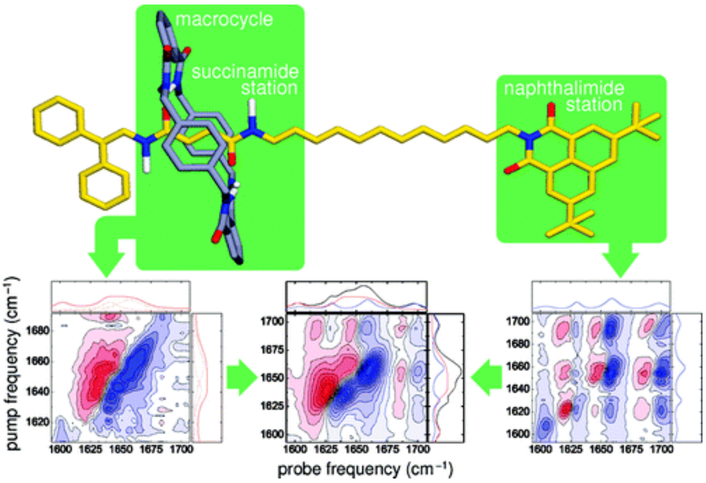
- Two-Dimensional Vibrational Spectroscopy of Rotaxane-Based Molecular Machines
  Bodis, P.; Panman, M. R.; Bakker, B. H.; Mateo-Alonso, A.; Prato, M.; Buma, W. J.; Brouwer, A. M.; Kay, E. R.; Leigh, D. A.; Woutersen, S. *Acc. Chem. Res.* **2009**, *42*, 1462–1469.
  Abstract:



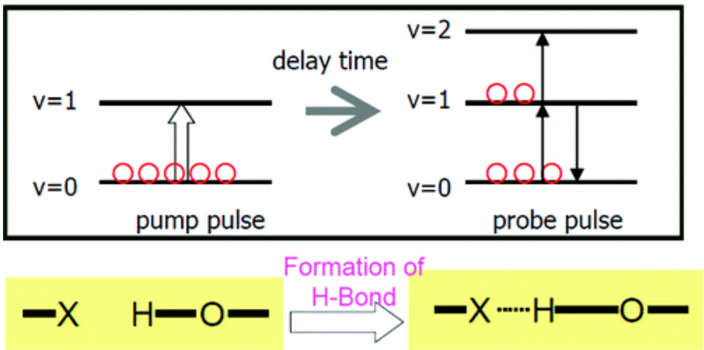
It has recently become possible to synthesize mechanical devices the size of a single molecule. Although it is tempting to regard such molecular machines as nanoscale versions of their macroscopic analogs, many notions from macroscopic mechanics no longer apply at a molecular level. For instance, the concept of viscous friction is meaningless for a molecular machine because the size of the solvent molecules that cause the friction is comparable to that of the machine itself. Furthermore, in many cases, the interactions between a molecular machine and its surroundings are comparable to the force driving the machine. As a result, a certain amount of intrinsic randomness exists in the motion of molecular machines, and the details of their mechanics are largely unknown.

For a detailed understanding of the mechanical behavior of molecular machines, experiments that probe their motion on an ultrafast time scale, such as two-dimensional (2D) vibrational spectroscopy, are essential. This method uses coupling between vibrational modes in a molecule to investigate the molecular conformation. The coupling shows up as off-diagonal peaks in a 2D graph of the vibrational response of the molecule, analogous to the spin coupling observed in multidimensional NMR spectroscopy. Both spin coupling and vibrational coupling are sensitive probes of the molecular conformation, but 2D vibrational spectroscopy shows orders of magnitude better time resolution than NMR.

In this Account, we use 2D vibrational spectroscopy to study molecular machines based on rotaxanes. These devices consist of a linear thread and a macrocycle that is noncovalently locked onto the thread. In the rotaxanes we study, the macrocycle and the thread both contain CO and NH groups. By determining the coupling between the stretching modes of these goups from the cross peaks in the 2D spectrum, we directly and quantitatively probe the relative position and orientation of the macrocycle and the thread for both a small model rotaxane and a rotaxane-based molecular shuttle.

Our results demonstrate the feasibility of using time-resolved 2D-IR experiments to measure externally triggered structural changes of molecular devices with subpicosecond time resolution. We can observe each of the elementary events that underlie the mechanical motion separately. With this ability to investigate the nature of the mechanical motions at the molecular level and with unprecedented time resolution, we expect that 2D-IR spectroscopy on molecular machines will lead to new insights into their function.

- Vibrational Dynamics of Hydrogen-Bonded Complexes in Solutions Studied with Ultrafast Infrared Pump−Probe Spectroscopy
  Banno, M.; Ohta, K.; Yamaguchi, S.; Hirai, S.; Tominaga, K. *Acc. Chem. Res.* **2009**, *42*, 1259–1269.
  Abstract :



In aqueous solution, the basis of all living processes, hydrogen bonding exerts a powerful effect on chemical reactivity. The vibrational energy relaxation (VER) process in hydrogen-bonded complexes in solution is sensitive to the microscopic environment around the oscillator and to the geometrical configuration of the hydrogen-bonded complexes. In this Account, we describe the use of time-resolved infrared (IR) pump−probe spectroscopy to study the vibrational dynamics of (i) the carbonyl CO stretching modes in protic solvents and (ii) the OH stretching modes of phenol and carboxylic acid. In these cases, the carbonyl group acts as a hydrogen-bond acceptor, whereas the hydroxyl group acts as a hydrogen-bond donor. These vibrational modes have different properties depending on their respective chemical bonds, suggesting that hydrogen bonding may have different mechanisms and effects on the VER of the CO and OH modes than previously understood.

