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## Tetrahedron

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Tetrahedron Symposium-in-Print Number 137

# 2007 Tetrahedron Prize for Creativity in Organic Chemistry Synthetic NanoSystems and NanoMachinery Professor Fraser Stoddart

Guest editor: Professor Richard Taylor

The Chemistry Department, The University of York, Heslington, York, YO10 5DD, UK

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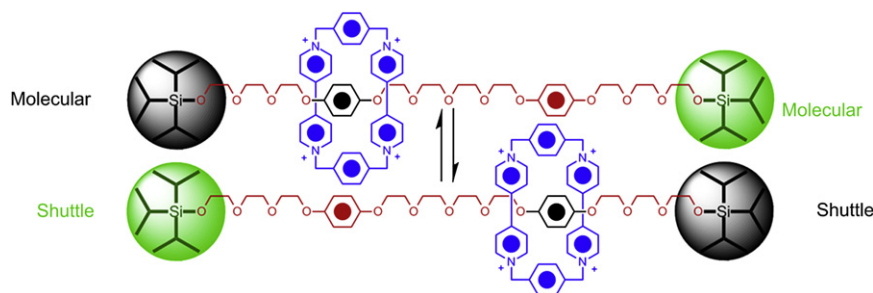
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## ARTICLES

## Big and little Meccano

J. Fraser Stoddart\*, Howard M. Colquhoun

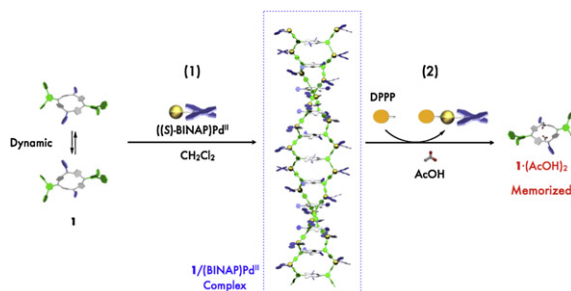
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## Translation of helical chirality from polymer into monomer: supramolecular polymerization of a chirality-memory molecule with an asymmetric Pd(II) complex

pp 8264–8270

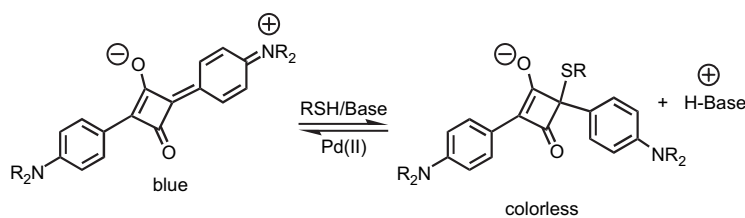
Md. Akhtarul Alam, Akihiko Tsuda, Yoshihisa Sei, Kentaro Yamaguchi, Takuzo Aida\*



**A colorimetric chemodosimeter for Pd(II): a method for detecting residual palladium in cross-coupling reactions**

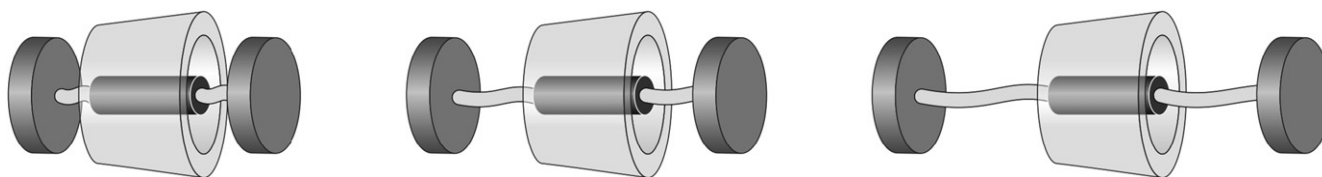
pp 8271–8278

Ronald J. T. Houk, Karl J. Wallace, Himali S. Hewage, Eric V. Anslyn\*

**Rotaxanes with a calix[6]arene wheel and axles of different length. Synthesis, characterization, and photophysical and electrochemical properties**

