Soft Matter World Newsletter

February | 2012 | Issue 38

Dear Soft Matter Colleagues,

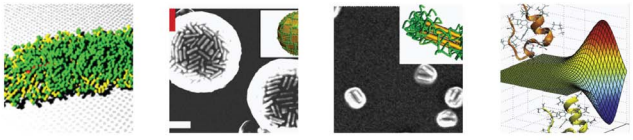
Welcome to our February newsletter. Soft Matter World is now on Facebook! Click here to follow us and "Like" our page. This month we are featuring the group of Dr. Rubinstein at the University of North Carolina at Chapel Hill, a study on self-assembly through chiral control of interfacial tension, and research on fabricating and patterning nanostructured materials with X-rays. Have a pleasant read and a great February.

Dr. Michael Rubinstein's Polymer Physics Group

Dr. Michael Rubinstein's group carries out research in polymer physics with applications to other soft matter & biological systems. The approach is based upon building and solving simple molecular models of complex systems with the goal of understanding properties of these systems, performing computer simulations to bridge between analytical models and experiments, and collaborating with experimentalists to test the predictions of these models.

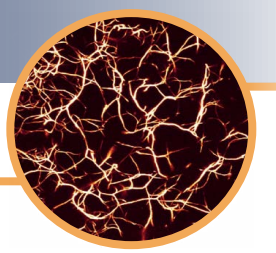
Current research in the group focuses on self-healing materials, intramolecular tension, viscoelasticity of entangled polymer networks and liquids, confined polymers, friction between charged brushes, particle dynamics in complex media, and self-assembly of syntactomers. Recently the group has initiated an experimental project on physical properties of the airway surface layer in lungs, focused on interactions between pericellular coat and overlaying biological gel.

Currently the group has ten members, including 2 postdoctoral scholars, 5 graduate students, and 2 undergraduate students and actively collaborates with researchers in the United States, Canada, Russian, France, China, England, Germany, and Greece. The group is a part of a number of local, national, and international research centers including Triangle Materials Research Science and Engineering Center, NSF Materials Interdisciplinary Science Team on Stressed Polymers, Advanced Energy Consortium, and Dynamics of Architecturally Complex Polymers Network. The group started the annual Triangle Soft Matter Workshop, runs the North American Soft Mater web site, and helped organize 2011 KITP program on Biological Frontiers of Polymers and Soft Matter Physics, and 2012 Boulder Summer School on Polymers in Soft and Biological Matter.



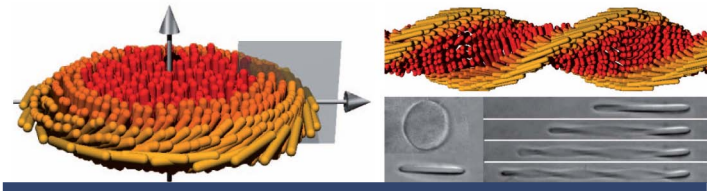
"Polymer physics is the basis for understanding self-assembly of nanostructures, properties of polymers in bulk and at surfaces, and biological systems."

Dr. Rubinstein received 2010 American Physical Society Polymer Physics Prize and Kodak C.E.K. Mees Award. Together with his co-author Dr. Colby he has written "Polymer Physics" textbook used in hundreds of universities wrld-wide. Dr. Rubinstein was awarded 2012 Michelin Materials Science Chair and was Joliot Curie Visiting Professor at ESPCI as well as visiting professor at College de France. He published 127 articles that average over 59 citations per article with Hirsch Index of 50. Read more on their website.



Reconfigurable Self-Assembly Through Chiral Control of Interfacial Tension

Zvonimir Dogic et al. Nature, 2012, January 4, 2012. DOI: 110.1038/nature10769



▲ Chirality affects the line tension of a membrane. A 2D disc self assembles into 1D ribbons.

A team of biologists and physicists from Brandeis University in Massachusetts has investigated how microscopic structure influences liquid crystal chirality. Using a viral suspension of wild-type and Tyr21Met fd phages and a series of microscopy and thermal measurements, the researchers demonstrated that molecular chirality can control interfacial tension. Chiral control of interfacial tension drives the formation of many polymorphic assemblages found in nature. DIC imaging of thermal fluctuations on the edge of an achiral mixture reveal that the edge adopts a surface-tension minimizing profile. Line tension is a function of temperature and the solution concentration, as temperature decreases so does the line tension and the 2D membrane transitions into a 1D twisted ribbon. In the ribbon phase, fd viruses condense into metastable, self- limited disks and form 1D twisted ribbons over a period of time.

A point mutation in the virus coat protein is also used to alter ribbon chirality. Chirality of the constituent molecules can be used to tune the line tension associated with the exposed edge of a colloidal monolayer membrane, thereby controlling the self- assembly of the membranes. Analyzing the relationship between surface tension and chirality can explain many natural phenomena and enable controlled self-assembly of liquid crystal structures. Read more in Nature.

