



ESPCI
Laboratoire PMMH
10 rue Vauquelin, 75231 Paris Cedex 05



Séminaire PMMH

Salle de réunion du PMMH, Campus Jussieu, Bâtiment Cassan A, 1^{er} étage

Vendredi 17 septembre 2021, 11h00-12h00

Michel Cloître

ESPCI Paris

Microscopic design of yield stress materials

Soft materials are all around us. They are present in personal and home care products, food, paints and in advanced formulations used for enhanced oil recovery, solid ink printing and additive manufacturing. To develop soft materials with tailored properties, formulators combine functional polymers, colloids, emulsions, and amphiphilic molecules, resulting in a great variability of composition, microstructure, and interactions. Many soft materials are glasses and gels that have in common the capacity to switch from solid-like behavior at rest to liquid-like under mechanical solicitation. A formidable challenge is to design yield stress fluids with tailored rheology in a rational way. In this talk I will present our methodology which is based on two pillars. On one hand, we use chemistry to fabricate polymer-colloid hybrids such as microgels, capsules, micelles, star polymers, with variable softness and tunable interactions, leading to a wide range of viscoelastic moduli and time scales. On the other hand, we exploit concepts from the physics of out-of-equilibrium materials, in particular jamming transition, supercooled glasses, dynamical heterogeneities, and targeted particle scale simulations to bridge the gap between mesoscopic scale properties, local dynamics and macroscopic rheology. This generic framework provides guidelines for designing and engineering yield stress materials with desired properties.