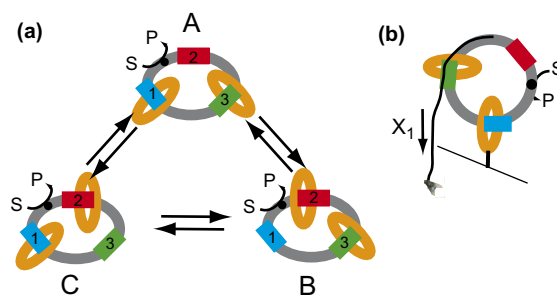
pp 8279–8286

Arturo Arduini\*, Rocco Bussolati, Alberto Credi\*, Andrea Pochini, Andrea Secchi, Serena Silvi, Margherita Venturi\*

**Microscopic reversibility and reciprocal relations for Brownian molecular machines**

pp 8287–8291

R. Dean Astumian

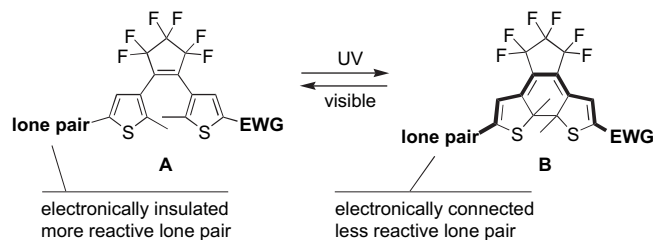


Triangle reaction scheme for a three-ring catenane and topology for using this molecule as a machine.

**Modulating chemical reactivity using a photoresponsive molecular switch**

pp 8292–8300

Hema D. Samachetty, Vincent Lemieux, Neil R. Branda\*



## pp 8301-8306

CN(Cc1ccc[nH]1)Cc2c3ccccc3cc(CN(C)Cc4ccc[nH]4)c5ccccc25

pp 8307-8317

Figure 1 illustrates the synthesis and characterization of the pentamethylcalix[5]arene derivative **1**. The left panel shows a 3D ball-and-stick model of the molecule. The middle panel displays a  $^1\text{H}$  NMR spectrum with a single sharp peak at  $\delta = -3.30$  ppm, indicating a highly symmetric environment. The right panel shows the chemical reaction scheme for the synthesis of **1** from a pentamethylcalix[5]arene derivative using  $\text{CF}_3\text{COOD}$  and  $\text{NEt}_3$ .



## pp 8318–8323

The diagram illustrates a photocatalytic cycle for the reduction of CO<sub>2</sub> to CO and H<sup>+</sup> to H<sub>2</sub>. The cycle involves a cobalt complex (Co(II)) and a photocatalyst. The cobalt complex is shown in its Co(II) state, and the photocatalyst is shown in its excited state. The reaction is driven by light (hν) and the photocatalyst is regenerated by the cobalt complex.



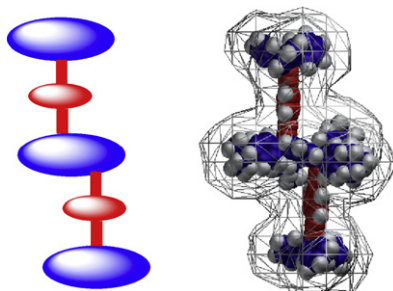
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Chemical structures and phase transition scheme for poly(1,3,5-trisubstituted thiophene)s. The scheme shows the reversible transition between gel and sol states for two polymers: (α) 1o and (β) 1o, and (α) 1c PSS and (β) 1c PSS. The transitions are triggered by UV light (dissociation) and visible light (association). Heating (Δ) and cooling (\*) also influence the transitions. The chemical structures show the polymers with different substituents: phenyl and benzyl for (α) 1o, and phenyl and benzyl for (β) 1o.

