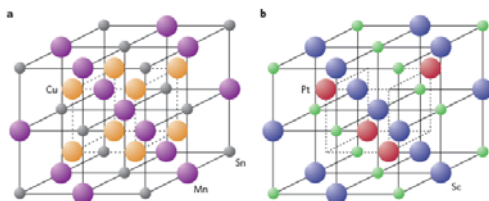


- Topological insulators: Starting a new family
Franz, M. *Nature Materials* **2010**, *9*, 536–537.

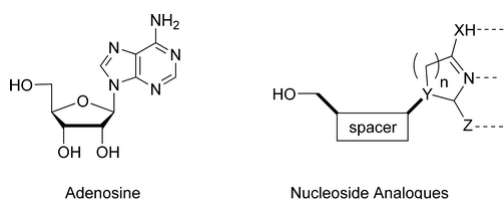
Abstract:



Ternary intermetallic Heusler compounds, originally discovered by a German mining engineer and chemist in 1903, may show exotic topological insulator behaviour unknown to science just five years ago. It is a historical fact that most of the key discoveries in condensed-matter physics and materials science have been made by experimentalists (think superfluidity, superconductivity, the quantum Hall effect, to name but a few). From time to time, theorists make paradigm-shifting predictions that lead to fundamentally new phenomena. Such is the story of topological insulators.

- Chemical Synthesis of Heterocyclic–Sugar Nucleoside Analogues
Romeo, G.; Chiacchio, U.; Corsaro, A.; Merino, P. *Chem. Rev.* **2010**, *110*, 3337–3370.

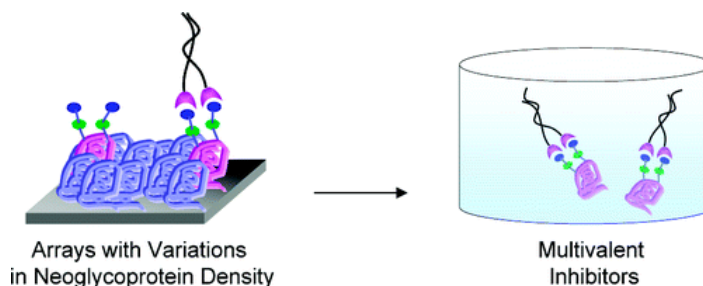
Abstract:



A variety of nucleoside analogues have now been discovered which expand the antiviral and anticancer spectrum and/or modify the pharmacological and/or pharmacokinetic properties of the parent compounds. In terms of their structure nucleosides can be considered to be constituted by three key elements: (i) the hydroxymethyl group, which is necessary for the phosphorylation of the molecule by kinases in order to achieve biological activity, (ii) the heterocyclic base moiety, which is implied in the recognition process of the nucleoside through specific hydrogen bonds, and (iii) the furanose ring, which in several instances seems to act as a spacer presenting the hydroxymethyl group and the base in the correct orientation.

- An Array-Based Method To Identify Multivalent Inhibitors
Zhang, Y.; Li, Q.; Rodriguez, L. G.; Gildersleeve, J. C. *J. Am. Chem. Soc.* **2010**, *132*, 9653–9662.

Abstract:

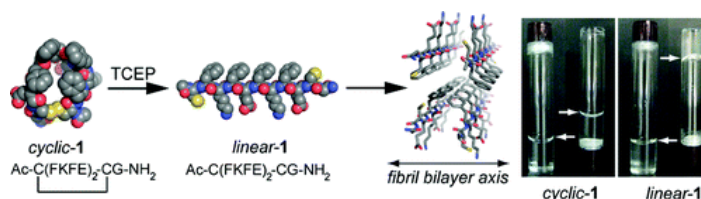


Carbohydrate–protein interactions play a critical role in a variety of biological processes, and agonists/antagonists of these interactions are useful as biological probes and therapeutic agents. Most carbohydrate-binding proteins achieve tight binding through formation of a multivalent

complex. Therefore, both ligand structure and presentation contribute to recognition. Since there are many potential combinations of structure, spacing, and orientation to consider and the optimal one cannot be predicted, high-throughput approaches for analyzing carbohydrate–protein interactions and designing inhibitors are appealing. In this report, we develop a strategy to vary neoglycoprotein density on a surface of a glycan array. This feature of presentation was combined with variations in glycan structure and glycan density to produce an array with approximately 600 combinations of glycan structure and presentation. The unique array platform allows one to distinguish between different types of multivalent complexes on the array surface. To illustrate the advantages of this format, it was used to rapidly identify multivalent probes for various lectins. The new array was first tested with several plant lectins, including concanavalin A (conA), *Vicia villosa* isolectin B4 (VVL-B4), and *Ricinus communis* agglutinin (RCA120). Next, it was used to rapidly identify potent multivalent inhibitors of *Pseudomonas aeruginosa* lectin I (PA-IL), a key protein involved in opportunistic infections of *P. aeruginosa*, and mouse macrophage galactose-type lectin (mMGL-2), a protein expressed on antigen presenting cells that may be useful as a vaccine targeting receptor. An advantage of the approach is that structural information about the lectin/receptor is not required to obtain a multivalent inhibitor/probe.