The IR pump−probe signals of the CO stretching mode of 9-fluorenone and methyl acetate in alcohol, as well as that of acetic acid in water, include several components with different time constants. Quantum chemical calculations indicate that the dynamical components are the result of various hydrogen-bonded complexes that form between solute and solvent molecules. The acceleration of the VER is due to the increasing vibrational density of states caused by the formation of hydrogen bonds.

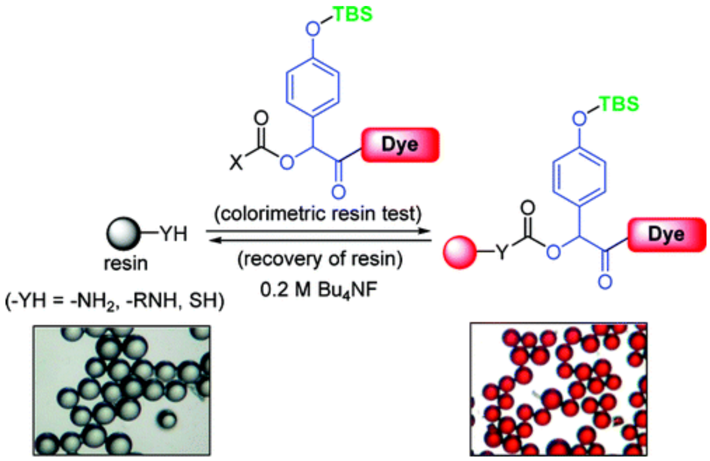
The vibrational dynamics of the OH stretching mode in hydrogen-bonded complexes were studied in several systems. For phenol−base complexes, the decay time constant of the pump−probe signal decreases as the band peak of the IR absorption spectrum shifts to lower wavenumbers (the result of changing the proton acceptor). For phenol oligomers, the decay time constant of the pump−probe signal decreases as the probe wavenumber decreases. These observations show that the VER time strongly correlates with the strength of hydrogen bonding. This acceleration may be due to increased coupling between the OH stretching mode and the accepting mode of the VER, because the low-frequency shift caused by hydrogen bond formation is very large. Unlike phenol oligomers, however, the pump−probe signals of phenol−base complexes did not exhibit probe frequency dependence. For these complexes, rapid interconversion between different conformations causes rapid fluctuations in the vibrational frequency of the OH stretching modes, and these fluctuations level the VER times of different conformations.

For the benzoic acid dimer, a quantum beat at a frequency of around 100 cm^{-1} is superimposed on the pump−probe signal. This result indicates the presence of strong anharmonic coupling between

the intramolecular OH stretching and the intermolecular stretching modes. From a two-dimensional plot of the OH stretching wavenumber and the low-frequency wavenumber, the wavenumber of the low-frequency mode is found to increase monotonically as the probe wavenumber is shifted toward lower wavenumbers.

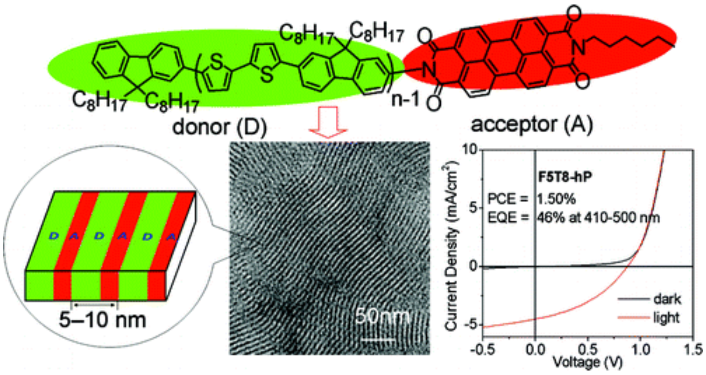
Our results represent a quantitative determination of the acceleration of VER by the formation of hydrogen bonds. Our studies merit further evaluation and raise fundamental questions about the current theory of vibrational dynamics in the condensed phase.

- Nondestructive, Colorimetric Monitoring of Amines and Thiols on a Solid Support
  Yang, S.-J.; Tian, X. Z.; Shin, I. *Org. Lett.* **2009**, *11*, 3438–3441.
  <u>Abstract:</u>



