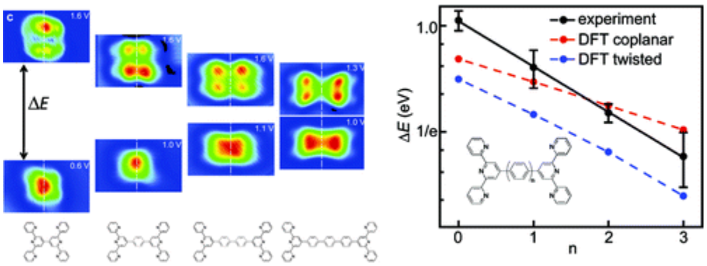
demonstrates molecular assembly of nanoparticles within tumors, and provides a new basis for the future design of nanomaterials for medical applications.

- Columnar Liquid Crystal with a Spontaneous Polarization along the Columnar Axis
  Miyajima, D; Araoka, F.; Takezoe, H.; Kim, J.; Kato, K.; Takata, M.; Aida, T. *J. Am. Chem. Soc.* **2010**, *132*, 8530–8531.
  Abstract:



A fan-shaped molecule (2), carrying hydrogen-bonding amide groups in proximity to its polar aromatic core, self-assembles into a columnar liquid crystalline mesophase, which unprecedentedly possesses a spontaneous macroscopic polarization along the columnar axis. Due to its polar nature, the mesophase displays a signal of second harmonic generation (SHG), which disappears on phase transition to an isotropic melt and then retrieves its original intensity on subsequent cooling.

- Probing Electronic Superexchange Coupling at Isolated Poly-p-phenylene Molecules
  Wang, W.; Wang, S.; Li, X.; Collin, J. P.; Liu, J.; Liu, P. N.; Lin, N. *J. Am. Chem. Soc.* **2010,** *132*,8774–8778.
  Abstract:

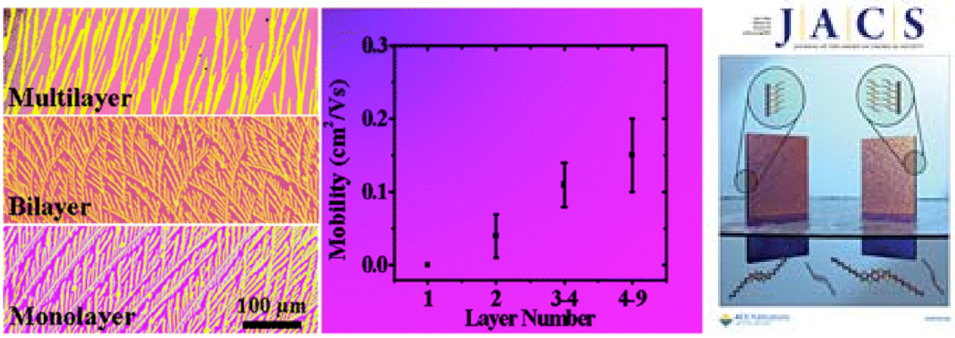


Superexchange coupling in poly-p-phenylene molecular wires was probed using scanning tunneling microscopy/spectroscopy at cryogenic temperatures. The coupling strength was characterized by measuring the energy splitting between the molecular states constructed by symmetric and antisymmetric dimerization of molecular fragments’ orbitals. The results confirm the theoretically predicted exponential decay behavior of the superexchange coupling on a single-molecule level. A decay constant of 0.10 ± 0.02 Å−1 was obtained. Owing to the high spatial resolution of scanning tunneling microscopy, the molecules’ internal states (e.g., molecular conformation) as well as external states (e.g., interaction with foreign atoms or molecules) were elucidated with atomic precision at the mean time of characterizing the superexchange coupling. This method provides a new approach to quantify how intramolecular charge transfer is influenced by molecular conformation and interaction with the surroundings.