- A Reductive Trigger for Peptide Self-Assembly and Hydrogelation
Bowerman, C. J.; Nilsson, B. L. *J. Am. Chem. Soc.* **2010**, *132*, 9526–9527.

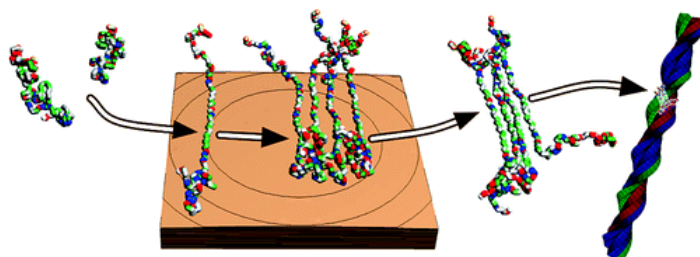
Abstract:



Stimulus-responsive peptide self-assembly provides a powerful method for controlling self-assembly as a function of environment. The development of a reductive trigger for peptide self-assembly and subsequent hydrogelation is described herein. A self-assembling peptide sequence, Ac-C(FKFE)₂-CG-NH₂, was cyclized via disulfide bonding of the flanking cysteine residues. The macrocyclic form of this peptide enforces a conformational restraint that prevents adoption of the β -sheet conformation that is required for self-assembly. Upon reduction of this disulfide bond, the peptide relaxes into the preferred β -sheet conformation, and immediate self-assembly into fibrillar superstructures occurs. At sufficient peptide concentration, self-assembly is accompanied by the formation of rigid, viscoelastic hydrogels.

- In Vitro Formation of Amyloid from α -Synuclein Is Dominated by Reactions at Hydrophobic Interfaces
Pronchik, J.; He, X.; Giurleo, J. T.; Talaga, D. S. *J. Am. Chem. Soc.* **2010**, *132*, 9797–9803.

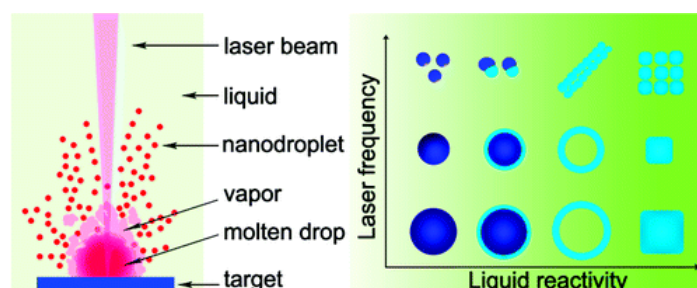
Abstract:



Most in vitro investigations of α -Synuclein (α Syn) aggregation and amyloidogenesis use agitation in the presence of air and/or Teflon to accelerate kinetics. The effect of the agitation is implicitly or explicitly attributed to mass transfer or fibril fragmentation. This paper evaluates these hypotheses by agitating α Syn under typical amyloidogenic conditions with controlled numbers of balls made of polytetrafluoroethylene (PTFE), polymethylmethacrylate (PMMA), and borosilicate glass with no headspace. Amyloid was assayed using thioflavin T fluorescence and atomic force microscopy. The observed kinetics were proportional to the PTFE surface area; the effects of PMMA and glass balls were negligible by comparison. No amyloid was observed to form in the absence of mixing balls. Agitation with only air also showed accelerated kinetics but different aggregate morphology. The results indicate that the mechanism active in agitation experiments is dominated by reactions at the hydrophobic–water interface. Of the mass transfer, fragmentation, and hydrophobic interface hypotheses, only the last is capable of explaining the data. Condition and sequence determinants of amyloidogenic propensity that have thus far been reported must be reinterpreted as being reflective of partitioning to hydrophobic–water interfaces. Comparable hydrophobic interfaces are not found in vivo.

- Morphology Control of Nanostructures via Surface Reaction of Metal Nanodroplets
Niu, K. Y.; Yang, J.; Kulinich, S. A.; Sun, J.; Li, H.; Du, X. W. *J. Am. Chem. Soc.* **2010**, *132*, 9814–9819.