**Synthesis and solid-state dynamics of molecular dirotors**

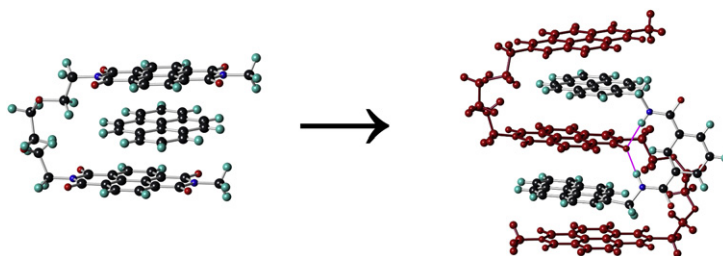
pp 8336–8345

Stephanie L. Gould, Richard B. Rodriguez, Miguel A. Garcia-Garibay\*

**Design, synthesis and computational modelling of aromatic tweezer-molecules as models for chain-folding polymer blends**

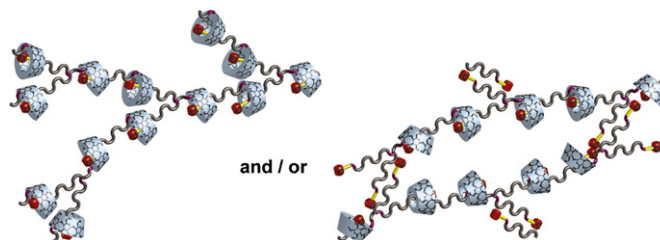
pp 8346–8354

Barnaby W. Greenland, Stefano Burattini, Wayne Hayes\*, Howard M. Colquhoun\*

**Branched supramolecular polymers formed by bifunctional cyclodextrin derivatives**

pp 8355–8361

Atsuhisa Miyawaki, Yoshinori Takashima, Hiroyasu Yamaguchi, Akira Harada\*

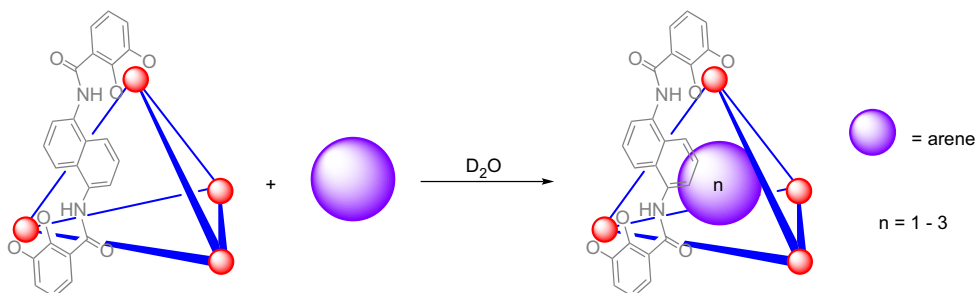


Monofunctional and bifunctional  $\alpha$ -cyclodextrin ( $\alpha$ -CD) derivatives were prepared to form a new supramolecular complex. The mixture was found to form highly viscous solutions.

**Simultaneously bound guests and chiral recognition: a chiral self-assembled supramolecular host encapsulates hydrophobic guests**

pp 8362–8367

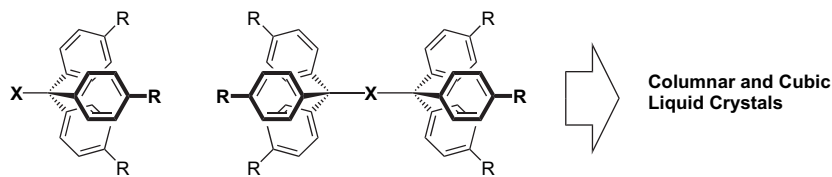
Courtney J. Hastings, Michael D. Pluth, Shannon M. Biros, Robert G. Bergman\*, Kenneth N. Raymond\*



**Nanostructured columnar and cubic liquid-crystalline assemblies consisting of unconventional rigid mesogens based on triphenylmethanes**