- Controllable Growth and Field-Effect Property of Monolayer to Multilayer Microstripes of an Organic Semiconductor

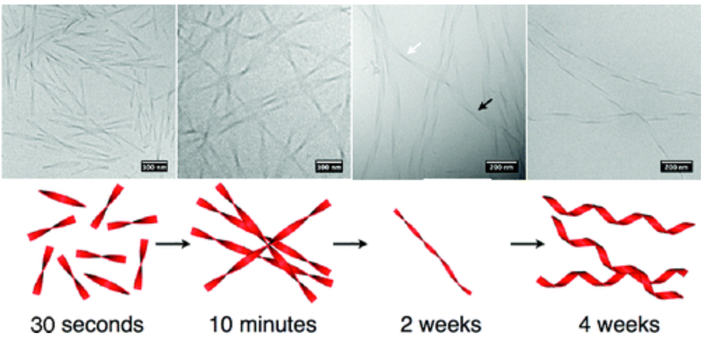
Li, L.; Gao, P.; Schuermann, K. C.; Ostendorp, S.; Wang, W.; Du, C.; Lei, Y.; Fuchs, H.; De Cola, L.; Müllen, K.; Chi, L. *J. Am. Chem. Soc.* **2010**, *132*, 8807–8809.

Abstract:



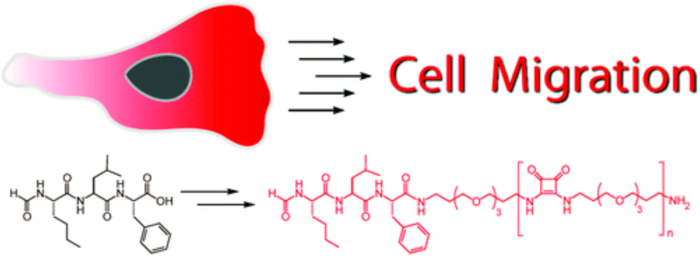
The controllable growth of partially aligned monolayer to multilayer micrometer stripes was demonstrated by adjusting the pulling speed in a dip-coating process. The number of molecular layers decreases with the increasing pulling speed. A lower pulling speed yields mixed multilayers (3−9 monolayers). It is noteworthy that pure monolayer and bilayer microstripes over large areas can be obtained at high pulling speeds. The stripe morphology strongly depends on the pulling speed or the number of molecular layers. XRD and confocal fluorescence measurements manifest that monolayer stripes are amorphous, while multilayer stripes (≥2) consist of crystalline states. FET devices were fabricated on these stripes. Monolayer stripes failed to reveal a field effect due to their amorphous state. In contrast, multilayer stripes exhibit good field-effect behavior. This study provides useful information for future molecular design in controlling molecular architectures. The controllable growth from monolayer to multilayer offers a powerful experimental system for fundamental research into the real charge accumulation and transporting layers for OFETs.

- Direct Observation of Morphological Tranformation from Twisted Ribbons into Helical Ribbons
  Pashuck, E. T.; Stupp, S. I. *J. Am. Chem. Soc.* **2010**, *132*, 8819–8821.
  Abstract:



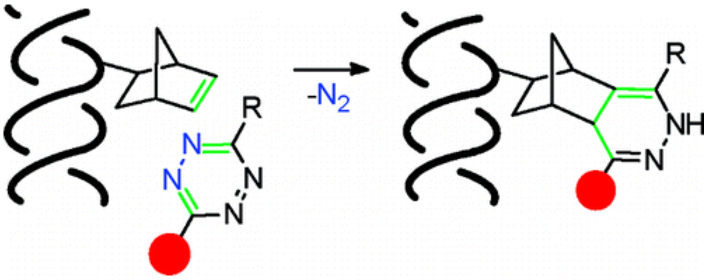
We report on the direct observation of a nanostructural transformation from a twisted ribbon to a helical ribbon in supramolecular assemblies of peptide amphiphiles. Using cryogenic electron microscopy, a peptide amphiphile molecule containing aromatic residues was found to first assemble into short twisted ribbons in the time range of seconds, which then elongate in the time scale of minutes, and finally transform into helical ribbons over the course of weeks. By synthesizing an analogous molecule without the aromatic side groups, it was found that a cylindrical nanostructure is formed that does not undergo any transitions during the same time period. The study of metastable states in peptide aggregation can contribute to our understanding of amyloid-related diseases, such as Alzheimer’s disease.