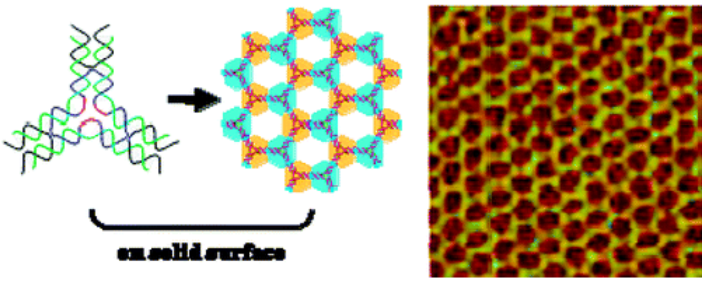
A new, nondestructive, highly sensitive method for colorimetric monitoring of primary amines, secondary amines, and thiols on a solid support was developed. The resin used in this method is simply regenerated for the repetition of the reaction or an ensuing reaction. By using this new method, several peptides containing secondary amide linkages and *C*-terminal hydrazide groups were prepared in high purities and yields. The results of concentration optimization experiments showed that reactions of polymer-bound amines and thiols with 50 mM **1**, 50 mM DBU, and 10 mM DMAP for 7 min at room temperature gave efficient color tests. Since high-temperature reactions may result in decomposition of resin-bound compounds, making regeneration of compounds after color tests problematic, the resin test was performed at room temperature. To examine the sensitivity of this new colorimetric method, the resin-bound amine and thiol containing dipeptides (10 μmol) shown in Figure 2 were coupled to 0.9 equiv of Fmoc-Leu. After washing, the resin was treated with **1** (50 mM) and 50 mM DBU−10 mM DMAP for 7 min at room temperature to monitor unreacted amine and thiol groups. The resin was clearly stained by using this procedure, indicating that the minimum detection sensitivity is ca. 1 μmol/g of resin. Since colorimetric tests of amines and thiols using **1** worked well, we next explored the regeneration of free amines and thiols after performing the color tests. The colored resin, obtained from reactions of resin-bound amines and thiols with **1**, was treated with 0.2 M Bu$_4$NF in THF for 1−13 min or twice for 5 min at room temperature. These treatments led to the complete removal of the dye moiety from the amine and thiol groups on the resin. On the basis of these results, double cleavage conditions (treatment of the colored resin twice with 0.2 M Bu$_4$NF for 5 min) were used in further studies. Importantly, the purity of peptides obtained from regenerated resin was quite similar to that obtained without employing the resin test, showing that the resin was successfully recovered.

- Monodisperse Co-oligomer Approach toward Nanostructured Films with Alternating Donor−Acceptor Lamellae
  Bu, L.; Guo, X.; Yu, B.; Qu, Y.; Xie, Z.; Yan, D.; Geng, Y.; Wang, F. *J. Am. Chem. Soc.* **2009**, *131*, 13242–13243.
  <u>Abstract:</u>



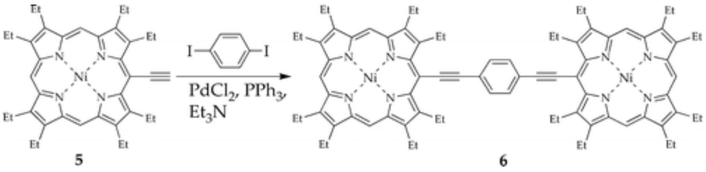
A series of donor−acceptor (D−A) co-oligomers with oligo(fluorene-alt-bithiophene) and perylene diimide as donor and acceptor segments, respectively, have been designed and synthesized. They can self-assembly into alternating D−A lamellar nanostructured films with the periods depending on the molecular length. These films have been successfully used in fabrication of high-performance single-molecular solar cells with power conversion efficiency up to 1.50%.

- Surface-Mediated DNA Self-Assembly
  Sun, X.; Ko, S.; Zhang, C.; Ribbe, A. E.; Mao, C. *J. Am. Chem. Soc.* **2009**, *131*, 13248–13249.
  <u>Abstract:</u>



This communication reports a strategy for solid surface-mediated DNA self-assembly. DNA molecules weakly interact with solid surfaces; thus are confined to solid surfaces. The confinement reduces the flexibility of DNA nanomotifs and promotes the DNA 2D crystals to grow on solid surfaces. As a demonstration, periodic DNA nanoarrays have been directly assembled onto mica surfaces. Such in situ assembly eliminates the sample transfer process between assembly and characterization and possible applications.

- Peripheral Covalent Modification of Inorganic and Organometallic Compounds through C−C Bond Formation Reactions
  Ren, T. *Chem. Rev.* **2008**, *108,* 4185-4207.
  <u>Abstract:</u>

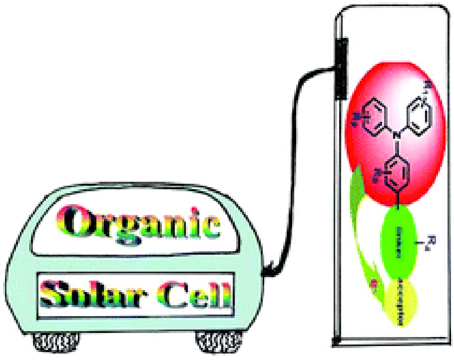


More than a century after the founding of coordination chemistry by Alfred Werner, inorganic chemistry has branched into organometallics, bioinorganic, polymer, and solid state/materials chemistry. A common feature of the new frontiers of inorganic chemistry is the increasing degree of complexity of ligands and the rich functionalities of the resultant compounds. The desire to achieve complex inorganic species of either novel functionality or intricate topology provides stimulus for new synthetic strategies with improved efficiency and selectivity. One of the emerging strategies invokes the formation of C−C bond at the coordinated ligands distant from the metal center. This approach takes advantage of Pd-catalyzed cross-coupling reactions that have been explored extensively by organic chemists with well-defined catalysts and the scope of substrates. Successful peripheral modifications include the Sonogashira, Suzuki, Negishi, Heck, and Stille reactions. Alternatively, peripheral C−C bond formation can also be achieved through homocoupling reactions such as the Glaser reaction and the olefin metathesis reaction.