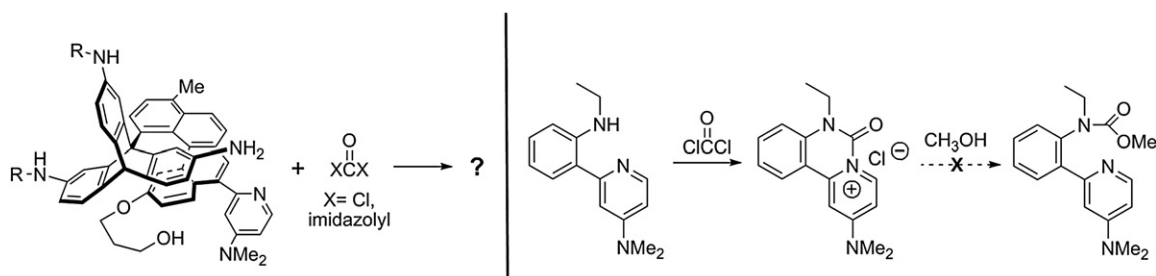
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Tsukasa Hatano, Takashi Kato\*

**Troubleshooting a molecular motor: a remarkably stable *N*-acyl pyridinium salt**

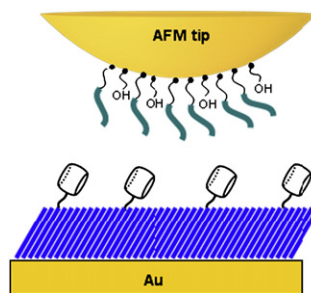
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Michael D. Markey, T. Ross Kelly\*

**Direct force measurement between cucurbit[6]uril and spermine using atomic force microscopy**

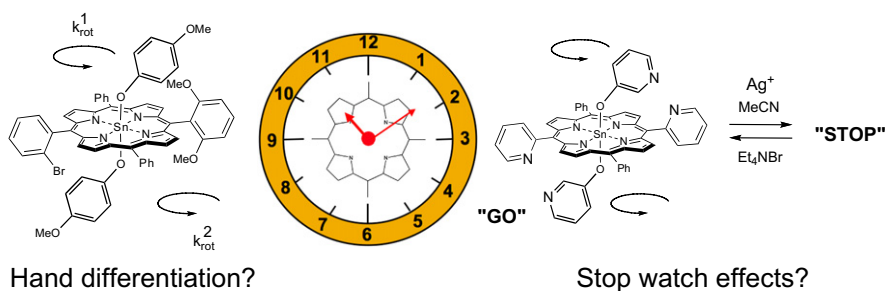
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**Investigations of rotamers in diaxial Sn(IV)porphyrin phenolates—towards a molecular timepiece**

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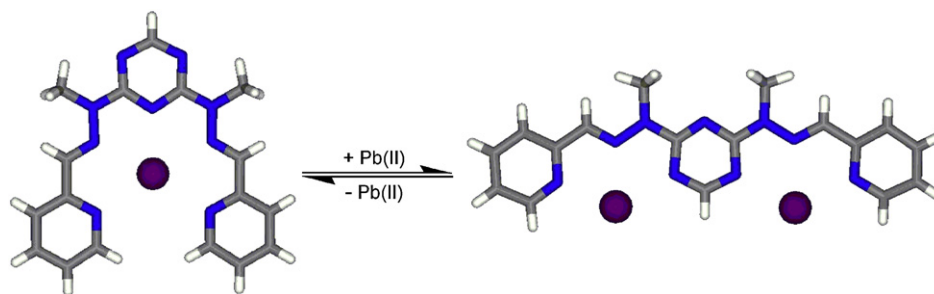
Sheshanath V. Bhosale, Connie Chong, Craig Forsyth, Steven J. Langford\*, Clint P. Woodward