- Unexpected Enhancement in Biological Activity of a GPCR Ligand Induced by an Oligoethylene Glycol Substituent
  Jiarpinitnun, C.; Kiessling, L. L. *J. Am. Chem. Soc.* **2010**, *132*, 8844–8845.
  Abstract:



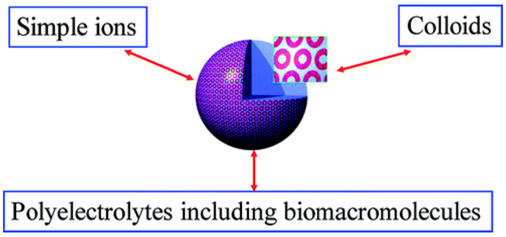
Polyethylene glycol (PEG) is widely used, and many biologically active molecules are modified with oligoethylene glycol substituents to enhance their half-lives in circulation. The pervasive use of PEG substituents is partly due to their presumed inertness. Our investigation of formyl peptide receptor (FPR)-mediated chemotaxis reveals that oligoethylene glycol substitution can enhance the ability of the peptide chemoattractant *N*-formyl-methionine-leucine-phenylalanine (fMLF) to activate signal transduction through FPR, a transmembrane G-protein-coupled receptor.

- Post-Synthetic Modification of DNA by Inverse-Electron-Demand Diels−Alder Reaction
  Schoch, J.; Wiessler, M.; Jaschke, A. *J. Am. Chem. Soc.* **2010**, *132*, 8846–8847.
  Abstract:



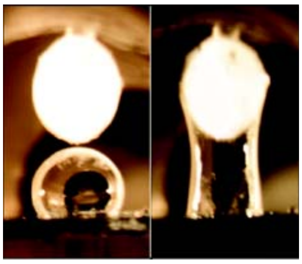
There is currently a tremendous interest in developing bioorthogonal “click chemistry” methods for the modification of biopolymers. Very recently, inverse-electron-demand Diels−Alder reactions have received attention, but to date they have not been applied to nucleic acids. Here we describe the first example of DNA modification by inverse-electron-demand Diels−Alder reaction. We synthesized four different building blocks for 3′-terminal, 5′-terminal, and internal incorporation of norbornene dienophiles into oligonucleotides. These DNA strands were either directly reacted with suitably derivatized tetrazine dienes or first subjected to enzymatic manipulations. We demonstrate that the inverse-electron-demand Diels−Alder reaction allows efficient site-specific post-synthetic conjugation, often at a 1:1 stoichiometry, without any side reaction. The reaction works in aqueous media at room temperature, and no transition metals are required. Both short chemically synthesized oligonucleotides and long enzymatically amplified DNA strands were successfully conjugated.

- Hydrophilic Macroionic Solutions: What Happens When Soluble Ions Reach the Size of Nanometer Scale?
  Tianbo, L. *Langmuir* **2010**, *26,* 9202–9213.
  Abstract:



Large, hydrophilic inorganic ions (mostly polyoxometalate macroions and cationic metal−organic hybrid nanocages) with high solubility in water and/or other polar solvents demonstrate unique solution behaviors. In dilute solutions, they behave significantly different from small simple ions (as described by the Debye−Hückel theory) because the macroions cannot be treated as point charges or large, insoluble colloidal suspensions (usually described by the DLVO theory) because the macroions form homogeneous, stable "real solutions". The size disparity between the macroions and their counterions results in complex macroion−counterion interaction and leads to the self-assembly of macroions into single-layered, hollow, spherical "blackberry" structures. The blackberries, with robust and very stable structures mimicking biological membranes, can adjust their size accurately and reversibly in response to the change of solvent content, charge density on the macroions, or in some cases merely solution pH. The blackberry membrane is permeable to small cations. The inorganic macroions with well-defined size, shape, mass, charge density (even accurately tunable within certain range), and no intramolecular interaction can be treated as simple model systems to understand the intermolecular interaction in polyelectrolyte solutions. The blackberry structures show certain similarities to the spherical virus capsids, from the overall structure to the kinetic properties of formation.