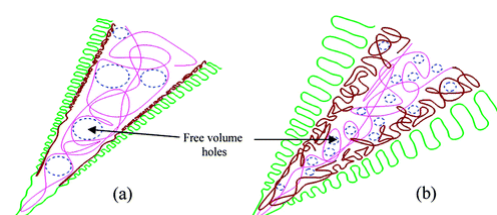
Abstract:



We report on the controllable synthesis of diverse nanostructures using laser ablation of a metal target in a liquid medium. The nanodroplets generated by laser ablation react with the liquid and produce various nanostructures, such as hollow nanoparticles, core–shell nanoparticles, heterostructures, nanocubes, and ordered arrays. A millisecond laser with low power density is essential for obtaining such metal nanodroplets, while the target material, the reactivity of liquid medium, and the laser frequency are decisive for controlling the morphology and size of the nanostructures produced. This green and powerful technique can be extended to different material systems for obtaining various nanostructures.

- A PALS Contribution to the Supramolecular Structure of Poly(l-lactide)
del Ro, J.; Etxeberria, A.; Lopez-Rodriguez, N.; Lizundia, E.; Sarasua, J. R. *Macromolecules* **2010**, *43*, 4698–4707.

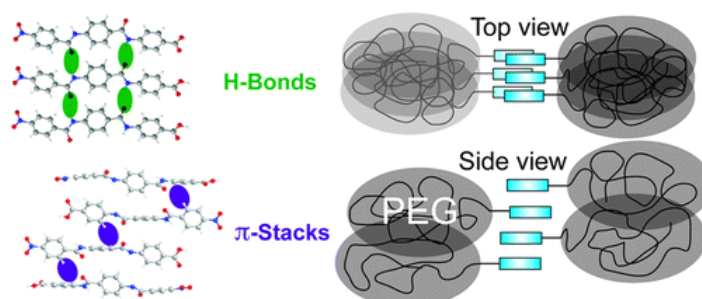
Abstract:



Positron annihilation lifetime spectroscopy (PALS) was conducted to follow the evolution of free volume during crystallization of PLLA at 100 °C. A finite lifetime distribution of three components was used to fit the PALS spectra. The analysis of the longest lifetime component (τ_3) indicates that the free volume distribution evolves during crystallization by increasing the number of holes yet decreasing their size; moreover, the free volume fraction increased during crystallization. Following the evolution of the shortest components a correlation was found with crystalline and amorphous phase contents present in PLLA. The first component (τ_1) was assigned to positron annihilation in occupied zones of the crystalline phase whereas the second component (τ_2) was attributed to annihilation by different amorphous arrangements. A model for the supramolecular arrangement of PLLA chains was devised in terms of free volume enlargement for annealed samples. According to this model transformations occur in mobile amorphous phase (MAP) and rigid amorphous phase (RAP) with PLLA chains evolving from folded or coil conformations in the as-quenched samples containing uniquely MAP to opener (more extended) conformations in samples containing larger RAP and crystalline fractions. The proposed model provides a rationale for the understanding of some unexpected effects associated with free volume that have been observed in several semicrystalline polymer systems, i.e., the lowering of density during crystallization (dedensification), the acceleration of polymer chains dynamics around the T_g (dynamic fragility) due to a rigid amorphous phase confined by crystallites, and also the gas permeability behavior in terms of solubility and diffusion coefficients.

- Hydrogen-Bonded Aggregates of Oligoamide–Poly(ethylene glycol) Block Copolymers
Bohle, A.; Brunklaus, G.; Hansen, M. R.; Schleuss, T. W.; Kilbinger, A. F. M.; Seltmann, J.; Spiess, H. W. *Macromolecules* **2010**, *43*, 4978–4985.

Abstract:



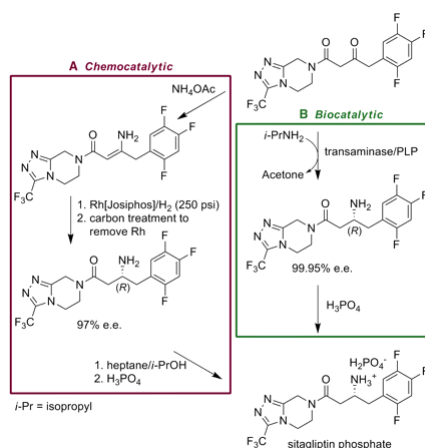
Rod-coil copolymers with an oligomeric rod aggregate on a nanometer length scale, which is important for many applications like e.g. organic photovoltaics. However, this aggregation behavior and the driving forces such as hydrogen bonding and π - π interactions, as well as the role of side groups, are not yet fully understood. Here, we investigated these noncovalent interactions in oligo(*p*-benzamide)–poly(ethylene glycol) (OPBA–PEG) copolymers using solid-state NMR supported by wide-angle X-ray scattering (WAXS), differential scanning calorimetry (DSC), and polarization optical microscopy (POM). It was found that longer OPBAs form layered β -sheet-like aggregates and that these are stabilized by amide hydrogen bonds in both unsubstituted OPBAs and OPBA–PEG rod-coil copolymers. The binding of the PEG also introduces a liquid crystalline phase. As a consequence, the local structural order is improved in the copolymer. Thus, by combining different methods of structural investigation, we were able to develop a model of local aggregation and packing in both the liquid crystalline and the solid state.