**Coordinative, conformational and motional behaviour of triazine-based ligand strands on binding of Pb(II) cations**

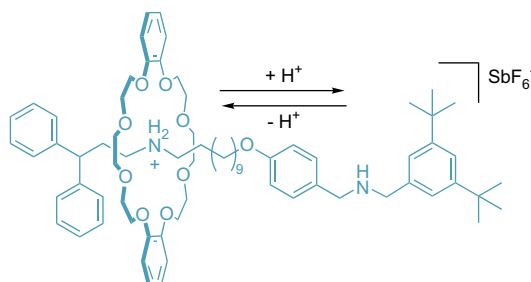
pp 8402–8410

Juan Ramírez, Adrian-Mihail Stadler, Lydia Brelot, Jean-Marie Lehn\*

**An ammonium/bis-ammonium switchable molecular shuttle**

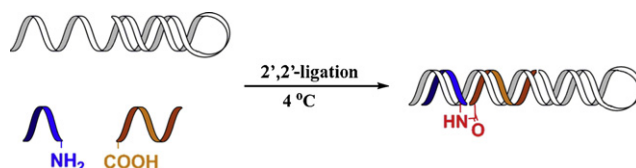
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David A. Leigh\*, Andrew R. Thomson

**2',2'-Ligation demonstrates the thermal dependence of DNA-directed positional control**

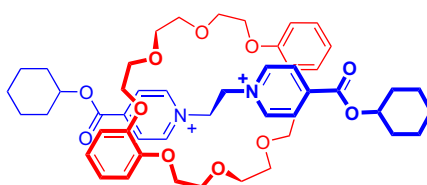
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Yu Liu, Ruojie Sha, Risheng Wang, Liang Ding, James W. Canary\*, Nadrian C. Seeman\*

**Characterization of a slippage stopper for the 1,2-bis(pyridinium)ethane–[24]crown-8 ether [2]pseudorotaxane motif**

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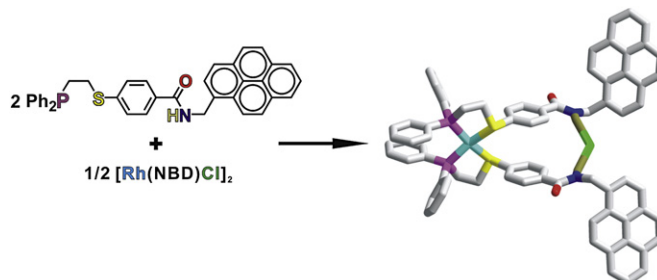
Michael A. Bolla, Jorge Tiburcio, Stephen J. Loeb\*



### Pyrene-appended fluorescent tweezers generated via the Weak-Link Approach and their halide recognition properties

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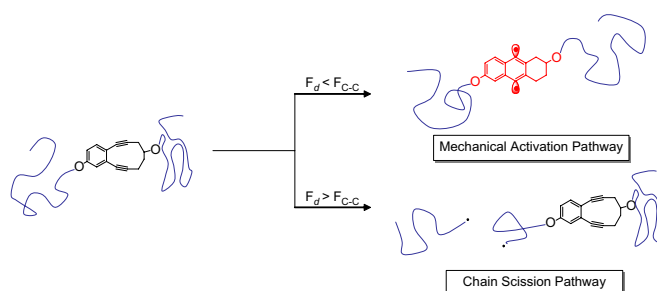
You-Moon Jeon, Dongwoo Kim, Chad A. Mirkin\*, James A. Golen, Arnold L. Rheingold



### Preparation of enediyne-crosslinked networks and their reactivity under thermal and mechanical conditions

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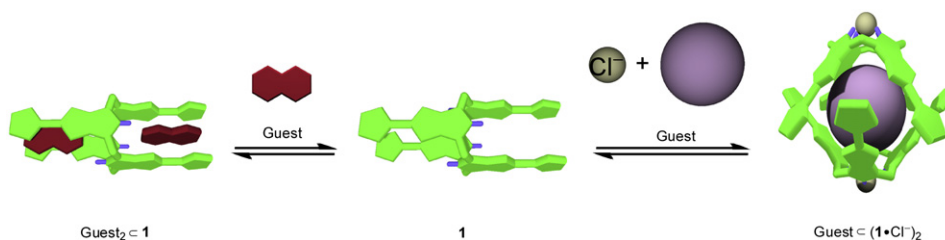
Charles R. Hickenboth, Joseph D. Rule, Jeffrey S. Moore\*