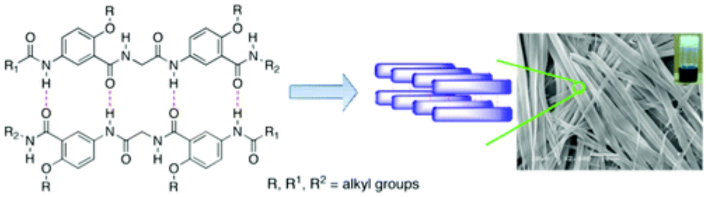
- Direct Measurements of Contact Force between Clathrate Hydrates and water
  Song, J. H.; Couzis, A.; Lee, J. W. *Langmuir* **2010**, *26*, 9187-9190.
  Abstract:



A method for precise and reproducible initial contact force measurements is introduced utilizing an apparatus fabricated with a microbalance and *z*-axis stage to study the interaction behavior between cyclopentane (CP) hydrate and water in a temperature controlled hydrocarbon environment. CP hydrate probes are prepared using hydrate slurries composed of 5 wt % CP and Wilhelmy rods. The CP hydrate probe is slowly brought into contact with water to determine the initial contact force. The effect of substrate morphology on the initial contact force is reported through employing aluminum substrates prepared using physical vapor deposition (PVD) and milling. Accurate and facile measurements are performed by applying a high-resolution microbalance with 0.1 μN resolution to provide repeatable and consistent results of initial contact force between hydrate and water.

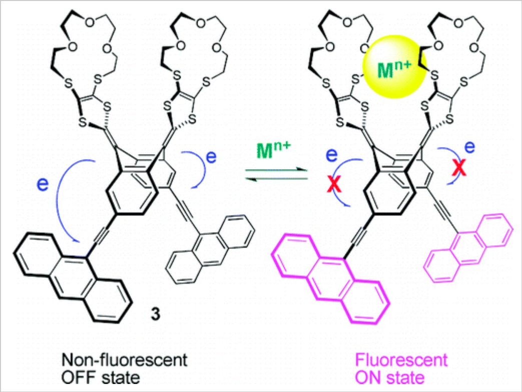
- Oligoamide Duplexes as Organogelators
  Cao, R.; Zhou, J.; Wang, W.; Feng, W.; Li, X.; Zhang, P.; Deng, P.; Yuan, L.; Gong, B. *Org. Lett.* **2010**, *12*, 2958–2961.

Abstract :



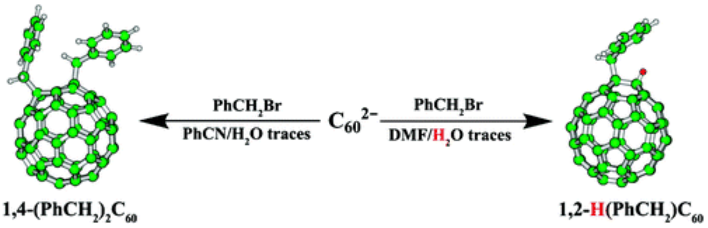
Oligoamide duplexes carrying multiple alkyl side chains were found to serve as gelators for aromatic solvents. The double-stranded backbone was essential for the hierarchical self-assembly of the molecular duplex into fibers of high aspect ratios. The demonstrated gelating abilities may be extended to a large family of analogous H-bonded duplexes having different H-bonding sequences, leading to a unique platform for developing a diverse variety of potential gelators based on a supramolecular and/or a dynamic covalent approach. Many synthetic molecules that assemble into supramolecular networks via hydrogen bonding, π–π stacking, and solvophobic effects have been reported as gelators.(3) Organic gelators are developed as "smart" or responsive gel systems that respond to stimuli such as photoirradiation, electrochemistry, solvent polarity and/or pH change. Nevertheless, the mechanism behind gelation remains elusive.

- Biscrown-Annulated TTFAQ–Dianthracene Hybrid: Synthesis, Structure, and Metal Ion Sensing
  Shao, M.; Dongare, P.; Dawe, L. N.; Thompson, D. W.; Zhao, Y. *Org. Lett.* **2010**, *12*, 3050–3053.
  Abstract:



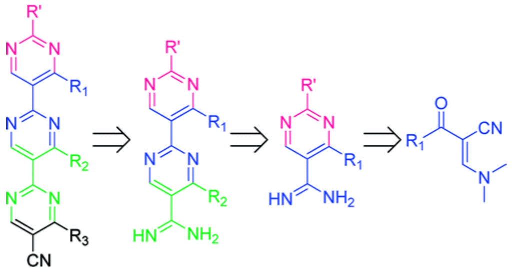
A new fluorescence chemosensor (3) made up of a biscrown-annulated TTFAQ receptor and two anthracene fluorophores was designed and synthesized. Its solid-state structure was disclosed by X-ray crystallographic analysis, while fluorescence titrations indicated a high sensitivity for large hard metal cations such as Ba^{2+}.Tetrathiafulvalene (TTF) possesses well-defined electron-donating and electrochemical properties and has been extensively employed in redox-switchable supramolecular hosts.

