

## **Master 2: *International Centre for Fundamental Physics***

### **INTERNSHIP PROPOSAL**

*(One page maximum)*

Laboratory name: Matière et Systèmes Complexes

CNRS identification code: UMR 7588

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Internship location: Université Paris Cité, Batiment Condorcet 688A

Thesis possibility after internship: YES

Funding: NO

#### **SYNERESIS OF A POLYMER NETWORK**

Summary (half a page maximum)

Syneresis is a generic term designing the spontaneous flow of solvent out of a hydrogel matrix during the self-assembly of colloids or polymers. Although it is a long-known phenomenon in food industry (diary product processing into cheese, yoghurts, ...) the mechanisms coupling microscopic structural events and macroscopic flow remain elusive. We have recently shown (Baumberger et al. *Soft Matter*, 2023, 19, 1720) that calcium-alginate gels, one of the most used biomaterials in tissue engineering and drug delivery, exhibit syneresis with a robust behavior when prepared in the strongly entangled regime of these semi-flexible, highly charged polyelectrolytes. We have been able to account for the surprising dynamical features by an unusual closed-loop aging mechanism, coupling network collapse events and the global flow.

This prompts us to revisit the non-linear and time-dependent mechanical properties of calcium-alginate gels. We will investigate the parameters affecting the network rigidity (entanglements, electrostatic interactions...). We will investigate how a mechanical stress can affect the kinetics of syneresis.

This is an experimental internship, relevant to the « extreme mechanics » of soft matter (see 2nd semester course « Soft & Slender, mechanics of Nature-inspired, highly deformable bodies », ICFP - Soft Matter & Biological Physics).

Please, indicate which speciality(ies) seem(s) to be more adapted to the subject:

Condensed Matter Physics:	NO	Soft Matter and Biological Physics:	YES
Quantum Physics:	NO	Theoretical Physics:	NO