### Binding studies of tetrathiafulvalene-calix[4]pyrroles with electron-deficient guests

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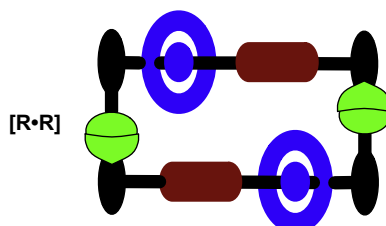
Kent A. Nielsen, Luis Martín-Gomis, Ginka H. Sarova, Lionel Sanguinet, Dustin E. Gross, Fernando Fernández-Lázaro, Paul C. Stein, Eric Levillain, Jonathan L. Sessler\*, Dirk M. Guldi\*, Ángela Sastre-Santos\*, Jan O. Jeppesen\*



### Integrating replication processes with mechanically interlocked molecular architectures

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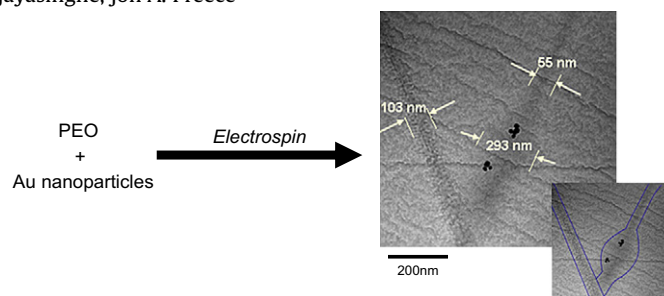
Annick Vidonne, Douglas Philp\*



**Electrospinning nanosuspensions loaded with passivated Au nanoparticles**

pp 8476–8483

Christopher A.E. Hamlett, Suwan N. Jayasinghe, Jon A. Preece\*

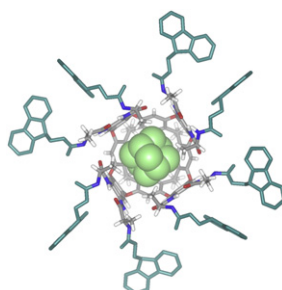


Electrospinning was used to fabricate PEO/Au nanoparticle composite nanofibres. The fibres were characterised by AFM, optical microscopy, TEM and DSC to investigate the morphology and crystallinity of the fibres.

**Deepened chiral cavitands**

pp 8484–8487

Enrique Mann, Julius Rebek, Jr.\*

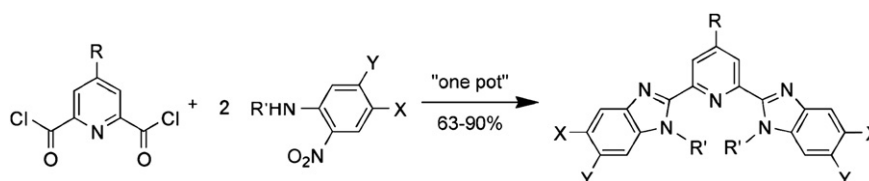


The synthesis and binding properties in solution of a new family of deep, chiral cavitands are described. The directionality of the hydrogen bond array on cavitant's upper rim is controlled by the presence of appropriately positioned asymmetric centers, creating a chiral hydrophobic pocket.

