Soft Matter World Newsletter

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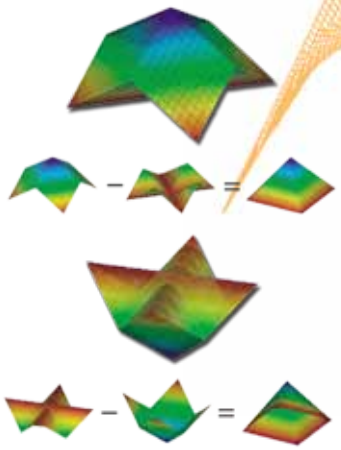
Dear Soft Matter Colleagues,

We have some great features this month; a new group from Hong Kong and a fascinating article about elastic wire packing. Also two of the years best annual soft matter conferences; JSMD and MRS Fall meeting have abstract submission closing this month!

Yilong Han Group at the Hong Kong University of Science and Technology

The Yilong Han group is based at the Hong Kong University of Science and Technology. They are comprised of Prof. Yilong Han, the principal investigator; a postdoc, Zheng Zhongyu, three Ph.D students, Wang Zi-Ren, Peng Yi, and Wang Feng; and a technician, Chan Man-Ki. Together they focus on the microscopic structures, interactions, dynamics, pattern formation and phase behaviors of colloids such as micro-ellipsoids and diameter-tunable microgel spheres.

Han believes colloids to be good model systems of atoms because trajectories of individual particles are measurable by video microscopy and image processing. Currently they are specifically focusing on the melting, freezing and geometrical frustrations of colloids in two dimensions (single layer systems), three dimensions and in thin films. In the realm of statistical physics, they have been applying the complex-network analysis to phase-space studies, and discovered that the phase spaces of some frustration spin models and lattice gas models belong to a new class of network with unique topology. They are also interested in configurational temperatures and Brownian motions. Some of their most recent projects and publications include:

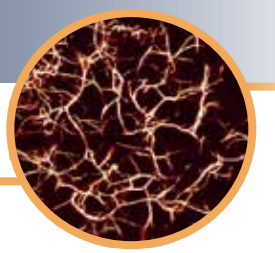


▲ The 3D shape of a full stack, including a lid and a container. The height difference between the lid and the container is a pyramid. Upside-down geometries of the lid emerges from the maximum packing in the container. This picture was featured in Kaleidoscope.

Melting of Colloidal Crystal Films: An investigation on the melting mechanisms in single and polycrystalline colloidal films composed of diameter-tunable microgel spheres with short-ranged repulsive interactions and confined between two glass walls. Thick films (>4 layers), thin-films (≤4 layers), and monolayers exhibit different melting behaviors. To read more visit the publisher site: Physical Review E.

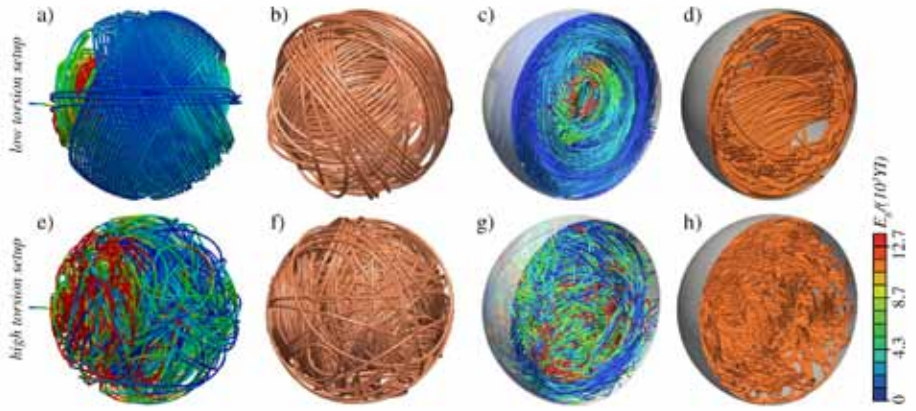
Phase-space networks of the six-vertex model under different boundary conditions: The six-vertex model is mapped to three-dimensional sphere stacks and different boundary conditions corresponding to different containers. The network analysis shows that the phase spaces of systems with different boundary conditions share some common features. They derived formulas for the number and the sizes of the disconnected phase-space subnetworks under the periodic boundary conditions. The sphere stacking provides new challenges in combinatorics and may cast light on some two-dimensional models. An image from this article was featured in the PRE Kaleidoscope images.

You can read more about the group at their website.



Packing of Elastic Wires in Spherical Cavities

N. Stoop, J. Najafi, F. K. Wittel, M. Habibi, and H. J. Herrmann. PRL 106, 214102 (2011). DOI: 10.1103/PhysRevLett.106.214102



▲ Morphologies of wires packed into spherical cavities. Top row: The low torsion setup results in an ordered morphology, characterized by ringlike coiling (a). A cut through the packing (c) reveils the shell-like inner structure. X-ray tomography scans from experimental realizations are shown in (b, d). Bottom row: The high torsion setup produces disordered structures (e, g), with corresponding experiments in (f,h). Color represents the bending energy Eb.

