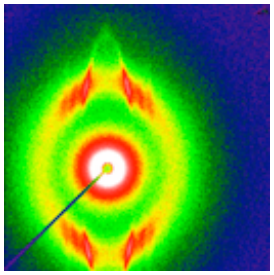

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Keynote 2 - Scattering and microscopy probes in colloidal systems under shear: Linking structure and dynamics with mechanical response

Monday, 10 December 2018 14:50 (40)

The microscopic structure and dynamics in colloidal systems at different length-scales, from single to multiple particle level, are probed under shear by a variety of scattering and direct imaging techniques. We present different studies of hard and soft particle glasses and attractive gels of spherical and rod-like colloids, where we link the mechanical response with the underlying particle dynamics and structure.
Yielding of colloidal glasses under large amplitude oscillatory shear was probed by simultaneous rheometry and light scattering with the LS-echo technique. We studied a range of colloidal systems with varying inter-particle interactions from hard and soft sphere glasses to attractive glasses and gels. LS-echo probes reversible and irreversible rearrangements that are linked with rheological yielding of the system.
Secondly we discuss the mechanisms responsible for a variety of shear induced structures in attractive colloidal gels and their relation to linear and nonlinear rheology. We use a combination of rheological experiments and rheo-confocal measurements with computer simulations. In such thixotropic systems steady and oscillatory shear can be used as an external field to tune the structure and mechanical properties of colloidal gels and drive them in metastable states, not easily accessible at quiescent conditions.
Finally, we present shear induced structural formations gels of attractive rod-like colloids. More specifically we discuss the rheological response and flow induced clustering of silica rods in a density matching solvent, where electrostatic repulsions are screened via the addition of CsCl. A variety of simultaneous imaging techniques and rheometry reveals structural changes at different length-scales. Shear induced log-rolling clusters in the vorticity direction are formed driven by an interplay of hydrodynamic interactions, confinement and a balance of shear and attractive forces. Structural formation is discussed as a function of volume fraction, shear rate, gap size, tool geometry as well as shear history.

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Session Classification : Early afternoon session - Colloids