- Chemical and Pharmacological Research of the Plants in Genus *Euphorbia*
  Shi, Q.-W. ; Su, X.-H. ; Kiyota, H. *Chem. Rev.* **2008**, *108,* 4295-4327.
  Abstract:

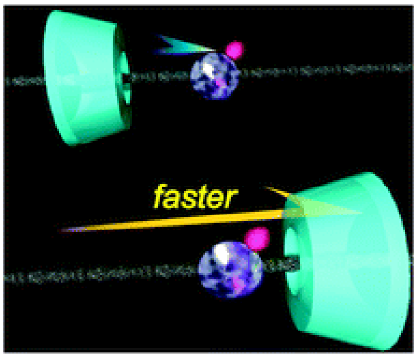
The genus Euphorbia is the largest in the spurge family, comprising more than 2000 species. Some species of the genus *Euphorbia* have been used as medicinal plants for the treatment of skin diseases, gonorrhea, migraine, and intestinal parasites and as wart cures. The researched parts of the *Euphorbia species* include roots, seeds, latex, lactiferous tubes, stem wood, stem barks, leaves, and whole plants. Plants in the family Euphorbiaceae are well known for the chemical diversity of their isoprenoid constituents. Diterpenoids are the majority of the genus with many different core frameworks such as jatrophanes, lathyranes, triglianes, ingenanes, myrsinols, etc. The triterpene alcohols found in the latex of Euphorbia species have been used as chemotaxonomic markers. In addition, sesquiterpenoids, phloracetophenones, cerebrosides, glycerols, flavonoids, and steroids were also obtained. The compounds isolated from genus *Euphorbia* and extracts perform many different activities, including antiproliferation, modulability of multidrug resistance, cytotoxic activity, antimicrobial and antiinflammatory activity, etc. Biological activities including skin irritant, tumor promotion, and proinflammatory properties are attributed to the presence of specific classes of macro- and polycyclic diterpenes. In this review article, we will summarize the phytochemical progress and list all of the compounds isolated from the genus Euphorbia over the past few decades. Also included are the biological activities of compounds isolated in recent years and parts structure−activity relationships.

- Triarylamine: a promising core unit for efficient photovoltaic materials.
  Ning, Z.; Tian, H. *Chem. Commun.* **2009**, 5483 – 5495.
  Abstract:



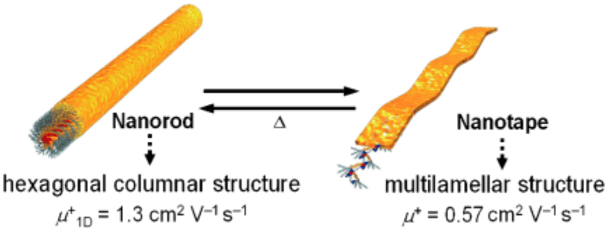
Triarylamine has been widely used in opto- and electro-active materials for its good electron donating and transporting capability, as well as its special propeller starburst molecular structure. Recently, organic photovoltaic functional materials with triarylamine as electron donor have aroused great interest and become the focus of intensive research in the field of solar cells. These materials have significantly reinforced the conversion efficiency of next-generation solar cells, especially dye sensitized solar cells. This Feature Article describes new synthetic methods and the application of starburst triarylamines, highlighting the applications in photovoltaic and optoelectrical fields.

- Face selective translation of a cyclodextrin ring along an axle.
  Oshikiri, T.; Yamaguchi, H.; Takashima, Y.; Harada, A. *Chem. Commun.* **2009**, 5515 – 5517.
  Abstract:



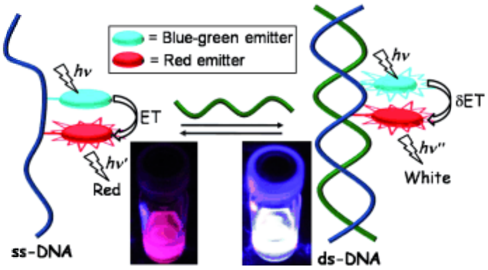
A cyclodextrin ring was face-selectively transferred between two stations linked by a 2-methylpyridinium group on an axle molecule.

- Interconvertible Oligothiophene Nanorods and Nanotapes with High Charge-Carrier Mobilities
  Yagai, S.; Kinoshita, T.; Kikkawa, Y.; Karatsu, T.; Kitamura, A.; Honsho, Y.; Seki, S. *Chem. Eur. J.* **2009**, *15*, 9320-9324.
  Abstract:



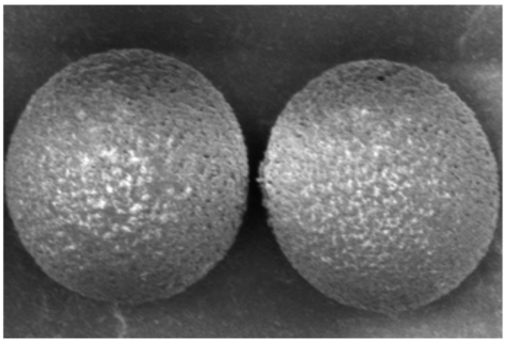
Barbarian aggregates: A barbituric acid-functionalized quarterthiophene self-aggregates in aliphatic solvents to form nanorods. Upon addition of a bismelamine receptor, the nanorods are converted into nanotapes, which can be thermally reconverted to nanorods. Nanorods and nanotapes self-organize into hexagonal columnar and multilamellar structures with high hole mobilities (see figure).

- White-Light-Emitting DNA (WED)
  Varghese, R.; Wagenknecht, H.-A. *Chem. Eur. J.* **2009**, *15*, 9307-9310.
  Abstract:



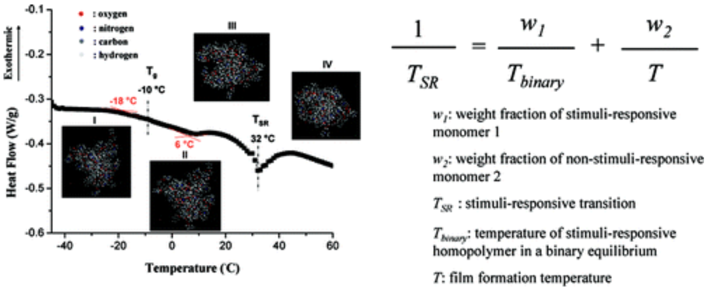
White knight: A DNA-based energy donor-acceptor couple exhibits red fluorescence in the single strand that changes to white light upon duplex formation in a completely reversible manner (see picture).