- Biocatalytic Asymmetric Synthesis of Chiral Amines from Ketones Applied to Sitagliptin Manufacture

5

Savile, C. K.; Janey, J. M.; Mundorff, E. C.; Moore, J. C.; Tam, S.; Jarvis, W. R.; Colbeck, J. C.; Krebber, A.; Fleitz, F. J.; Brands, J.; Devine, P. N.; Huisman, G. W.; Hughes, G. J. *Science* **2010**, 329, 305 – 309.

Abstract:

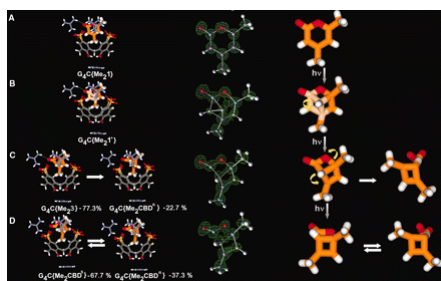


Pharmaceutical synthesis can benefit greatly from the selectivity gains associated with enzymatic catalysis. Here, we report an efficient biocatalytic process to replace a recently implemented rhodium-catalyzed asymmetric enamine hydrogenation for the large-scale manufacture of the antidiabetic compound sitagliptin. Starting from an enzyme that had the catalytic machinery to perform the desired chemistry but lacked any activity toward the pro-sitagliptin ketone, we applied a substrate walking, modeling, and mutation approach to create a transaminase with marginal activity for the synthesis of the chiral amine; this variant was then further engineered via directed evolution for practical application in a manufacturing setting. The resultant biocatalysts showed broad applicability toward the synthesis of chiral amines that previously were accessible only via resolution. This work underscores the maturation of biocatalysis to enable efficient, economical, and environmentally benign processes for the manufacture of pharmaceuticals.

- Single-Crystal X-ray Structure of 1,3-Dimethylcyclobutadiene by Confinement in a Crystalline Matrix

Legrand, Y.-M.; van der Lee, A.; Barboiu, M. *Science* **2010**, 329, 299 – 302.

Abstract:

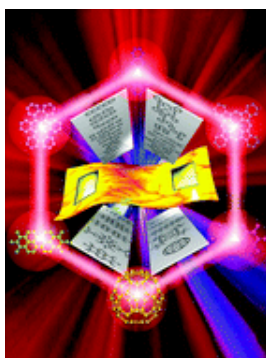


Cyclobutadiene (CBD), the smallest cyclic hydrocarbon bearing conjugated double bonds, has long intrigued chemists on account of its strained geometry and electronic instability, but the parent compound and its unperturbed derivatives have thus far eluded crystallographic characterization. In this work, we immobilize a precursor, 4,6-dimethyl- α -pyrone, in a guanidinium-sulfonate-calixarene (G_4C) crystalline network that confines the guest through a combination of CH- π and hydrogen-bond

interactions. Ultraviolet irradiation of the crystals transforms the entrapped 4,6-dimethyl- α -pyrone into a 4,6-dimethyl- β -lactone Dewar intermediate that is sufficiently stable under the confined conditions at 175 kelvin to allow a conventional structure determination by x-ray diffraction. Further irradiation pushes the reaction to completion, enabling the structure determination of 1,3-dimethylcyclobutadiene Me₂CBD. Our data support experimental observation of square-planar (Me₂CBD^S) and rectangular-bent (Me₂CBD^R) geometries in the G₄C host matrix. The hydrogen-bonded, dissociated carbon dioxide coproduct interacts more strongly with Me₂CBD^S than with Me₂CBD^R.

- High performance organic semiconductors for field-effect transistors.
Dong, H.; Wang, C.; Hu, W. *Chem. Commun.* **2010**, 46, 5211 – 5222.

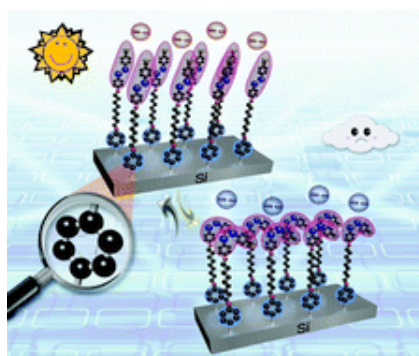
Abstract:



The purpose of this feature article is to give an overview of recent advances in development of high performance organic semiconductors for field-effect transistors, especially those with mobility of/over amorphous silicon, since they are believed to be promising candidates with practical applications in the near future's organic electronic industry. We hope this comprehensive summary of high performance organic semiconductors will provide guidelines for the design and synthesis of novel, high performance organic field-effect semiconductors.

