

## PhD POSITION at MINES PARIS and ESPCI PARIS

### *Thermosensitive nanocomposites with tailorable porosity and mechanics*

**Key-words:** soft matter, hydrogels, colloids, stimuli-responsive materials, architected materials, biomaterials, tissue engineering

**- Urgent application deadline before May 27<sup>th</sup> for possible PhD scholarship -**

#### Research description:

Thermosensitive hydrogels allowing to deliver and encapsulate cells near body temperature bring promising solutions for numbers of applications in biology and medicine. In such systems, the presence of macroporosity is of paramount importance as it determines the ability of cells to migrate and proliferate. In a recent study (*Dang et al. Carbo. Polym. 2022*), our team has developed a design strategy to make thermosensitive hydrogels where a controlled porosity is formed in the presence of the cells at the same time as a sol-gel transition takes place in a polymer solution. One major challenge for applications remains the ability to tailor in one same material the macroporosity as well as the rheological and the mechanical behaviors.

**This PhD project will explore how the introduction of colloidal nanoparticles provides a new approach to design thermosensitive nanocomposites having adjustable macroporosity and mechanical properties.** The PhD student will investigate this question using original experimental protocols combining time-resolved microstructural and mechanical characterization. The results of this research will be applied to the fabrication of prototypes for cell encapsulation and delivery.

**Context:** This project is part of a long-standing and close collaboration between the C3M laboratory (ESPCI Paris) and the Centre des Matériaux (MINES Paris) to develop innovative soft matter solutions for biology and medicine. Both ESPCI Paris and MINES Paris are major institutions of higher education (French “Grandes Ecoles d’Ingénieurs”) with internationally renowned research centers strongly oriented towards application and innovation.

- The C3M laboratory – Molecular, Macromolecular Chemistry and Materials – focuses its research on the design, synthesis and study of polymeric and supramolecular materials. It is known for conducting fundamental research inspired by or oriented towards applications.
- The Centre des Matériaux is a research center devoted to materials sciences. It offers an extensive experimental platform and expertises for the mechanical and microscopic characterization of solids, including polymers, nanoparticles and coatings.

**Your profile:** Exceptional candidates of any nationality are eligible to apply. They should have:

- a background in physics, chemistry, materials sciences or related disciplines.
- Interest in one or more of the following research areas: Soft Matter Physics, Physical Chemistry and Materials science.
- Quantitative and experimental skills in physics of polymers and colloids or more generally in the characterization of soft matter systems.
- Ability and desire to work in a multi-disciplinary team on projects combining fundamental and translational research.

#### Duration, contact and application:

**Duration:** three years.

**Starting date:** September-December 2022

**Supervisor:** Laurent Corté (MINES Paris) – **Co-supervisor:** Michel Cloître (ESPCI Paris)

**Applications** should gather a covering letter including a brief statement of research interests, CV and contact information for two to three references. Both applications and informal enquiries may be addressed **as soon as possible (before May 27)** to Pr. Laurent Corté ([laurent.corte@minesparis.psl.eu](mailto:laurent.corte@minesparis.psl.eu)).