- Reaction of C_{60}^{2-} with Organic Halides Revisited in DMF: Proton Transfer from Water to RC_{60}^{-} and Unexpected Formation of 1,2-Dihydro[60]fullerenes
  Yang, W.-W.; Li, Z.-J.; Gao, X. *J. Org. Chem.* **2010**, *75*, 4086–4094.
  Abstract:



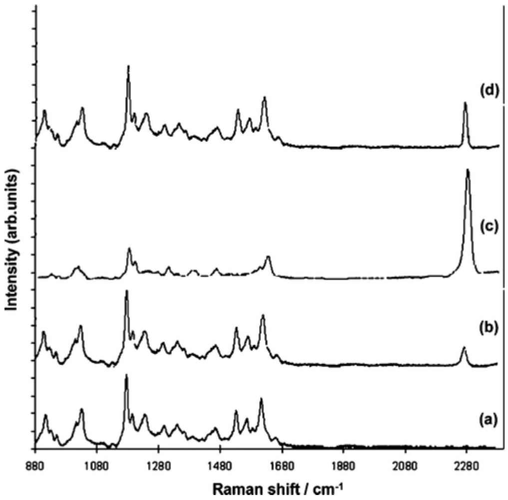
The reactions of dianionic C_{60} with organic halides, which have been studied extensively in benzonitrile (PhCN), are revisited in a different solvent medium, *N*,*N*-dimethylformamide (DMF), by using $ArCH_2Br$ (Ar = Ph, $C_6H_4CH_3$, C_6H_4Br). Interestingly, instead of the 1,4-R_2C_{60} adducts, which are the typical products when the reactions are carried out in PhCN, the 1,2-dihydro[60]fullerenes (1,2-HRC_{60}) have been obtained as the major products in DMF, except for the case of *o*-$CH_3C_6H_4CH_2Br$ probably due to the steric effect. The obtained 1,2-dihydro[60]fullerenes have been characterized with single-crystal diffraction, ^1H and ^{13}C NMR, high-resolution mass spectrometry (HRMS), and UV–vis. Further examination with deuterated reagents including $PhCD_2Br$, DMF-d_7, and D_2O has revealed that the fullerenyl hydrogen of 1,2-dihydrofullerenes originates from traces of water residue in DMF. When the reaction is re-examined in PhCN with the addition of an excessive amount of water, the yield of 1,2-dihydrofullerene increases significantly, but is still lower compared with that obtained in DMF, demonstrating a considerable solvent effect on the reactivity of C_{60}^{2-}. A possible mechanism accounting for such a difference is proposed. The work has presented an alternative protocol for effective preparation of 1,2-dihydro[60]fullerenes, and may also provide clues toward a better understanding of the proton transfer process for anionic C_{60}-mediated reducing reactions involving H_2O.

- Facile Iterative Synthesis of 2,5-Terpyrimidinylenes as Nonpeptidic α-Helical Mimics
  Anderson, L.; Zhou, M.; Sharma, V.; McLaughlin, J. M.; Santiago, D. N.; Fronczek, F. R.; Guida, W. C.; McLaughlin, M. L. *J. Org. Chem.* **2010**, *75*, 4288–4291.
  Abstract:



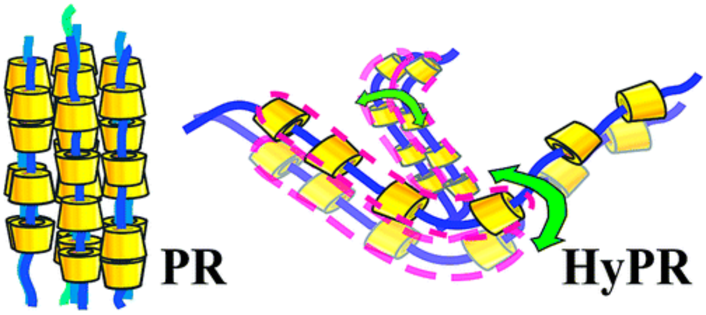
A facile iterative synthesis of 2,5-terpyrimidinylenes that are structurally analogous to α-helix mimics is presented. Condensation of amidines with readily prepared α,β-unsaturated α-cyanoketones gives 5-cyano-substituted pyrimidines. Iterative transformation of the 5-cyano group into an amidine allows synthesis of 2,5-terpyrimidinylenes with variable groups at the 4-, 4′-, and 4″-positions. These compounds are designed to mimic the *i*, *i* + 4, and *i* + 7 sites of an α-helix.

- Original Fluorinated Copolymers Achieved by Both Azide/Alkyne “Click” Reaction and Hay Coupling from Tetrafluoroethylene Telomers
  Soules, A.; Ameduri, B.; Boutevin, B.; Calleja, G. *Macromolecules* **2010**, *43*, 4489–4499.
  Abstract:



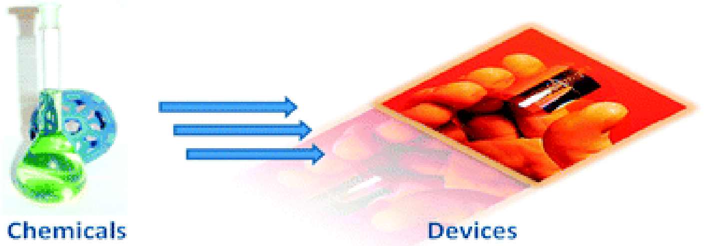
The synthesis and characterization of an original class of linear poly(alkyl aryl) ethers containing 1,2,3-triazolyl and fluorinated moieties based on oligo(tetrafluoroethylene) telomer are presented. These polymers were prepared, from α,ω-dipropargyl ether bisphenol AF and 1,10-diazido-1*H*,1*H*,2*H*,2*H*,9*H*,9*H*,10*H*,10*H*-perfluorodecane, in 62% overall yields via the azide/alkyne “click” reaction and/or oxidative coupling of acetylenes (Hay reaction). The latter reactant was produced from the ethylene end-capping of oligo(tetrafluoroethylene) followed by a nucleophilic substitution with sodium azide. A simple tuning of the reaction conditions allowed us to direct the originally favored “click” reaction toward a competitive homocoupling of the terminal alkynes, thus leading to copolymers with drastically different structures, as evidenced by size exclusion chromatography, DSC, Raman, and UV−vis spectroscopy. Hence, original poly(alkyl aryl) ether copolymers with a high thermal stability (higher than 300 °C) that exhibit alternating statistic or block microstructures were obtained.

- Crystallinity and Cooperative Motions of Cyclic Molecules in Partially Threaded Solid-State Polyrotaxanes
  Inomata, A.; Sakai, Y.; Zhao, C.; Ruslim, C.; Shinohara, Y.; Yokoyama, H.; Amemiya, Y.; Ito, K.
  Macromolecules **2010**, *43*, 4660–4666.
  Abstract:



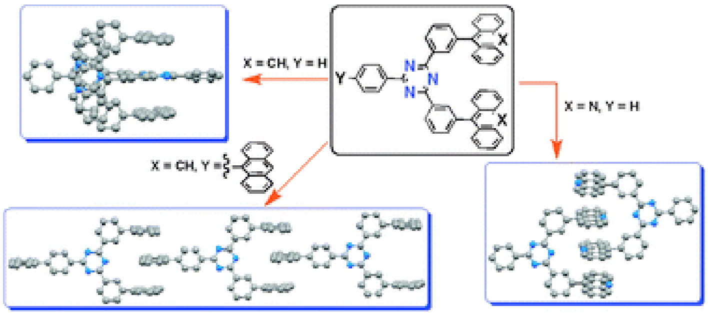
We investigated the structure, thermal properties, and dynamics of polyrotaxane (PR), composed of poly(ethylene glycol) (PEG) and α-cyclodextrins (CDs), and PR derivatives comprising hydroxypropylated CDs, that is, hydroxypropylated PRs (HyPRs), in the solid state by using wide-angle X-ray scattering (WAXS), differential scanning calorimetry (DSC), and viscoelastic spectroscopy. It was observed that HyPRs with high chemical modification ratios show a WLF-type viscoelastic relaxation that can be ascribed to the cooperative segmental motion of several CD molecules, whereas HyPRs with a lower modification ratio and PR with a highly ordered packing structure of CDs do not exhibit any mechanical relaxation mode. A comparison between the relaxation temperatures of HyPRs with different modification and inclusion ratios suggested that the hydrogen bond between CDs primarily dominates the viscoelastic properties of solid-state PR. Our experimental results indicate a close relationship between the crystallinity and fluctuation of cyclic molecules in solid-state PR, which is the first evidence of the dynamic softening of the glassy state formed by assembled cyclic molecules in solid-state PR.

