

Postdoctoral position in polymer chemistry and physical chemistry M/F

Description of the project

Water-in-water emulsions are ternary mixtures consisting of water and two incompatible hydrophilic polymers. Although they have great potential for use in the formulation of compartmentalized pharmaceutical, cosmetic, and food products, their use is limited by their inherent instability. In the last decade, significant efforts have been made to develop stabilizers, but the link between their chemical composition and their ability to adsorb and wet the water/water interface remains poorly understood.

The **MUlti-SCAle compartmentalized all-aquEous sysTems (MUSCADET)** project aims to develop multi-scale compartmentalized aqueous systems by adsorbing particles consisting of two polyelectrolytes with opposite charges functionalized by neutral hydrophilic polymer segments, which form core-corona structures, namely **complex coacervate core micelles**, at the interface. The composition of these colloidal particles will be adapted to optimize their ability to stabilize water-in-water emulsions, adopting a strategy based on well-defined structures through the use of **synthetic block copolymers**. These particles will provide additional functionality to the systems, in particular thanks to their core composed of a polyelectrolyte complex, which is by itself an additional compartment, smaller in size than the emulsion droplets but close to them thanks to their adsorption at the interface.

The candidate will be responsible for synthesizing double-hydrophilic block copolymers by **controlled radical polymerization (ATRP and RAFT)** in order to develop well-defined complex coacervate core micelles. The macromolecular architecture of these copolymers will be precisely varied and characterized (in particular by NMR and SEC). The goal will be to develop a library of these particles with various sizes, core/corona ratios, morphologies, and corona compositions. Additionally, **pH-responsive systems** will be explored for the on-demand trigger of conformational changes. The co-assemblies will be characterized by static and dynamic light scattering as well as by cryo-transmission electron microscopy. The postdoctoral researcher will work together with a PhD student who will study the stability and microstructure of water-in-water emulsions in the presence of the co-assemblies.

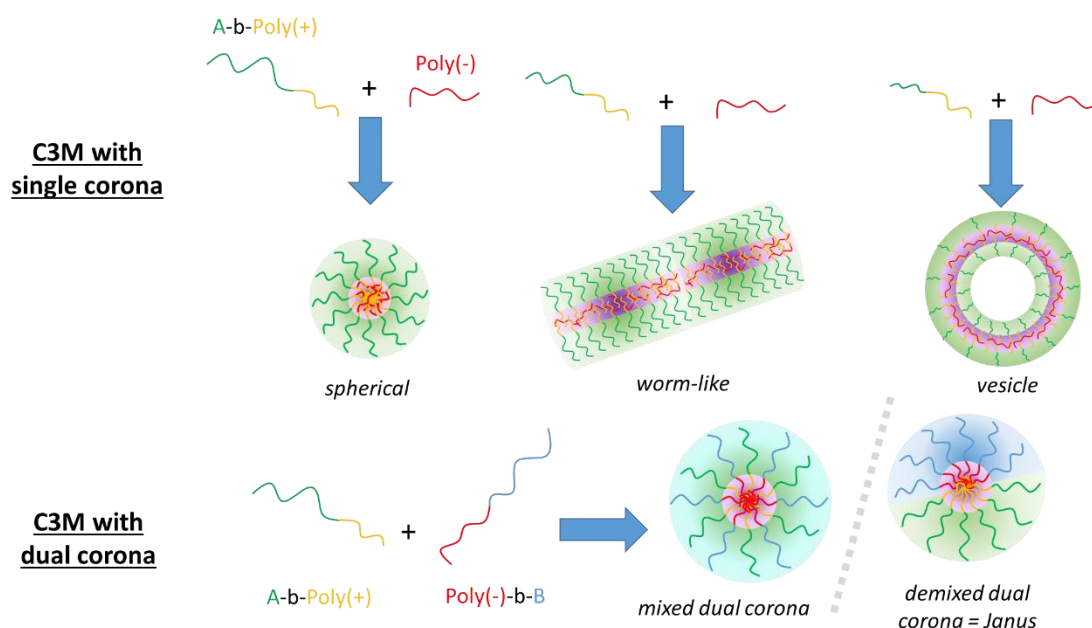


Figure 1 : Workflow of the MUSCADET postdoctoral project.



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Research profile

The candidate must hold a **PhD in polymer chemistry and/or physical chemistry**, or equivalent. Experience in **macromolecular synthesis**, particularly using controlled radical polymerization (ATRP and/or RAFT), and in **characterization in the solution state** (^1H and ^{13}C NMR, size exclusion chromatography) is essential. Skills in structural characterization (scattering techniques, microscopy) would be appreciated.

Research environment

The research work will be carried out in the **Soft Matter Science and Engineering** Laboratory (SIMM: <https://www.simm.espci.fr/>). The SIMM laboratory is a CNRS Joint Research Unit located at ESPCI Paris-PSL, and is also part of Sorbonne University. The research conducted at the laboratory focuses on the development and study of complex fluids and soft materials, and benefits from the expertise and equipment for macromolecular synthesis, multi-scale mechanical and structural studies, and the physicochemical characterization of these systems. The postdoctoral researcher will benefit from this dynamic environment and will get easy access to all the upmentioned characterizations. He/she will also receive support and mentorship for building his/her future research, prioritizing publications in recognized, international peer-reviewed journals and communications in international conferences in the fields of polymer chemistry and soft matter science.

Practical informations

Starting date : February 2026

Gross monthly salary : Minimum €2991 based on experience

Contract duration : 18 months

Contact and application

For more informations, the candidates can contact Théo Merland (theo.merland@espci.psl.eu) or Nadège Pantoustier (nadege.pantoustier@espci.psl.eu)

Applications must be submitted on the CNRS employment website :

<https://emploi.cnrs.fr/Offres/CDD/UMR7615-THEMER-001/>