

Master 2 Internship (6 months, second semester of the 2021-2022 academic year)
Microfluidic synthesis of bio-based polymer microparticles
CEBB, Pomacle (près de Reims)

Context

Polymer microparticles are used in many applications such as controlled drug delivery, food technology and many more. Microfluidic-assisted techniques are promising for their sobriety, sustainability, scalability, and perfect size control on the produced microparticles. Billions of tons of fossil resources are used each year in the polymer microparticle industry, which requires finding renewable alternatives to produce polymers through ecological processes that are healthier for humans and the environment. Naturally occurring alternatives have poor mechanical strength and characteristics compared to fossil-derived microparticles. Besides, they are structurally more complicated and harder to be chemically modified. In this context, tunable bio-based polymers are considered as promising choice to fabricate microparticles, not only because they are derived from biomass but also due to their tunable properties compared to the natural polymers.

Objective

The objective of this project is to combine the advantages of the tunable bio-based polymers in terms of durability and those of microfluidics in terms of ease of scaling, sobriety, and size control. First, acrylic monomers derived from biomass will be produced. Then, the monomers obtained will be injected by syringe pumps into a microfluidic droplet generation chip. The monomer droplets will be solidified by *in situ* or off-chip thermally initiated polymerization. In the last step, a double emulsion will be made to encapsulate an active ingredient such as an antioxidant. The thermal properties of the produced microparticles will be studied according to the chemical structure and to physical parameters.

Profile and expected skills

- Engineering or master 2 student in chemical, process engineering, or microfluidics.
- Desired qualities: rigor, autonomy, quality of writing, capacity for adaptation and initiative.
- Desired meticulousness: handling of fragile tools
- Teamwork skills.
- Skills in polymer and/or organic chemistry would be appreciated.
- Skills in analytical chemistry laboratory techniques and image processing would be a plus.

Host laboratories

The Biotechnology Chair – CentraleSupélec: hosted by the European Centre for Biotechnology and Bioeconomy (CEBB), is structured around three thematic axes (Characterization & conversion of lignocellulosics, Biotransformation and Separation techniques) and a transversal base of Modeling, simulation & visualization oriented towards the modeling of living organisms and the transition to industrial scale. Backed by the Process and Materials Engineering Laboratory (LGPM), the Chair ensures a close link between its parent institution, CentraleSupélec, and the region's economic and academic players, by putting its R&D expertise at the service of innovative projects.

URD ABI – AgroParisTech: Located at the heart of the Pomacle-Bazancourt biorefinery, URD ABI AgroParisTech is a research and development unit of AgroParisTech dedicated to the valorization of agrosources and biorefinery byproducts. With expertise in white biotechnologies, green chemistry, and process engineering, the team works on multi-disciplinary research projects aiming at the development of new industrial processes allowing integrating the transformation of byproducts of agriculture into high value-added chemicals such as polymers, fine chemicals, functional additives, or cosmetics.

Practical details

The internship will take place at the European Center for Biotechnology and Bioeconomy, 3 rue des Rouges-Terres, Pomacle (51110), located 20 km from Reims.

The duration of training is 6 months and may start between February and March 2022.

Gratification according to public rules for internships.

Contacts

Applications (CV + motivation letter, academic transcripts) should be sent by email to:

Dr. Hassan El Itawi: hassan.el-itawi@centralesupelec.fr

Dr. Sami Fadlallah: sami.fadlallah@agroparistech.fr

Websites

Chaire de Biotechnologie: www.chaire-biotechnologie.centralesupelec.fr

Laboratoire LGPM: lgpm.centralesupelec.fr

URD ABI: <https://chaire-abi-agroparistech.com/Home/>

CEBB: <https://cebb-innovation.eu/>