- Organic photovoltaics: a chemical approach
  Delgado, J. L.; Bouit, P. A.; Filippone, S.; Herranz, M.; Martín, N. *Chem. Commun.* **2010**, *46*, 4853 – 4865.
  Abstract:



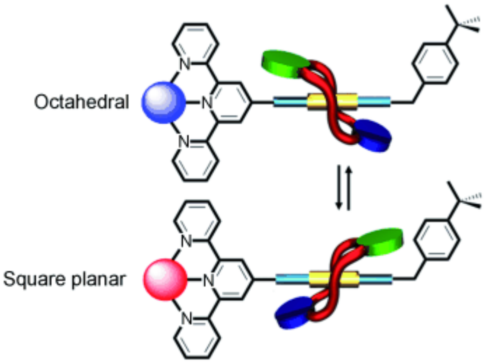
The design of new organic functional molecules able to harvest sun light and efficiently undergo photon to current energy conversion processes is at the forefront of chemical challenges. In this review, the fundamental contribution of chemistry to the multidisciplinary field of organic photovoltaics is presented in a systematic way through the wide variety of organic compounds synthesized to be successfully used in photovoltaic devices.

- Diverse dimerization of molecular tweezers with a 2,4,6-triphenyl-1,3,5-triazine spacer in the solid state
  Hisamatsu, Y.; Aihara, H. *Chem. Commun.* **2010**, *46*, 4902 – 4904.
  Abstract:



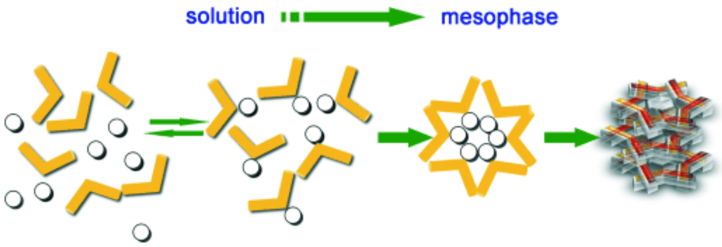
Molecular tweezers with a 2,4,6-triphenyl-1,3,5-triazine spacer exhibit diverse dimerization through – stacking interactions in the solid state, and these dimeric species form highly organized supramolecular networks.

- A [2]Rotaxane Flip Switch Driven by Coordination Geometry
  Davidson, G. J. E.; Sharma, S.; Loeb, S. J. *Angew. Chem. Int. Ed.* **2010**, *49*, 4938-4942.
  Abstract:



The carrot is better than the stick! Changes in the metal coordination geometry of the capping group in a [2]rotaxane ligand results in molecular switching by reorienting a trapped macrocyclic component (see picture). Switching was successfully initiated when the metal coordination site was made more attractive (square planar), but not when the metal coordination site was made less attractive (octahedral).

- Orthogonal Action of Noncovalent Interactions for Photoresponsive Chiral Columnar Assemblies
  Vera, F.; Barberá, J.; Romero, P.; Serrano, J. L.; Ros, M. B.; Sierra, T. . *Angew. Chem. Int. Ed.* **2010**, *49*, 4910-4914.
  Abstract:



Making a stack: Helical columnar architectures are prepared by a hierarchical self-assembly process involving H-bonding, π-π, and ion-dipole interactions (see picture). The strategic combination of these supramolecular interactions within mesomorphic systems yields materials in which photoinduced chirality and the incorporation of ions can be used to design multifunctional liquid crystals.