- A photoswitchable methylene-spaced fluorinated aryl azobenzene monolayer grafted on silicon
Min, M.; Bang, G. S.; Lee, H.; Yu, B. C. *Chem. Commun.* **2010**, 46, 5232 – 5234.

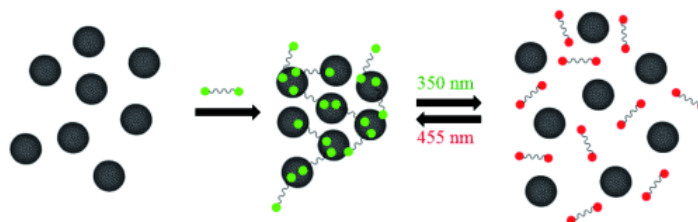
Abstract:



Aryldiazonium-terminated methylene-spaced trifluoromethylazobenzene derivatives have been synthesized. Their self-assembled monolayers (SAMs) on a silicon surface allow for a stable and reversible molecular photoswitch.

- Light-Responsive Molecular Recognition and Adhesion of Vesicles
Mohan Nalluri, S. K.; Jan Ravoo, B. *Angew. Chem. Int. Ed.* **2010**, *49*, 5371–5374.

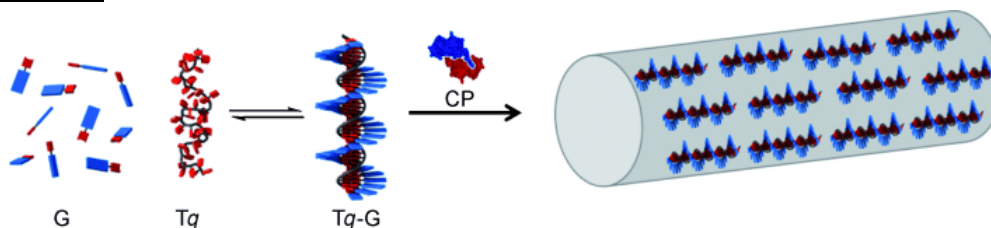
Abstract:



Supramolecular glue: The photoinduced isomerization of difunctional azobenzenes can be used to induce and reverse the molecular recognition and adhesion of bilayer vesicles made up of cyclodextrin (CD) molecules. The molecular basis of this light-responsive supramolecular glue is the *cis-trans* isomerization of the azobenzene (see picture; black circles CD, green *trans*-azobenzene, red *cis*-azobenzene).

- Encapsulation of DNA-Templated Chromophore Assemblies within Virus Protein Nanotubes
de la Escosura, A.; Janssen, P. G. A.; Schenning, A. P. H. J.; Nolte, R. J. M.; Cornelissen, J. J. L. M. *Angew. Chem. Int. Ed.* **2010**, *49*, 5335–5338.

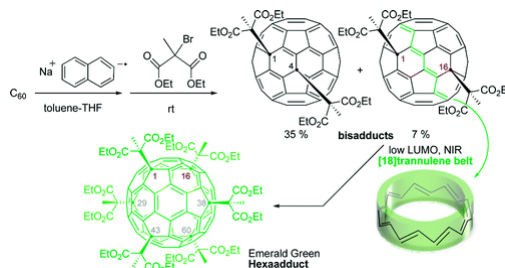
Abstract:



A beneficial virus: The hierarchical self-assembly of a three-component system consisting of single-stranded DNA (oligothymines; *Tq*), chromophores (*G*), and virus coat proteins (*CP*) leads to the formation of micrometer-long nanotubes (see picture). Tuning the interaction between the three components leads to the formation of structures with different length scales, and the chromophores within the nanotubes maintain the helical arrangement of the *Tq-G* template.

- Synthesis and Regiochemistry of [60]Fullerenyl 2-Methylmalonate Bisadducts and their Facile Electron-Accepting Properties
Kokubo, K.; Arastoo, R. S.; Oshima, T.; Wang, C.-C.; Gao, Y.; Wang, H.-L.; Geng, H.; Chiang, L. Y. *J. Org. Chem.* **2010**, *75*, 4574–4583.