- Toward Controlling the Surface Morphology of Macroporous Copolymer Particles.
  Dubinsky, S.; Park, J. I.; Gourevich, I.; Chan, C.; Deetz, M.; Kumacheva, E. *Macromolecules* **2009**, *42*, 1990-1994.
  Abstract :



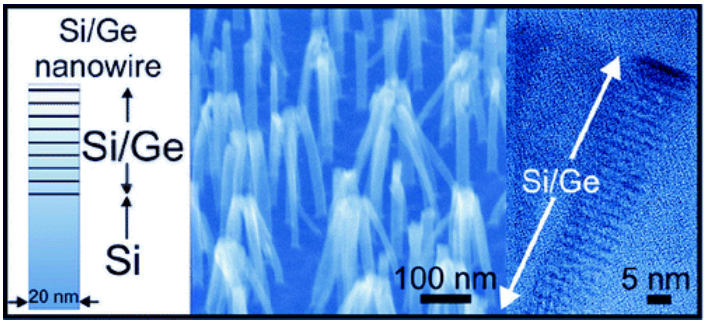
Syntheses of macroporous polymer particles under certain conditions produce microbeads with a smooth nonporous "skin" layer. This effect limits the applications of porous microbeads by preventing solute molecules to permeate the dense particle surface and reach particle's porous interior. This paper reports a straightforward method thatswithout the adjustment of the composition of microbeadsscan be used to suppress the formation of the "skin" on the surface of macroporous polymer particles. The approach presented as a solubility parameter-interfacial tension "map" paves the way to the selection of a broader range of porogen solvents and hence better rationalization of the composition of the monomer mixtures used in the synthesis of macroporous particles.

- New Thermal Transitions in Stimuli-Responsive Copolymer Films.
  Liu, F.; Urban, M. W**.** *Macromolecules* **2009**, *42*, 2161-2167.
  Abstract:



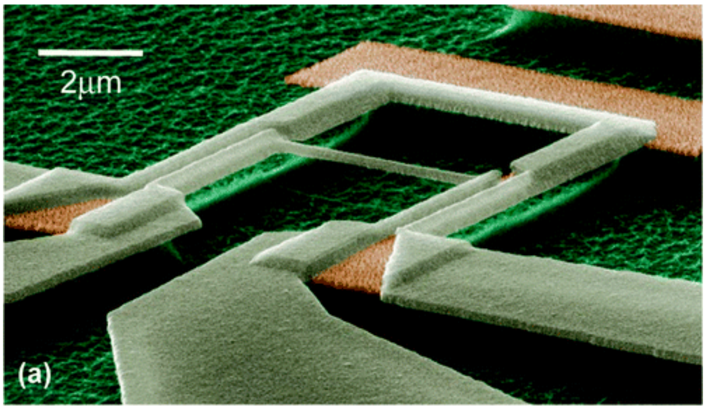
These studies report for the first time new thermal relaxations in stimuli-responsive solid-phase copolymers detected by differential scanning calorimetry (DSC) and dynamic mechanical analysis (DMA). When 2-(*N*,*N*-dimethylamino)ethyl methacrylate (DMAEMA) and *n*-butyl acrylate (nBA) monomers were copolymerized into colloidal dispersions and allowed to coalesce to form solid continuous films, in addition to the glass-transition temperature (*T*g), which follows the Fox equation for random copolymers, a new composition-sensitive endothermic stimuli-responsive transition (*T*SR) was observed. The *T*SR transition changes with the composition of the stimuliresponsive component of the copolymer, the temperature, and the rate of temperature change. On the basis of the experimental data, the following relationship was established: 1/*T*SR) *w*1/*T*binary + *w*2/*T* or 1/*T*SR) *w*1(1/*T*binary -1/*T*) + 1/*T*, where *T*SR is the temperature of the stimuli-responsive transition, *T*binary is the temperature of the stimuli-responsive homopolymer in a binary polymer-water equilibrium, *w*1 and *w*2 (*w*2) 1 - *w*1) are weight fractions of each component of the copolymer, and *T* is the film-formation temperature. This relationship allows us to predict *T*SR transitions in stimuli-responsive solid copolymers. The enthalpic (Δ*H*) components of the *T*g and *T*SR transitions determined from DSC measurements are 122 kcal/mol for *T*g and 199 kcal/mol for *T*SR, which are part of the total energy, Δ*E*tot, of the system. The calculated values of the Δ*E*tot obtained using computer modeling simulations (168 kcal/mol for *T*g and 223 kcal/mol for *T*SR, respectively) are in good agreement with the experimental data, and the energy difference is attributed to the inclusion of the entropic components in Δ*E*tot calculations.