The packing of thin objects is a ubiquitous process in both nature and technology. When driven by outside forces they can undergo complex spatial rearrangements and structures. Some of the pertinent examples laid forth in the paper include the folding of insect wings in insect cocoons, crumpled wires or paper and the packing of DNA in viral capsids.

In this article researchers developed a method to investigate the packing dynamics of elastic wire in spherical cavities. The container consisted of a hollow rigid sphere with a small hole to which a nozzle is attached. Nylon or silicon wire of consistent radius is fed into the spheres with counterspinning spools providing a controlled speed and large forces. The entire process is recorded with a camera and tomography images for numerical analysis of the internal structure.

With the use of pre-curved or straight wires the experiment contained two different setups varying the amount of internal torsion in the system.

The results indicated a significant difference in packing order depending on the torsion. In the low torsion system the wire forms loops which align parallel to each other leading to ringlike structures. In contrast, the high torsion system demonstrated bending deformations and frequent reorientations of loops. They found the highest packing densities in the low torsion system for large cavities and vice versa for the high torsion system.

The research elucidates the importance of torsion in biological and technological systems which employ high density packing regimes.

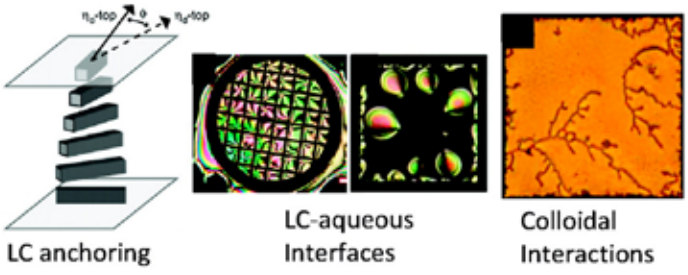
To read more visit PRL.

Recent Advances in Colloidal and Interfacial Phenomena Involving Liquid Crystals

Yiqun Bai and Nicholas L. Abbott. Langmuir, 2011, 27, 5719-5738. DOI: 10.1021/la103301d

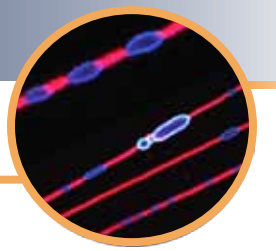
This feature article describes recent advances in several areas of research involving the interfacial ordering of liquid crystals (LCs).

- Ordering of LCs at bio/chemically functionalized surfaces.
- Investigations of the ordering of LCs at interfaces with immiscible isotropic fluids, particularly water.
- The third and final advance addressed involves interactions between colloids mediated by LCs.



Overall, these three topics serve to illustrate the broad opportunities that exist to do fundamental interfacial science and discovery-oriented research involving LCs.

Visit Langmuir at ACS publications to read more.



2011 Materials Research Society (MRS) Fall Meeting

The 2011 MRS Fall Meeting and Exhibit is being held at the end of this year from November 28th to December 2nd in Boston, Massachusetts. The increasingly cross-disciplinary worldwide activity on materials research culminates every year in the MRS Fall Meetings. Symposium organizers from around the world have created a program that addresses leading-edge research and captures the extraordinary progress in materials science and technology, featuring an exciting mix of well-established and popular topics.

The meeting will feature 47 technical symposia, grouped into six broad topics. These topics are:

- General Materials Science
- Energy and the Environment
- Functional Materials
- Nanomaterials
- Biomaterials
- Materials Exploration

Tutorials will be offered in several technical areas to complement these scientific sessions. Poster sessions, an integral feature of the MRS meetings, will be held in the evenings, and the meeting chairs will give awards to the best posters.

The abstract submission deadline for the MRS 2011 Fall Meeting is June 21, which is coming soon! To read more visit the MRS Meetings and Exhibits section of the Materials Research Society (MRS) website here.

Julich Soft Matter Days 2011

The 11th annual Julich Soft Matter Days (JSMD), located by the Gustav-Stresemann-Institut in Bonn, Germany will be held this fall from November 15th through the 18th. Hosted by the Institute of Solid State Research (IFF), the program will consist of lectures from invited speakers, talks, and posters focusing on four topics:

- Biosystems
- Colloids
- Polymers
- Self-Assembly

The deadline for submission of your abstract is coming up soon, on the 17th of June. The final registration deadline for attending the conference is on September 16th.

To learn more, register, or submit an abstract, visit the JSMD conference website.

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

Linda S. Hirst and Adam Ossowski

SoftMatterWorld.org