Abstract:



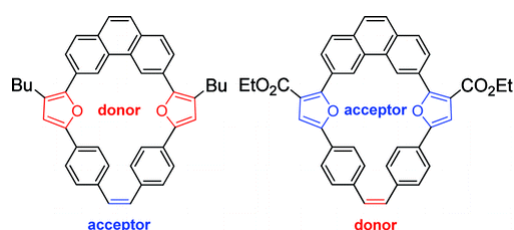
A simple one-pot reaction using *in situ* chemically generated Na-naphthalenide as an electron reductant in the preferential generation of C_{60}^{2-} is described. Trapping of C_{60}^{2-} intermediate with 2 molar equiv of sterically hindered 2-bromo-2-methylmalonate ester afforded two singly bonded fullerenyl bisadducts $C_{60}[CMe(CO_2Et)]_2$ in 35% and 7% yield, respectively. The regiochemistry of

these two products was determined to be 1,4- and 1,16-bisadducts, respectively, by NMR, UV-vis-NIR, LCMS, and X-ray single crystal structural analysis. The minor 1,16-bisadduct **2** exhibits long wavelength absorption bands in the near-IR region and prominent electron-accepting characteristics as compared with those of the major 1,4-bisadduct and pristine C₆₀. As revealed by DFT calculation, we propose that the origin of these unusual characters of **2** arises from the moiety of [18π]-trannulene, in close resemblance to that of the highly symmetrical emerald green 1,16,29,38,43,60-hexaadduct of C₆₀, EF-6MC_n. Accordingly, we anticipate a fast progressive formation of plausible 1,16-bisadduct-like intermediate moieties on a C₆₀ cage as the precursor structure leading to the formation of EF-6MC_n, by taking the corresponding regiochemistry and electronic properties into account.

- Phenanthrene-Tethered Furan-Containing Cyclophenes: Synthesis and Photophysical Properties

Bai, H.-T.; Lin, H.-C.; Luh, T.-Y. *J. Org. Chem.* **2010**, *75*, 4591–4595.

Abstract:

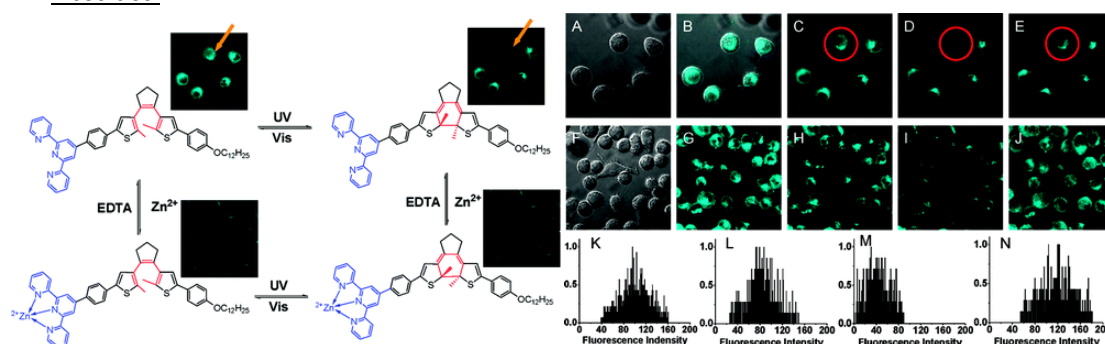


Two phenanthrene-fused furan-containing teraryl cyclophenes **5** and **6** are synthesized. These cyclophenes exhibit charge transfer band in the absorption spectra, unusually large Stokes shifts in the emission spectra, and exceptionally high $\mu\beta$ values in the electric-field-induced second-harmonic generation (EFISH) experiments. The $\mu\beta_{1.91}$ values for **5** and **6** are 438 and 777×10^{-48} esu, respectively. The bridging double bond in **5** and **6** can serve as either an electron donor or acceptor depending on the nature of the substituent on furan rings. DFT calculations at the B3LYP/6-31G** level indicate that the electron density distributions in HOMO and LUMO are very different. Interaction between the oligoaryl systems and the double bond may account for the significant enhancement in hyperpolarizability.

- Multiresponsive Switchable Diarylethene and Its Application in Bioimaging

Piao, X.; Zou, Y.; Wu, J.; Li, C.; Yi, T. *Org. Lett.* **2009**, *11*, 3818–3821.

Abstract:

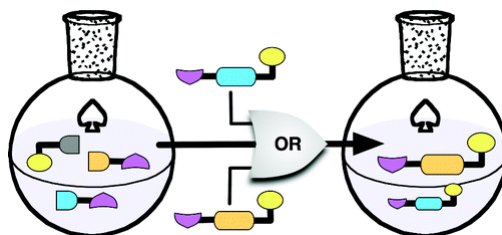


A multiresponsive fluorescent switch based on diarylethene and terpyridine units was developed. It exhibits effective switchable fluorescence which can be controlled by UV/visible light or metal ion/EDTA in solution. More importantly, having low toxicity, it can enter live cells as a fluorescent

probe and can also serve as a detector for the biological process of metal ion transmembrane transport. Fluorescence labeling technology is important to the advancement of biological imaging, which is widely used for the monitoring of internal cellular processes. In the past few decades, much progress has been made in designing fluorescent probes for bioimaging and some materials, such as organic dyes, fluorescent proteins, quantum dots, metallic complexes, and up-conversion nanoparticles are now standard and widely used.