**Improved synthesis of functionalized mesogenic 2,6-bisbenzimidazolylpyridine ligands**

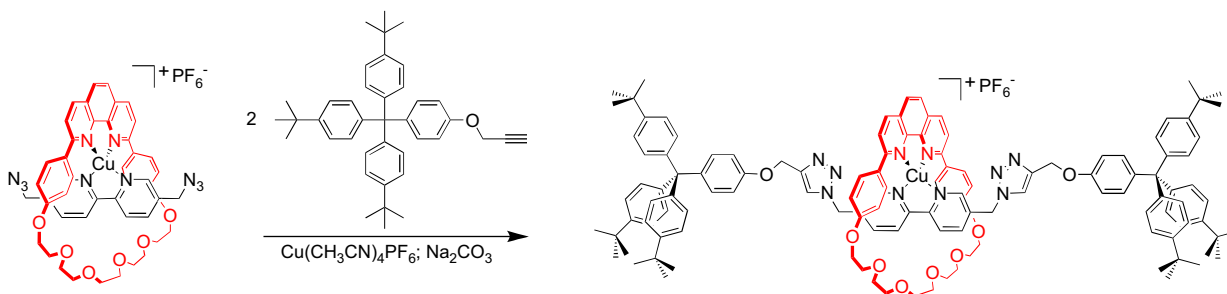
pp 8488–8495

Blayne M. McKenzie, Adriane K. Miller, Rudy J. Wojtecki, J. Casey Johnson, Kelly A. Burke, Karis A. Tzeng, Patrick T. Mather, Stuart J. Rowan\*

**Synthesis of new copper(I)-complexed rotaxanes via click chemistry**

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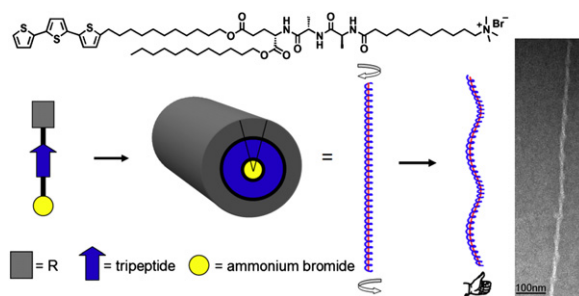
Stéphanie Durot, Pierre Mobian, Jean-Paul Collin, Jean-Pierre Sauvage\*



**Self-assembly of amphiphiles with terthiophene and tripeptide segments into helical nanostructures**

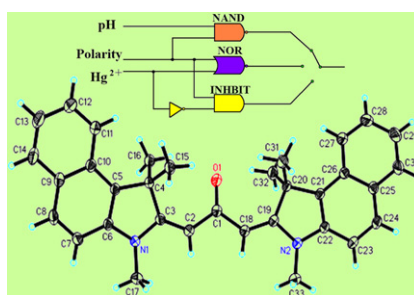
pp 8504–8514

Wei-Wen Tsai, Liang-shi Li, Honggang Cui, Hongzhou Jiang, Samuel I. Stupp\*

**An efficient multiple-mode molecular logic system for pH, solvent polarity, and  $\text{Hg}^{2+}$  ions**

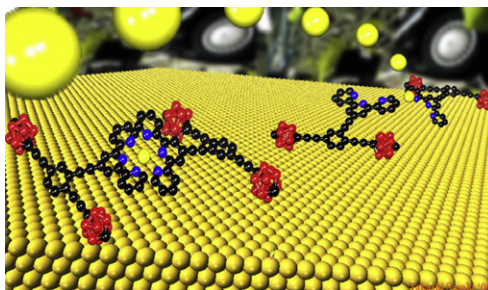
pp 8515–8521

Dong Zhang, Jianhua Su, Xiang Ma, He Tian\*

**The assembly line: self-assembling nanocars**

pp 8522–8529

Takashi Sasaki, Jason M. Guerrero, James M. Tour\*

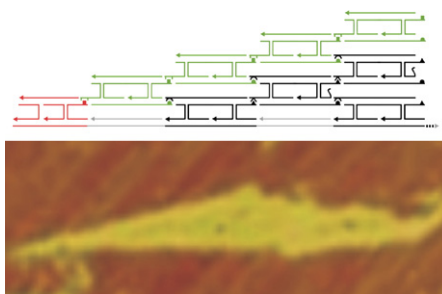


We report here the synthesis of two nanocars by a process resembling an assembly line.