- Sub-20 nm Si/Ge Superlattice Nanowires by Metal-Assisted Etching
  Geyer, N.; Huang, Z.; Fuhrmann, B.; Grimm, S.; Reiche, M.; Nguyen-Duc, T.-K.; de Boor, J.; Leipner, H. S.; Werner, P.; Gösele, U. *Nano Lett.* **2009**, *9*, 3106–3110.
  Abstract:



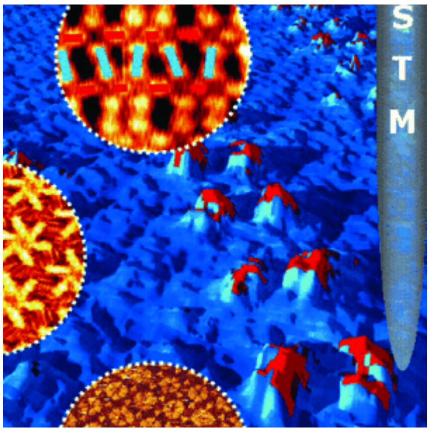
An effective and low-cost method to fabricate hexagonally patterned, vertically aligned Si/Ge superlattice nanowires with diameters below 20 nm is presented. By combining the growth of Si/Ge superlattices by molecular beam epitaxy, prepatterning the substrate by anodic aluminum oxide masks, and finally metal-assisted chemical wet etching, this method generates highly ordered hexagonally patterned nanowires. This technique allows the fabrication of nanowires with a high area density of 10^{10} wires/cm^2, including the control of their diameter and length.

- Parametric Nanomechanical Amplification at Very High Frequency
  Karabalin, R. B.; Feng, X. L.; Roukes, M. L. *Nano Lett.* **2009**, *9*, 3116–3123.
  Abstract:



Parametric resonance and amplification are important in both fundamental physics and technological applications. Here we report very high frequency (VHF) parametric resonators and mechanical-domain amplifiers based on nanoelectromechanical systems (NEMS). Compound mechanical nanostructures patterned by multilayer, top-down nanofabrication are read out by a novel scheme that parametrically modulates longitudinal stress in doubly clamped beam NEMS resonators. Parametric pumping and signal amplification are demonstrated for VHF resonators up to ~130 MHz and provide useful enhancement of both resonance signal amplitude and quality factor. We find that Joule heating and reduced thermal conductance in these nanostructures ultimately impose an upper limit to device performance. We develop a theoretical model to account for both the parametric response and nonequilibrium thermal transport in these composite nanostructures. The results closely conform to our experimental observations, elucidate the frequency and threshold-voltage scaling in parametric VHF NEMS resonators and sensors, and establish the ultimate sensitivity limits of this approach.

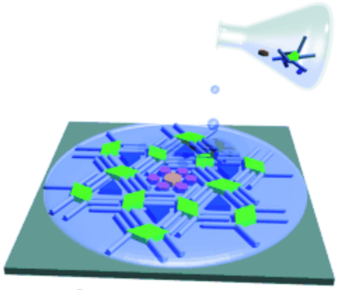
- Molecular and Supramolecular Networks on Surfaces: From Two-Dimensional Crystal Engineering to Reactivity
  Elemans, J. A. A. W.; Lei, S.; De Feyter, S. *Angew. Chem. Int. Ed*. **2009**, 48, 7298 – 7333.
  Abstract:



Seeing is believing: Scanning tunneling microscopy (STM) allows the visualization of molecules in real space on atomically flat conductive substrates (see picture), and has formed the basis for the rapid development of supramolecular chemistry at surfaces. This Review highlights recent developments in

the design and functionality of supramolecular surface patterns, with a focus on chirality, porosity, and reactivity.

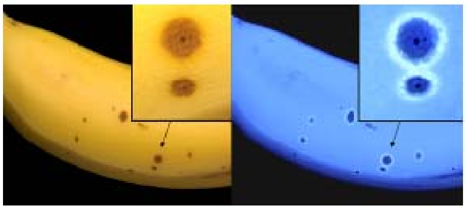
- Two-Dimensional Crystal Engineering: A Four-Component Architecture at a Liquid–Solid Interface
  Adisoejoso, J.; Tahara, K.; Okuhata, S.; Lei, S.; Tobe, Y.; De Feyter, S. *Angew. Chem. Int. Ed.* **2009**, 48, 7353 –7357.
  Abstract:



4-Component Network

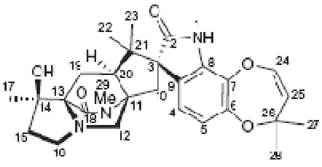
Get it together: A four-component 2D crystal has been formed at a liquid-solid interface and successfully visualized by scanning tunneling microscopy. Simply premixing the four components and applying the solution onto the graphite surface leads to the spontaneous self-assembly of the 2D crystal. Selected guest molecules induce a structural transformation of the host network from nonporous to porous by coadsorption inside the formed pores.

- Fluorescent chlorophyll catabolites in bananas lightup blue halos of cell death
  Moser, S.; Müller, T.; Holzinger, A.; Lütz, C.; Jockusch, S.; Turro, N. J.; Kräutler, B. *Proc. Nat; Acad. Sci.* **2009**, *106*, 15538–15543.
  Abstract:

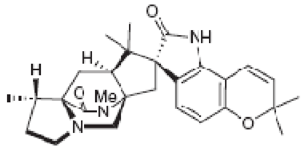


Breakdown of chlorophyll is a major contributor to the diagnostic color changes in fall leaves, and in ripening apples and pears, where it commonly provides colorless, nonfluorescent tetrapyrroles. In contrast, in ripening bananas (*Musa acuminata*) chlorophylls fade to give unique fluorescent catabolites (FCCs), causing yellow bananas to glow blue, when observed under UV light. Here, we demonstrate thecapacity of the blue fluorescent chlorophyll catabolites to signalsymptoms of programmed cell death in a plant. We report on studiesof bright blue luminescent rings on the peel of very ripe bananas,which arise as halos around necrotic areas in 'senescence associated'dark spots. These dark spots appear naturally on the peel of ripe bananas and occur in the vicinity of stomata. Wavelength, space, and time resolved fluorescence measurements allowed the luminescent areas to be monitored on whole bananas. Our studies revealed an accumulation of FCCs in luminescent rings, within senescing cells undergoing the transition to dead tissue, as was observable by morphological textural cellular changes. FCCs typically are short lived intermediates of chlorophyll breakdown. In some plants, FCCs are uniquely persistent, as is seen in bananas, and can thus be used asluminescent in vivo markers in tissue undergoing senescence. While FCCs still remain to be tested for their own hypothetical physiological role in plants, they may help fill the demand for specific endogenous molecular reporters in noninvasive assays of plant senescence. Thus, they allow for in vivo studies, which provide insights into critical stages preceding cell death.

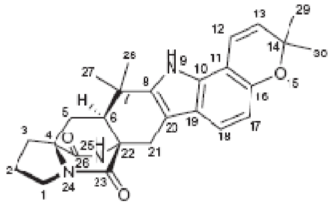
- Asymmetric total syntheses of (1)- and (2)-versicolamide B and biosynthetic implications
  Miller, K. A.; Tsukamoto, S.; Williams, R. M. *Nat. Chem.* **2009**, *1*, 63-68.
  Abstract:



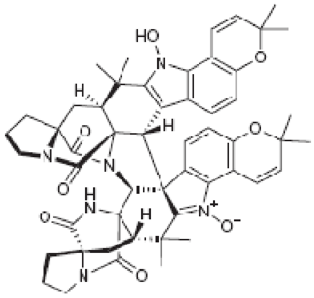
(−)-Paraherquamide A (**1**)



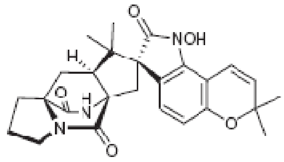
Paraherquamide F (VM55594) (**2**)



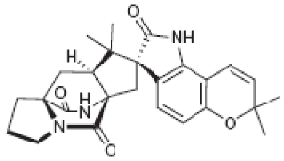
(+)-Stephacidin A ((+)-**3**)



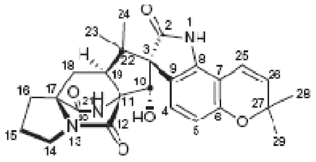
(−)-Stephacidin B (**4**)



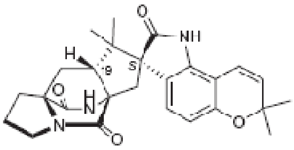
(−)-Notoamide A (**5**)



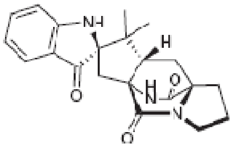
(−)-Notoamide B ((−)-**6**)



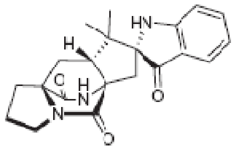
(−)-Sclerotiamide (**7**)



(+)-Versicolamide B ((+)-**8**)



(−)-Brevianamide A (**9**)



(−)-Brevianamide B (**10**)

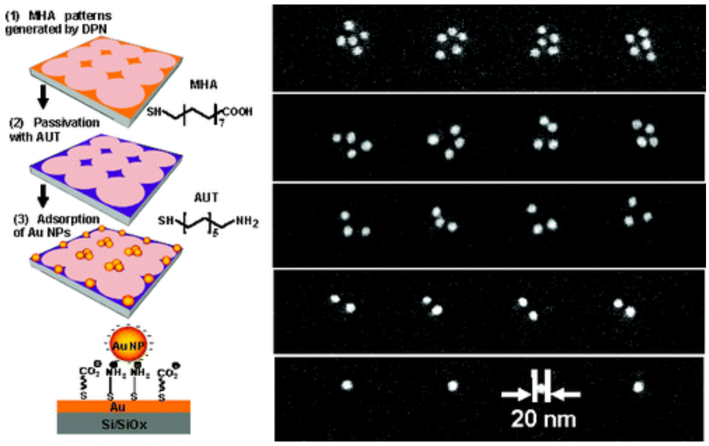
The Diels–Alder reaction is one of the most well-studied, synthetically useful organic transformations. Although it has been postulated that a significant number of naturally occurring substances arise by biosynthetic Diels–Alder reactions, rigorous of a mechanistically distinct natural Diels–Alderase enzyme remains elusive. Within this context, several related fungi within the Aspergillus genus produce a number of metabolites of opposite absolute configuration, including (1)- or (2)-versicolamide B. These alkaloids are hypothesized to arise via biosynthetic Diels–Alder reactions, implying that each Aspergillus species possesses enantiomerically distinct Diels–Alderases. In this paper, experimental validation of these

biosynthetic proposals via deployment of the intramolecular hetero-Diels–Alder reaction as a key step in the asymmetric total syntheses of (1)- and (2)-versicolamide B is described. Laboratory validation of the proposed biosynthetic Diels– Alder construction, coupled with the secondary metabolite profile of the producing fungi, reveals that each Aspergillus species has evolved enantiomerically distinct indole oxidases, as well as enantiomerically distinct Diels–Alderases.

- Controlled Assembly of Gold Nanoparticles and Graphene Oxide Sheets on Dip Pen Nanolithography-Generated Templates

Li, B.; Lu, G.; Zhou, X.; Cao, X.; Boey, F.; Zhang, H. *Langmuir* **2009**, *25*, 10455–10458.