- A Simple Network of Synthetic Replicators Can Perform the Logical OR Operation
Allen, V. C.; Robertson, C. C.; Turega, S. M.; Philp, D. *Org. Lett.* **2010**, *12*, 1920–1923.

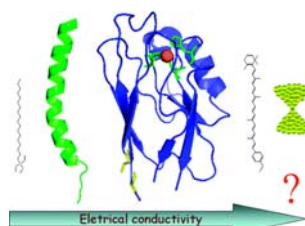
Abstract:



A small network of synthetic replicators is capable of responding to instructional inputs such that the output of the network is an excess of one of the replicators whenever the input contains either or both of the replicators, mirroring the OR boolean logic operation.

- Proteins as Solid-State Electronic Conductors
Ron, I.; Pecht, I.; Sheves, M.; Cahen, D. *Acc. Chem. Res.* **2010**, *43*, 945–953.

Abstract:



Protein structures can facilitate long-range electron transfer in solution. But a fundamental question remains: can these structures also serve as solid-state electronic conductors? Answering this question requires methods for studying conductivity of the “dry” protein (which only contains tightly bound structured water molecules) sandwiched between two electronic conductors in a solid-state type configuration. If successful, such systems could serve as the basis for future, bioinspired electronic device technology.

In this Account, we survey, analyze, and compare macroscopic and nanoscopic (scanning probe) solid-state conductivities of proteins, noting the inherent constraints of each of these, and provide the first status report on this research area. This analysis shows convincing evidence that “dry” proteins pass orders of magnitude higher currents than saturated molecules with comparable thickness and that proteins with known electrical activity show electronic conductivity, nearly comparable to that of conjugated molecules (“wires”). These findings suggest that the structural features of proteins must have elements that facilitate electronic conductivity, even if they do not have a known electron transfer function.

As a result, proteins could serve not only as sensing, polar, or photoactive elements in devices (such as field-effect transistor configurations) but also as electronic conductors. Current knowledge of peptide synthesis and protein modification paves the way toward a greater understanding of how

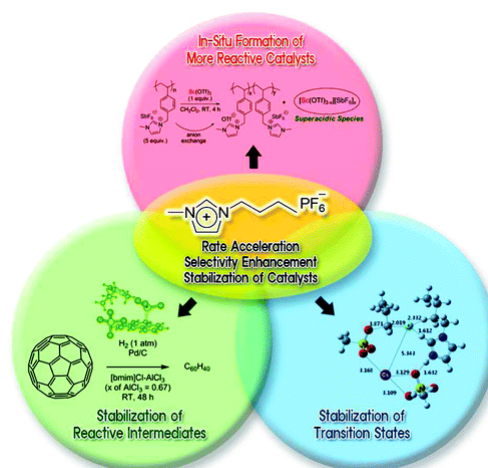
changes in a protein's structure affect its conductivity. Such an approach could minimize the need for biochemical cascades in systems such as enzyme-based circuits, which transduce the protein's response to electronic current. In addition, as precision and sensitivity of solid-state measurements increase, and as knowledge of the structure and function of "dry" proteins grows, electronic conductivity may become an additional approach to study electron transfer in proteins and solvent effects without the introduction of donor or acceptor moieties.

We are particularly interested in whether evolution might have prompted the electronic carrier transport capabilities of proteins for which no electrically active function is known in their native biological environment and anticipate that further research may help address this fascinating question.

- Toward Understanding the Origin of Positive Effects of Ionic Liquids on Catalysis: Formation of More Reactive Catalysts and Stabilization of Reactive Intermediates and Transition States in Ionic Liquids

Lee, J. W.; Shin, J. Y.; Chun, Y. S.; Jang, H. B.; Song, C. E.; Lee, S. *Acc. Chem. Res.* **2010**, *43*, 985–994.

Abstract:



Over the past decade, ionic liquids have received a great deal of attention as a new means for catalyst immobilization. Large numbers of catalysts having polar or ionic character have been successfully immobilized in ionic liquids, thus allowing their recovery and recycling. However, catalyst immobilization is not the only benefit of ionic liquids in catalysis, of greater importance are the positive effects of ionic liquids on catalytic rates. In this Account, we highlight our work in elucidating the origin of the accelerating effects of ionic liquids in a range of catalytic reactions.

Lewis acidic metal triflates often become much more reactive in ionic liquids containing noncoordinating anions as a result of "anion exchange." Consequently, the more electrophilic Lewis acidic species generated in situ accelerate the catalytic reactions dramatically. In some cases, highly reactive intermediates, such as vinyl cations, arenium cations, oxygen radical anions, and so forth, can be stabilized in the presence of ionic liquids, thus increasing the reactivity and selectivity of the reactions.