Hard X-rays Meet Soft Matter: When Bottom-Up and Top-Down Get Along Well:

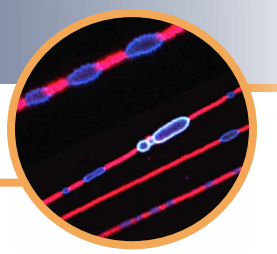
Plinio Innocenzi, Luca Malfatti, and Paolo Falcaro. Soft Matter, 2012, Advance Article. DOI: 10.1039/c2sm07028f

Researchers from Universita di Sassari in Aleghero, Italy and CSIRO in Clayton South, Australia examined deep x-ray lithography as a means to fabricate and pattern functional nanostructured materials. The lithography process can now be applied at the nanoscale by patterning soft materials with DXRL.

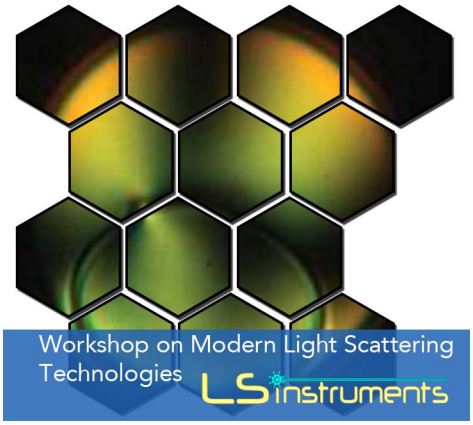
The capability of x-rays to generate free radicals when interacting with soft uncondensed matter can be used as a writing tool to pattern and locally modify functional properties. When a soft material is used as a resist, DXRL can fabricate patterns and simultaneously induce controlled molecular changes. These changes can be: the crosslinking of a silica network on mesoporous films with the simultaneous removal of the templating agent, the crosslink of hybrid or porous ceramic network and the growth of metal nanoparticles, the production of nanoperforated thin ceramic layers, the selective decomposition of functional thin and monolayers, or the selective decomposition of functional molecules in a thick hybrid or ceramic film.

▲ The combined approach of bottom-up and top-down routes allows direct soft matter patterning and fabrication of devices using faster and more versatile protocols.

This novel approach enables the fabrication of functional nanomaterials with the minimum number of steps. Read more in Soft Matter.



LS Instruments Presents: Workshop on Modern Light Scattering Technologies



The next workshop on Modern Light Scattering Technologies will be held at the Georgia Institute of Technology in Atlanta on the 23rd and 24th of May, 2012.

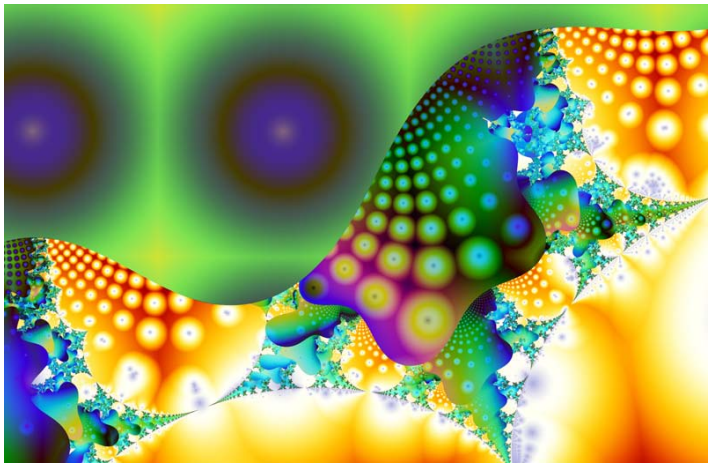
Any registration before the 30th of March 2012 will receive a discount of $120. The workshop is strictly limited to 20 participants.

The course offers a unique combination of introductory lectures on light scattering and optical microrheology with the possibility to gain hands on experience using the latest laboratory equipment in the field of Dynamic Light Scattering (DLS), Static Light Scattering (SLS) and Diffusing Wave Spectroscopy (DWS). View the list of lecturers and download the registration form on the website.

Boulder School for Condensed Matter and Materials Physics: Polymers in Soft and Biological Matter

The Boulder School for Condensed Matter and Materials Physics will take place from July 9 to August 3, 2012. Sixteen lecturers and speakers are anticipated for this school focused on polymers in soft and biological matter.

The Boulder Summer School in Condensed Matter and Materials Physics has been established to provide education for advanced graduate students and postdocs working in condensed matter physics, materials science and related fields. The goal is to enable students to work at the frontiers of science and technology by providing expert training not easily available



within the traditional system of graduate education and postdoctoral apprenticeship. The deadline for electronic applications for the school is February 27, 2012.

Register and read more on the website.

We hope you enjoy browsing softmatterworld.org and come back soon

Linda S. Hirst, Adam Ossowski and Dmitri Medvedko

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