

WK5: Workshop *In Situ* Rheology, SAXS, and XPCS for the Study of Soft Matter

Organizers: Xiao-Min Lin (NST/ANL), Suresh Narayanan and Alec Sandy (APS/ANL)

Location: Bldg. 446, Conference Room

Soft matter is a class of materials that includes complex fluids such as polymers, liquid crystals, and colloidal suspensions. The presence of hierarchical structures from micrometer to nanometer scales instills in these materials highly unusual structural and dynamical properties, especially when they are deformed and under flow in response to external stress. These studies are typically carried out using separate measurements of macroscopic mechanical properties using rheology and microstructure using SAXS/SANS.

In situ rheology and SAXS measurements offer unique insight into such materials that would otherwise remain unknown. A recent development in this area is the use of time-resolved SAXS and XPCS to study dynamics at the nanoscale while simultaneously measuring rheological properties using a rheometer. This development opens up new avenues where stress relaxation at the nanoscale can be tracked using coherent x-ray speckles and connected to the microstructure and bulk properties.

While there are a handful of *in situ* rheology-SAXS/SANS capabilities across the globe, the APS and CNM now provide unique capabilities at Sector 8-ID to simultaneously study rheology, microstructure, and dynamics in soft materials at a single location. This workshop will bring together a team of experts in these areas of research with the aim of identifying forefront areas of research exploiting these unique capabilities.

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| 9:15—9:30 | Alec Sandy, Suresh Narayanan (Argonne National Laboratory)
<i>Opening Remarks</i> |
| 9:30—10:00 | Ronald Larson (University of Michigan)
<i>Multi-scale Modeling of the Structure and Rheology of Surfactant Solutions and Polymer-Colloidal Networks</i> |
| 10:00—10:30 | Xiao-Min Lin (Argonne National Laboratory)
<i>Unraveling the Role of Order-to-disorder Transition in Dense Colloidal Solution by In Situ Small-angle X-ray Scattering</i> |
| 10:30—10:45 | Break |
| 10:45—11:15 | James Harden (University of Ottawa)
<i>Rheo-XPCS Studies of Shear Induced Rejuvenation, Nano-Plasticity, and Stress Relaxation in Soft Glassy Materials</i> |
| 11:15—11:45 | James Swan (Massachusetts Institute of Technology)
<i>Fast Methods for Simulating the Dynamics of Soft Materials</i> |

11:45—12:15	Matthew Helgeson (University of California Santa Barbara) <i>Toward In Situ Morphology Characterization of Complex Fluids under Arbitrary Processing Flows</i>
12:15—1:30	Lunch
1:30—2:00	Simon Rogers (University of Illinois at Urbana-Champaign) <i>Coupling Large-amplitude Oscillatory Shear Stress Measurements to Microstructure Changes Via In Situ Rheo-Scattering</i>
2:00—2:30	Chris Sorensen (Kansas State University) <i>Studies of Shear Effects on Aggregation and Gelation</i>
2:30—2:45	Break
2:45—3:15	Jacinta Conrad (University of Houston) <i>Transport of Interacting Nanoparticles in Complex Polymeric Fluids</i>
3:15—3:45	Subramanian Ramakrishnan (Florida State University) <i>Universal Scaling of Quench-dependent Dynamics in Intermediate Concentration Colloidal Gels</i>
3:45—4:15	Xiang Cheng (University of Minnesota) <i>From Flocking Birds to Swarming Bacteria: Study of the Dynamics of Active Fluids Using Fast Confocal Rheometry</i>
4:15—4:20	Closing Remarks
4:20	Adjourn