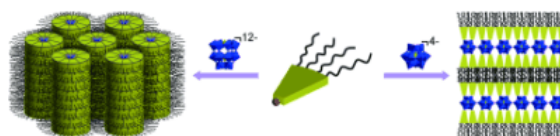
Concerted processes such as S_N2 and Diels–Alder reactions can also be accelerated through the cooperative activation of both the nucleophile and the electrophile by ionic liquids. In transition metal-catalyzed reactions, certain catalytically active oxidation states can be stabilized in ionic liquids against deactivation to catalytically inactive species. Thus it is clear that gaining an understanding of

the origin of these “positive ionic liquid effects” is highly important, not only for predicting the effects of ionic liquids on other organic reactions but also for designing new catalytic reactions.

Ionic liquids, by virtue of (typically) having a synthetically accessible carbon backbone, are amenable to tailoring by the organic chemist. Accordingly, their molecular structures can be subtly varied to give “tunable” properties, which can then be used to rationally examine the fundamental reasons that they accelerate catalyzed reactions. Although the origins of enhanced catalytic rates by ionic liquids have been elucidated in many areas, other undiscovered ionic liquid phenomena remain to be unearthed. Developing a better understanding of these modularly tunable liquid salts will foster new discoveries of catalytic reactions that are accelerated by ionic liquids as solvents or additives.

- Self-Assembly and Structural Evolvement of Polyoxometalate-Anchored Dendron Complexes
Yang, Y.; Wang, Y.; Li, H.; Li, W.; Wu, L. *Chem. Eur. J.* **2010**, *16*, 8062-8071.

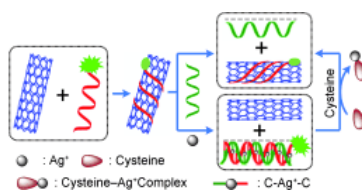
Abstract:



A cationic dendritic molecule that has alkyl chains has been synthesized and employed to encapsulate anionic polyoxometalates through electrostatic interactions. The prepared surfactant-encapsulated polyoxometalate (SEP) complexes were used as building blocks to fabricate self-assemblies in solution and the solid state. Monodispersion, lamellar, and columnar assemblies of SEP complexes have been characterized in detail. With increasing the number of peripheral cationic dendrons on inorganic clusters, the SEPs undergo changes from globular assemblies to monodispersions in solution and from lamellar assemblies to hexagonal columnar structures in the solid state, depending on the amounts of cationic dendrons in the complexes. The structural evolvement was simulated through consideration of the size and shape of the cationic dendron and polyanionic clusters, and the experimental results are in good agreement with the interpretation of the simulations. The present research demonstrates a new kind of dendritic complex and provides a route for controlling their assembling states by simply alternating the number of cationic dendrons in the complexes.

- A Reusable DNA Single-Walled Carbon-Nanotube-Based Fluorescent Sensor for Highly Sensitive and Selective Detection of Ag^+ and Cysteine in Aqueous Solutions
Zhao, C.; Qu, K.; Song, Y.; Xu, C.; Ren, J.; Qu, X. *Chem. Eur. J.* **2010**, *16*, 8147-8154.

Abstract:



Here we report a reusable DNA single-walled carbon nanotube (SWNT)-based fluorescent sensor for highly sensitive and selective detection of Ag^+ and cysteine (Cys) in aqueous solution. SWNTs can

effectively quench the fluorescence of dye-labeled single-stranded DNA due to their strong π - π stacking interactions. However, upon incubation with Ag^+ , Ag^+ can induce stable duplex formation mediated by C- Ag^+ -C (C=cytosine) coordination chemistry, which has been further confirmed by DNA melting studies. This weakens the interactions between DNA and SWNTs, and thus activates the sensor fluorescence. On the other hand, because Cys is a strong Ag^+ binder, it can remove Ag^+ from C- Ag^+ -C base pairs and deactivates the sensor fluorescence by rewrapping the dye-labeled oligonucleotides around the SWNT. In this way, the fluorescence signal-on and signal-off of a DNA/SWNT sensor can be used to detect aqueous Ag^+ and Cys, respectively. This sensing platform exhibits high sensitivity and selectivity toward Ag^+ and Cys versus other metal ions and the other 19 natural amino acids, with a limit of detection of 1 nM for Ag^+ and 9.5 nM for Cys. Based on these results, we have constructed a reusable fluorescent sensor by using the covalent-linked SWNT-DNA conjugates according to the same sensing mechanism. There is no report on the use of SWNT-DNA assays for the detection of Ag^+ and Cys. This assay is simple, effective, and reusable, and can in principle be used to detect other metal ions by substituting C-C base pairs with other native or artificial bases that selectively bind to other metal ions.