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(I) Rheo-XPCS studies of yielding, recovery and memory in nanocolloidal soft glasses

Monday 19 June 2023 14:30 (30 minutes)

This talk reviews recent studies of the dynamical and mechanical behaviour of nanocolloidal soft glassy materials using Rheo-XPCS, x-ray photon correlation spectroscopy with in situ rheology [1]. Rheo-XPCS allows for simultaneous studies of the mechanics and nanoscale dynamics of materials over a wide range of timescales from milliseconds to hours. As such, it is an outstanding tool to characterize the behaviour of glassy and other metastable soft systems under the influence of applied stress and strain. I will present several case studies of soft glasses composed of concentrated suspensions of charged silica nanoparticles, demonstrating (i) their stress relaxation and micro-structural dynamics in response to applied step strains below and above the macroscopic yielding transition, (ii) their macro- and micro-structural creep dynamics in response to applied shear stresses, and (iii) their ability to acquire micro-structural and mechanical memory in response to applied oscillatory strain histories. These studies provide insights into the nanoscale origins of non-equilibrium phenomena in driven soft glassy systems.

[1] R.L. Leheny, M.C. Rogers, K. Chen, S. Narayanan, and J.L. Harden, "Rheo-XPCS,"Curr. Opin. Colloid Interface Sci. 20, 261 (2015).

Keyword-1

Rheo-XPCS

Keyword-2

soft glassy materials

Keyword-3

collective dynamics

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