

Laguillaumie Léa



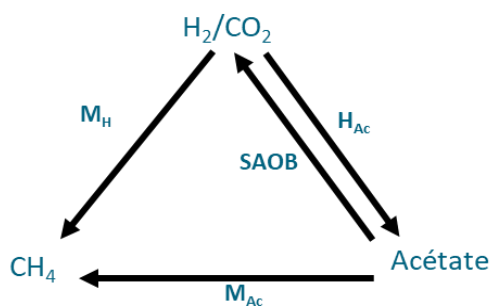
## Title: CO<sub>2</sub> recovery to organic acids with an anaerobic mixed culture

Years: 3½

### Background

The thesis project aimed at upgrading gaseous effluents of the H<sub>2</sub>/CO<sub>2</sub> type for the production of organic acids, in particular acetate. The latter is a chemical precursor for the production of fuels, solvents or biodegradable polymers, for example. **Faced with the growing need for a circular carbon economy to reduce the use of fossil fuels and to reduce greenhouse gas emissions, the reuse of gases such as CO<sub>2</sub> for the synthesis of biomolecules is a crucial issue.** Biological processes have the advantage of being less expensive, particularly working with anaerobic mixed cultures that do not require sterilization of the equipment. A microbial consortium (or mixed culture) refers to a set of groups of microorganisms with different metabolisms, which coexist in a given system. Often of natural origin (soil, manure, sludge, intestine, etc.), these catalysts are ubiquitous and cheap. In addition, mixed cultures are robust and resilient following long periods of storage, such as after being stopped for a few weeks. Indeed, mixed cultures have a great microbiological diversity, which allows them to adapt dynamically to given culture conditions and substrates. Selection pressures make it possible to converge on one or more dominant activities of interest. The potential for industrial application of this type of process is therefore interesting in the current economic and environmental context for recycling carbon at lower cost.

### Objectives



Studying a mixed culture producing acetate in anaerobic chemolithoautotrophy (from H<sub>2</sub>/CO<sub>2</sub>). The diagram below represents the main biological functions potentially active in the studied consortium, given the culture conditions. The PhD project aims at studying the dynamic behaviour of these different groups of microorganisms, and **identifying the key process parameters allowing the selection of one function of interest.** In particular, an important competition for the H<sub>2</sub> substrate exists between hydrogenotrophic methanogenesis (MH) and homoacetogenesis (HAC) which produce methane or acetate, respectively. This particular competition is central to this thesis project.

### Keywords

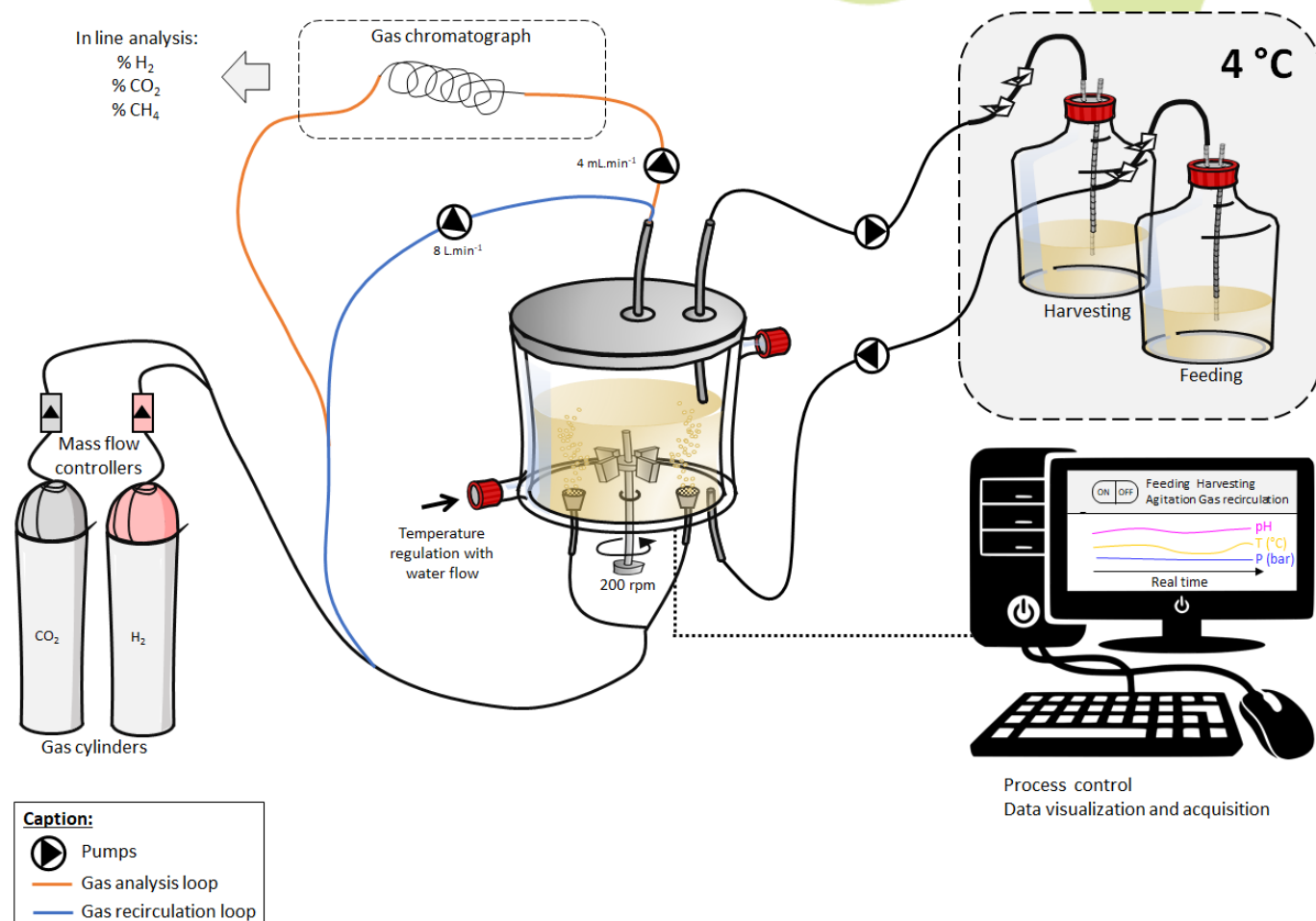
CO<sub>2</sub> recovery

Gas fermentation

Carbon circular economy

Consortium engineering

## Methodology



**Doctoral project integrated into projects:** CO2ORGANICS

**Funding:** INRAE TRANSFORM, INSA, 3BCAR