Oral Presentation

Session: Process - Bioactivity measure

Photobioreactor scale-up for the culture of encapsulated microalgae

Klara WECK

Sébastien CALVO, Angélique DELAFOSSE, Dominique TOYE

University of Liège / Chemical Engineering Department / PEP's laboratory, Belgium

ABSTRACT

This work aims at cultivating fixed biomass (encapsulated microalgae) to product high added value metabolites. Encapsulation consists in algae entrapment in a polymeric matrix to form spherical beads. It facilitates the microalgae harvest, the recovery of metabolites of interest thus the use of continuous processes and limits the contamination risks (C.Vilchez, 1997), (B.Cheirsilp, 2017). However, the industrial feasibility of this innovative production technology is not yet assessed due to the lack of large-scale experiments involving encapsulated microalgae. A *Chlamydomonas reinhardtii* strain, genetically modified to produce and secrete *Gaussia* luciferase (Lauersen, 2013) has been encapsulated in 3 mm diameter beads and cultivated in 1L and 5L photobioreactors. Photobioreactors are diphasic liquid - solid reactors, in which the culture medium is used to fluidize the encapsulated microalgae (beads), which ensures an efficient circulation of beads near the photobioreactor walls and thus a good distribution of light to beads. The secreted metabolite is expected to be continuously recovered in the culture medium. An external loop containing only liquid is used to control the medium conditions (pH and temperature regulation) and includes a continuous UV sterilization of the media to avoid bacterial contamination. The luciferase concentration in the medium is measured by bioluminescence. The dry biomass is followed by spectrophotometry, after dissolution of alginate beads using a specifically developed method. During batch cultures performed in the 1L photobioreactor, a one week growth was observed, followed by a three weeks stationary phase. No cells leakage was noticed during this one month period. Tests are presently in progress in the 5L photobioreactor. Results obtained up to now seems to demonstrate that the culture of encapsulated microalgae at pilot scale is feasible.

Keywords: photobioreactor, encapsulation, scale-up

References:

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BIOGRAPHY

Klara Weck

PhD student in the Chemical Engineering department of the University of Liège (Belgium)

Klara.weck@uliege.be

LinkedIN: www.linkedin.com/in/klara-weck

1. Biography

Master's degree in chemical engineering obtained in ENSGTI (engineering school, Pau, France). Last semester specialized in environment during an Erasmus program in DTU (Copenhagen, Denmark). Master thesis in CEA (Cadarache, France): optimization of culture conditions in photobioreactors to produce high added value metabolites.