



Etude de la digestion anaérobie de résidus microalgaux

Hana Berriche

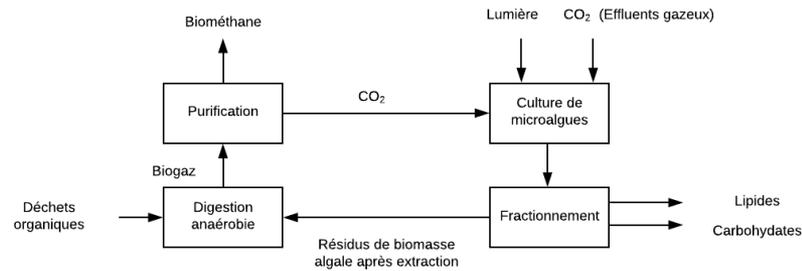
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Traitement des résidus: Retour au milieu naturel

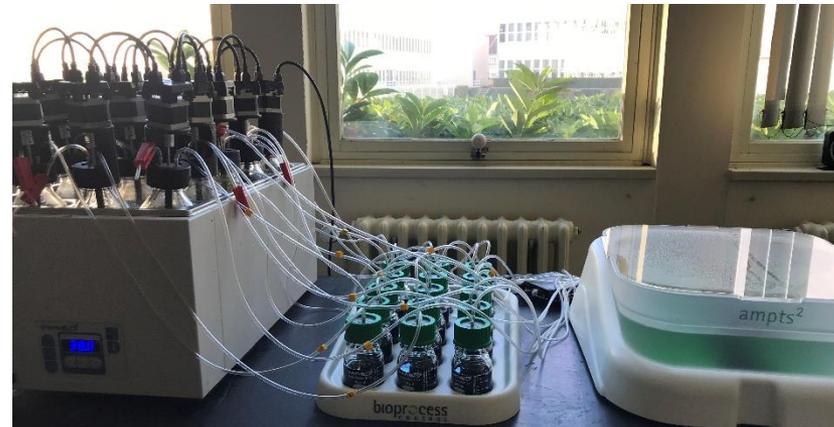


Défis

Système BMP

Concentration élevée
en **protéines**

Inhibitions



Merci de votre attention

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Study of the anaerobic digestion of microalgae residues

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PROBLEM STATEMENT

During the current scenario of energy crisis, the study of alternative biomass as an efficient energy producing feedstock in terms of biomethane through anaerobic digestion (AD) process seems to congruente the future needs.

Besides bioessential and high value-added compounds (such as proteins or vitamins) from microalgal biomass, the **Algotech** project, where this thesis research is part, is closing the loop to create a circular economy, which aims to minimize the impact of any nuisance resulting from microalgal waste. Hence, anaerobic digestion of **microalgae** (with potentially co-substrates to improve biogas formation) is an auspicious approach to produce biogas and could be the solution for treating residues. Unfortunately, there are many challenges such as the chemical composition variation and the occurrence of inhibitory phenomena during the fermentation stages. These locks make algal biofuels not yet economically profitable although they are more environment friendly than fossil fuels. To achieve such goals, in this work, **microalgal residues will be utilised to produce energy (biomethane) and create prime value.**

Taking account of the low C/N ratio of the microalgae residues, rich carbon substrates will be added.

THE ALGOTECH PROJECT

CO-DIGESTION

BMP TEST

✓ The most relevant indicator for assessing AD.
 ✓ Estimation of the **biomethane yields** and **biodegradability** of the mix (Microalgae + co-substrate) helps to select the **most suitable ratio**.

Microalgae or co-substrate → CO₂ Capture → CH₄ measurement → Scale up with the suitable co-substrate

EXAMPLES OF REACTORS CONFIGURATIONS

Main objective: Lower biogas retention time, higher organic loading rate, higher BMP.

- CTR: Continuous stirred tank reactor
- UASB: Upflow anaerobic sludge blanket
- ABR: Anaerobic baffled reactor

DISCUSSION

The objective of this poster is to introduce the **Algotech** Project. This thesis is focused on the utilization of the **microalgal residues**, after their extraction of lipids and carbohydrates, as feedstock to produce biogas in a circular economy. Therefore, AD of microalgae residues should be the most direct route and appropriate process even if it has three major critical points in the digestion of microalgal waste: a low biodegradability depending both on the biochemical composition of the microalgae, its protein content which may cause inhibition, and finally, the presence of sodium in some marine species that could affect the performance of digestion. The initiation of anaerobic digestion is the most critical step. Physicochemical pretreatments, adequate co-substrate and control of the species' crude composition are strategies that would increase the methanogenic potential. Thus, attention should be paid to the economic balance. A need of returns of experience and monitoring on AD plants is important.

REFERENCES

Berriche, H., et al. (2023). Study of the anaerobic digestion of microalgae residues. *Journal of Environmental Chemical Engineering*, 13(10), 111111. <https://doi.org/10.1016/j.jece.2023.111111>

Berriche, H., et al. (2022). Study of the anaerobic digestion of microalgae residues. *Journal of Environmental Chemical Engineering*, 12(10), 110111. <https://doi.org/10.1016/j.jece.2022.110111>

Berriche, H., et al. (2021). Study of the anaerobic digestion of microalgae residues. *Journal of Environmental Chemical Engineering*, 11(10), 109111. <https://doi.org/10.1016/j.jece.2021.109111>

ACKNOWLEDGMENTS

The Algotech project is financially supported by the "Wallonie Region - SPW-DRONE" (supported).

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