**Templated self-assembly of wedge-shaped DNA arrays**

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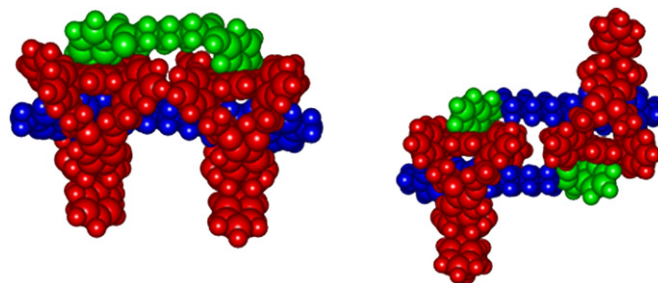
Daniel Lubrich, Jonathan Bath, Andrew J. Turberfield\*



**Construction of supramolecular multi-component assemblies by using allosteric interactions**

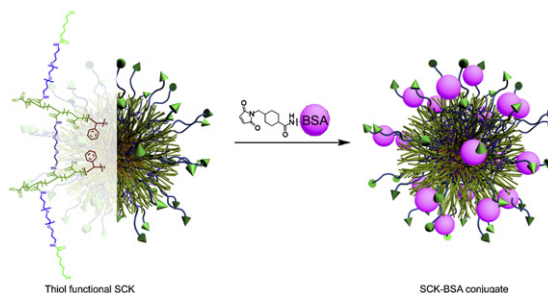
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Nico Veling, Paul J. Thomassen, Pall Thordarson, Johannes A.A.W. Elemans, Roeland J.M. Nolte\*, Alan E. Rowan\*

**Thiol-functionalized shell crosslinked knedel-like (SCK) nanoparticles: a versatile entry for their conjugation with biomacromolecules**

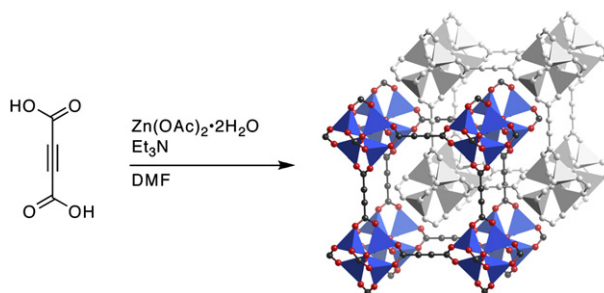
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Andreas M. Nyström, Karen L. Wooley\*

**Room temperature synthesis of metal-organic frameworks: MOF-5, MOF-74, MOF-177, MOF-199, and IRMOF-0**

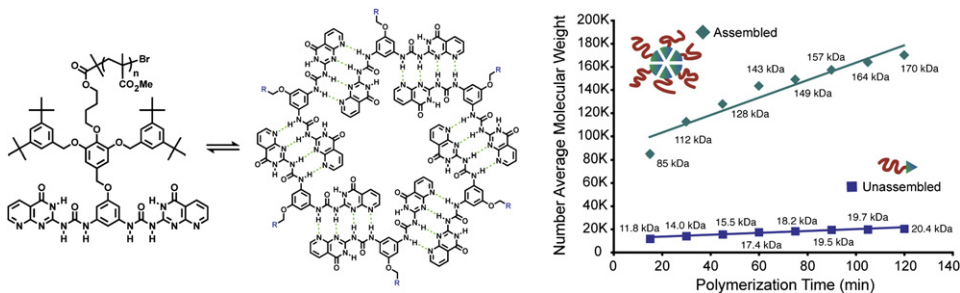
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David J. Tranchemontagne, Joseph R. Hunt, Omar M. Yaghi\*

**Bis-ureidodeazapterin (Bis-DeAP) as a general route to supramolecular star polymers**

pp 8558–8570

Eric M. Todd, Steven C. Zimmerman\*



**OTHER CONTENT****Calendar****p I**

\*Corresponding author

 Supplementary data available via ScienceDirect**COVER**

The subtle interplay between covalent, noncovalent and mechanical bond formation in the template-directed synthesis of a [2]catenane is reminiscent of the metal struts, nut and bolts that are used in Meccano to build a car. Exquisite order emerges out of a toolbox of bits and pieces that are made to measure in a highly programmed manner.

Cover figure designed by Fraser Stoddart

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