

### CONTEXT

In a context where we want to strengthen the circular economy and rely more on the bioeconomy, wastewater and waste are now considered resources. Thus, the wastewater treatment plant becomes a water resource recovery facility (WRRF). Recently, a new biological treatment process has emerged: aerobic granulation. It uses dense granules rather than flocs (aggregated microorganisms), which significantly improves settling and reduces plant size and energy consumption. It was also discovered that these granules contain a high proportion of biopolymers, derived from the metabolism of certain bacteria and possessing gelling and super-absorbent properties. Several applications are envisaged, ranging from agriculture (preserving plants against desiccation) to materials engineering (adding additives to cements to make them more resistant and fireproof). **However, there is still a need to optimize the production of biopolymers from wastewater treatment.**

In this context, INSA Toulouse, through its “Toulouse Biotechnology Institute”, and in particular its SYMBIOSE team, is offering a Master 2 internship to study a process for producing biopolymers with gelling properties of interest for the recovery of wastewater.

### OBJECTIVES OF THE INTERNSHIP

**The objective of the internship is to optimize biopolymer production in an effluent treatment reactor.**

This will involve **understanding the effect of the reactor's operating and environmental parameters** (residence time, settling sequence, substrate type, applied load, shear rate, aeration rate, etc.) on microbial competition and, ultimately, on **the microbial selection of biopolymer producers**. The influence of these parameters on biopolymer production, in terms of quantity and quality, will also be studied. Analyses and mass balances will be performed to determine the best production conditions. An online sensor is also being developed, based on signals from oxygen and pH probes.

#### Key milestones of the internship:

- Bibliography on biopolymers and aerobic granulation bioreactors.
- In-reactor selection of relevant microbial systems for the synthesis of extracellular biopolymers with gelling properties.
- Extraction and characterization of the biopolymers produced.
- Data interpretation
- Communication / report writing

### WHO ARE YOU ?

- Engineer (or equivalent) in process or bioprocess engineering, bac +5 level.
- Taste for experimental work and pilot monitoring in real conditions. Interest in analytical techniques for characterizing biopolymers
- Rigor and precision in analytical work and data analysis.
- Interest and aptitude for teamwork.
- Ease of writing (in French or in English).
- Motivation for environmental issues.

## CONDITIONS

Fundings : traineeship grant (around 650 €/mois)

Period : February to July 2025

Location : TBI, INSA, 135 Avenue de Rangueil, 31077 Toulouse Cedex 04

[www.toulouse-biotechnology-institute.com](http://www.toulouse-biotechnology-institute.com)

<https://www.toulouse-biotechnology-institute.fr/poles/equipe-symbiose/>

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## REFERENCE

Filali et al. 2012. <https://doi.org/10.1016/j.bej.2012.05.001>