Dear Soft Matter Colleagues,

Thank you for another great year at SoftMatterWorld.org! This month’s newsletter brings you two new research articles and a short piece regarding the Calendar Competition and when you can expect to hear the results! We are closing this year’s newsletter with a comprehensive list of upcoming conference deadlines up until February 2014 and a job listing at the University of California, Merced - home of softmatterworld.org!

Torsional Mechanical Responses in Azobenzene Functionalized Liquid Crystalline Polymer Networks


Soft materials can offer an alternative to hard materials in actuation applications. Organisms use soft biological materials as actuators in systems ranging from sensing to flexing wings. Soft materials are easy to deform, offer large shape deformation, and can be made to respond to light signals. Recent research into such materials has focused on liquid crystal polymer networks, or LCNs, which generate large strain responses.

Researchers collaborating at Patterson Air Force Research Laboratory, Ohio have examined planar and torsional responses of azobenzene functionalized liquid crystal polymer networks (azo-LCNs) in the twisted-nematic and hybrid geometries (figure 1A). The twisted-nematic has a rotation in molecular alignment of 90 degrees in the plane of the substrates, while the hybrid alignment rotates the same amount from planar to homeotropic (perpendicular to substrate surface). These cantilevers held their respective geometries after photopolymerization.

The 6mm x 0.5mm x 8 µm cantilevers, as seen in figure 3, bent according to their geometries. The magnitude of the bend was controlled by the light intensity. When the nematic director on the exposed surface paralleled the long axis of the cantilever structure, the cantilever bent towards the light source. The opposite occurred when the nematic director in the facing surface was orthogonal to the long axis of the cantilever. This difference in behavior is explained by contraction or extension of the irradiated surface as induced by trans-cis-trans reorientation.

If the nematic director was offset from the principal axes, the cantilevers cork-screwed, twisting in addition to bending. Such in-plane bending and out-of-plane twisting was observed in both the nematic-twisted and hybrid geometries.

Using light to activate these LCN cantilevers can allow for remote manipulation and demonstrating the factors involved in how the cantilevers bend allows for control over their behavior. Potential applications include using such materials as photo-addressable actuators in robotics.

The article was featured on the cover of Soft Matter, Issue #39 (see this month’s marquee image). Visit RSC Publishing to read more or download a full version.

-Michael Lane
3D Soft Materials With Negative Poisson Ratio

Recently, many 3D metamaterial designs have been found where when uniaxial pressure is applied, buckling occurs in the transverse direction as opposed to outward expansion. Materials that exhibit this buckling are said to have a negative poisson ratio (Fig 2), which has been observed only in 2D designs and 3D designs with limited straining. Recently, The Harvard University School of Engineering and Applied Sciences, with Katia Bertoldi and her team, conducted multiple computational designs for “Bucklicrystals”, short for buckling crystals, that all exhibit a negative poisson ratio.

All three designs tested experimentally employed building blocks which were comprised of a soft silicone-based rubber, vinyl polysiloxane. Building blocks were either made with 6, 12 or 24 holes and all were spherical in shape and about 20mm in diameter. A larger model was constructed using a single type of these building blocks in particular patterns of either cubic, body-centered cubic or face-centered cubic structures. Each of the Bucklicrystal designs were put under uniaxial pressures of varying severity. The poisson ratio, transverse strain and normalized stress were all calculated for each possible combination of hole numbers and pattern.

All combinations resulted in a negative poisson ratio, meaning all designs tested were viable and all structure changes were completely reversible. However some designs, such as the 24 holed face centered cubic, continued to buckle at extended pressure strength although it had the lowest normalized stress. These soft Bucklicrystals may have applications in protective energy absorbing materials, such as in bomb blast suits and vehicle lining for collisions.

The full article, featured in Advanced Materials, can be found at the Wiley Online Library.

-Marcus Rice

Assistant Professor Position at University of California, Merced

EXPERIMENTAL SOFT CONDENSED MATTER & BIOPHYSICS

The School of Natural Sciences at UC Merced invites applications for one new faculty position in Experimental Soft Condensed Matter/Biophysics starting July 1, 2014 at the rank of Assistant Professor (tenure-track). They are seeking exceptionally qualified candidates with expertise in areas including but not limited to: complex fluids, liquid crystals, self-assembly in soft materials, granular materials, biomaterials and biopolymers, biomimetic materials, cytoskeletal mechanics/dynamics, membranes, protein structure, biophotonics, single molecule biophysics, cell migration, mechanosensing, multicellular, bacterial and tissue-level systems.

Special consideration will be given to applicants who participate in interdisciplinary research, and who will complement our existing Physics faculty.

Interested applicants can read more about the posting via the UC Merced website.
UPCOMING DEADLINES

- OIST Workshop: Dynamics at Interfaces
  APPLICATION DEADLINE - JANUARY 2014
- Functional Polymeric Materials
  POSTER SUBMISSION – 10 DEC 13
  LAST CHANCE – 13 DEC 13
- Biological and Pharmaceutical Complex Fluids II:
  Novel Trends in Characterizing Interactions, Microstructure and Rheology
  ORAL ABSTRACTS SUBMISSION DEADLINE: FEBRUARY 14TH, 2014
  POSTER ABSTRACTS SUBMISSION DEADLINE: MAY 15TH, 2014
- Surface Design and Engineering
  ABSTRACT SUBMISSION DEADLINE – 7TH FEBRUARY 2014
- XXXIII Dynamics Days US
  DEADLINE FOR REGISTRATION – DECEMBER 18, 2013
- Physics of Soft and Biological Matter
  ABSTRACT SUBMISSION – JANUARY 20TH 2014
- 45th IFF Spring School: Computing Solids: Models, Ab-initio Methods and Supercomputing
  ABSTRACT SUBMISSION DEADLINE – 1 FEBRUARY 2014
- Liquids 2014: 9th Liquid Matter Conference
  ABSTRACT SUBMISSION – JAN 31 2014
  EARLY BIRD REGISTRATION – APRIL 1 2014
- Advances in Microfluidics and Nanofluidics 2014
  ABSTRACT SUBMISSION – 31 JAN 2014
- Advanced School in Soft Condensed Matter ‘Solutions in the Spring’
  APPLICATION DEADLINE: 17 JANUARY 2014
- MoSim 2014 | Down Under
  REGISTRATION Closes – JANUARY 20TH, 2014
- NIBB 2014 "Neutrons in Biology and Biotechnology"
  ABSTRACT SUBMISSION – JANUARY 10TH
  REGISTRATION DEADLINE – JANUARY 31ST
- PP ‘2014’ | The 11th International Symposium on Polymer Physics
  REGISTRATION DEADLINE – DECEMBER 20TH, 2013
- The 7th International Conference on Times of Polymers & Composites
  EARLY BIRD REGISTRATION – FEBRUARY 3RD, 2014
- The 6th Pacific Rim Conference on Rheology
  ABSTRACT SUBMISSION DEADLINE – DECEMBER 6TH, 2013
- 2nd International Conference on BioTribology
  ABSTRACT SUBMISSION – DECEMBER 13TH, 2013

2014 SoftMatterWorld Calendar

December 1st marked the end of image submissions for the 2014 calendar competition. Thank you for your submissions and effort in spreading the word! We now face the challenge of selecting the top 12 images which will be featured in the 2014 Soft Matter World Calendar. The winners will be notified by the second week of December and officially announced in the January 2014 Newsletter.

If you have submitted an image, and have not yet received a notification email acknowledging your submission, please send an email to:

AOSSOWSKI@SOFTMATTERWORLD.ORG