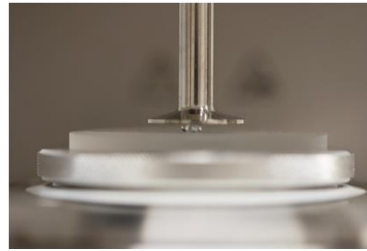
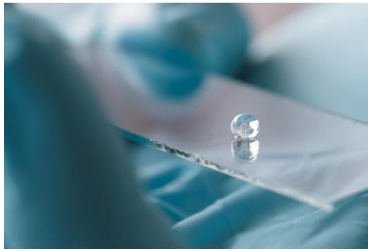


PhD Project

Brittle-to-Ductile Yielding Transition in Colloidal Gels and Glasses



Credit: Mélanie Chaille / CNRS Images

Understanding the response of soft materials under stress is of paramount importance, both fundamentally and in applications. Very often, the mechanical response of the material is dictated by its interactions with surfaces. To overcome this issue and probe the intrinsic properties of materials, we will produce unique spherical beads of gel and glasses of millimetric size. The gels and glasses are based on colloidal particles. The gels consist in a homogeneous porous stress-bearing network structure and the glasses consist in a dense packing of the particles. Our objective is to rationalize the fate of the beads under a mechanical compression, and especially understand how they yield. We want to investigate the complex interplay between the flow of liquid through the pores (the poroelasticity), the plasticity and fracture of the structure. We expect to unveil the physical mechanisms that control whether a bead of gel or glass yields in a brittle or ductile manner.

We will use a multiscale approach that combines mechanical measurements under compression, image analysis, and time- and space-resolved light scattering. We will explore several strategies to produce unique beads of colloidal gels and glasses with tunable toughness and brittleness. We will build an optical set-up to measure with a space and time resolution the microscopic rearrangements of the colloids in the bead during compression. We will measure concomitantly the mechanical response of the bead to the compressive stress and image the overall behavior of the bead.

The work will be performed within the Soft Matter Team (<https://www.softmatter-l2c.fr/>) of the Laboratoire Charles Coulomb in Montpellier, France, under the supervision of Laurence Ramos and Luca Cipelletti, in close collaboration with Christian Ligoure.

Expected starting time: September 2024

We are looking for a motivated candidate with a solid background in condensed matter physics, soft matter or material science.

Please send a CV and a motivation letter to **Laurence Ramos** (laurence.ramos@umontpellier.fr) and **Luca Cipelletti** (luca.cipelletti@umontpellier.fr)

Local context: The Soft Matter team at the Laboratoire Charles Coulomb (L2C)

The Laboratoire Charles Coulomb (L2C, UMR 5221 CNRS and Université Montpellier, south France) is a multidisciplinary physics laboratory based in the Montpellier Triolet Campus. The soft matter group (<https://www.softmatter-l2c.fr/>) is composed of 17 permanent researchers and about 8 PhD students and postdocs. In addition to fully equipped chemistry rooms for sample preparation and basic characterization, a wide palette of techniques and setups are available and readily accessible to all team members: (confocal) microscopy, rheology, AFM, static and dynamic light scattering, small angle X-ray scattering...

Several collaborative projects, regular group seminars and a lively and friendly atmosphere make the experience of students and postdocs at L2C enjoyable and profitable.

Grant

Interested candidates should apply on the ADUM web site (dead line: May 12, 2024)

https://adum.fr/as/ed/voirproposition.pl?site=adumR&matricule_prop=55765

and participate to an interview with a committee from the Ecole Doctorale I2S of Montpellier University (<https://edi2s.umontpellier.fr/>), to be held between after May 20, 2024.