Abstract:

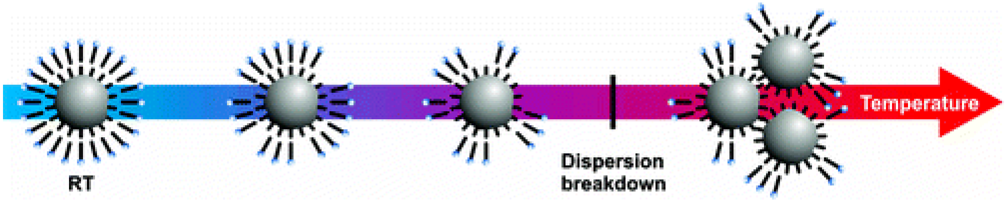


The ability to organize nanomaterials, e.g., Au nanoparticles (NPs) and graphene oxide (GO) sheets, into ordered structures with high accuracy and resolution on a substrate is crucially important for fundamental studies and applications. In this letter, we developed a simple and efficient method to generate positively charged 11-amino-1-undecanethiol (AUT) templates on Au substrates, which were successfully used for controlled assembly of negatively charged Au NPs or GO sheets from aqueous solution. The templates were obtained by passivation of the exposed Au area with AUT after 16-mercaptohexadecanoic acid (MHA) patterns were generated by dip-pen nanolithography (DPN) on Au. The electrostatic interaction ensures that the Au NPs and GO sheets only adsorb on the designed AUT areas. Importantly, by using this method, the number of Au NPs adsorbed on patterned areas can be controlled, and a single Au NP array was successfully achieved.

- Temperature-Dependent Colloidal Stability of Hydrophobic Nanoparticles Caused by Surfactant Adsorption/Desorption and Depletion Flocculation

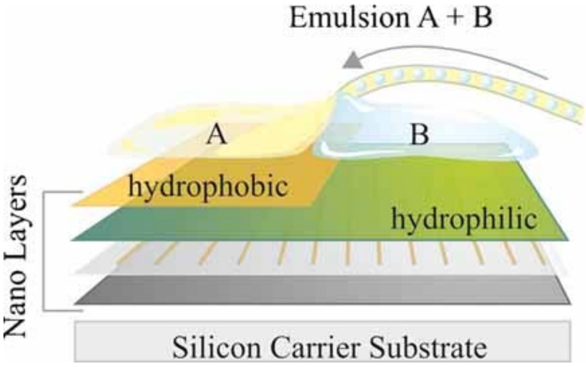
  Dederichs, T.; Meoller, M.; Weichold, O. *Langmuir* **2009**, *25*, 10501–10506.

  Abstract:



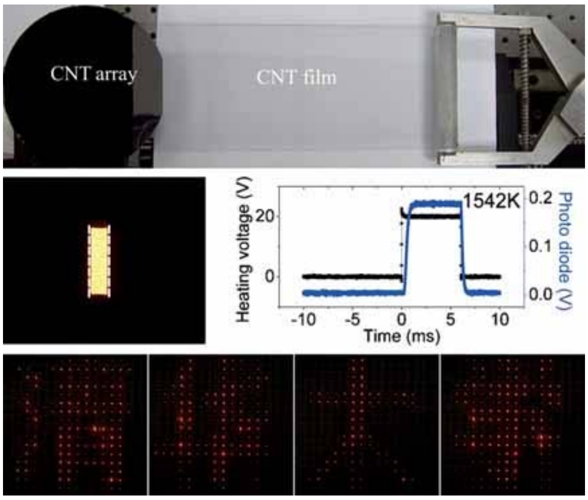
Nanoparticles coated with self-assembled dodecyltrimethylammonium bromide shells are shown to undergo colloidal destabilization at higher temperatures. This is caused by two different mechanisms depending on the surfactant concentration. Up to a surfactant concentration of 55 mM, the surfactant micelles dissolve before the breakdown of the dispersion. In this case, the breakdown is triggered by desorption of surfactant molecules from the particle surface causing flocculation via hydrophobic interactions. Since the surfactant concentration influences the adsorptiondesorption equilibrium, the breakdown temperature increases with increasing surfactant concentration from approximately 100 to 160 _C. Beyond 55 mM, surfactant micelles are still present when the dispersion breaks down and estabilization is caused by high temperature depletion flocculation. Since higher surfactant concentrations result in a larger number of micelles in solution, the breakdown temperature for concentrations above 55 mM decreases with increasing surfactant concentration.

- A Stack of Functional Nanolayers for Simultaneous Emulsion Separation and Sensing
  Truman, P.; Uhlmann, P.; Frenzel, R.; Stamm, M. *Adv. Mater.* **2009,** 3601-3604.
  Abstract:



A novel lab-on-a-chip device based on a stack of four nanolayers for emulsion separation and simultaneous detection is introduced. Emulsions are separated on top of chemically patterned surfaces while the process is monitored using semiconductor sensors.

- Fast High-Temperature Response of Carbon Nanotube Film and Its Application as an Incandescent Display
  Liu, P.; Liu, L.; Wei, Y.; Liu, Y.; Chen, Z.; Jiang, K.; Li, Q.; Fan, S. *Adv. Mater.* **2009,** 3563-3566.
  Abstract:



Super aligned carbon nanotube (CNT) film shows a fast high-temperature response: the film can be heated to incandescence and cools down in about 1 ms. Using screen printing and laser cutting, an incandescent CNT film array that can dynamically display Chinese characters is fabricated. More applications of the film may be developed based on its fast response.