PhD (M/F) in Soft Matter Physics / Materials Science:

Development of core-shell structures biomimetics of plant cells

Université Grenoble-Alpes, CERMAV, Laboratoire Rhéologie et Procédéq

Place of work: Gières - Auvergne-Rhône-Alpes - France
Keywords: Soft matter, microfluidics, biomaterials

Research

Plant cells have remarkable physical properties that allow them to withstand high osmotic pressures while being able to remodel themselves in response to biological stimuli. The origin of the mechanical properties of plant walls is an assembly of polysaccharide complexes forming an interpenetrating network. The objective of this thesis project is to succeed in assembling these polymers of plant origin in order to elaborate core-shell objects (fibres, capsules) that have the same physical properties as the walls of plant cells known for their resistance to hydric and mechanical stresses. This bioinspired approach would make it possible to meet a challenge in microencapsulation: to produce capsules that can withstand high osmotic pressures (drying), that are entirely biobased and whose mechanical properties can bemodulated. It opens up the prospect of replacing microcapsules of synthetic origin that are widely used in many fields and that are at the origin of the production of microplastics.

Main activities:

- Physico-chemical formulation to understand the links between physico-chemical conditions and rheological and mechanical properties of polysaccharide films.

- Conducting confocal microscopy experiments to understand the kinetics of polysaccharide membrane formation in a model geometry, as well as its structure.

- Elaboration of core-shell objects by microfluidics (capsules, fibres) and evaluation of their mechanical properties (by osmotic shock, compression).

- Analysis and synthesis of results, data processing.

- Oral and written communication of results: writing of reports and scientific articles, participation in international conferences

Starting date:
01/12/2022

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