Studien-/ Diplom-/Bachelor-/Masterarbeit – Experimental

Topic: Optimization of enzymatic fat splitting in continuous process.

Biocatalytic reaction holds a promising alternative to conventional chemical process due to its mild conditions. However, the high cost of enzymes has been the barrier for industrial application. In LIPES project (www.lipes.eu), continuous process of enzymatic hydrolysis of triglycerides are being scaled up from laboratory scale (1L) to industrial scale (4000L), to demonstrate the economic feasibility of the enzymatic process compared to the conventional high pressure high temperature splitting.

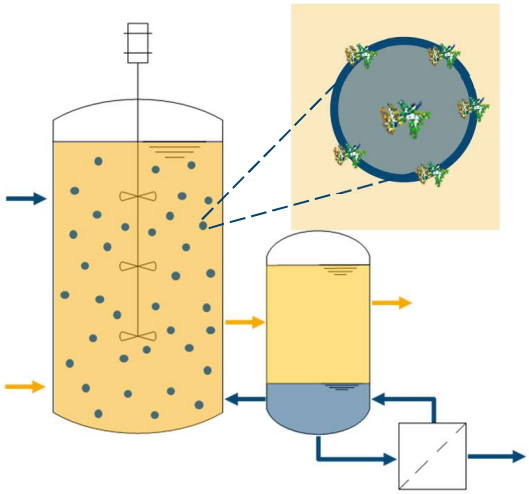

Fig.1. Continuous enzymatic fat splitting process.

The process uses water and oil as substrates, with lipase enzymes acting as catalyst on the water-oil interface. The reaction is conducted in a stirred tank reactor as shearing is needed to create sufficient contact area. The products are taken after a separation step, and membrane is used to recycle the biocatalysts back to the reactor.

To ensure the low cost of catalyst, it is imperative to develop a continuous process with low enzyme activity loss with high yield. By adjusting the process parameters, such as higher temperature and higher stirring rate, it is possible to influence the reaction kinetic to give higher yield and reduce the residence time. This modification has to be balanced with the high deactivation of enzyme due to high temperature and high shearing.

A 13L pilot plant has been erected in our facilities to assist the scale up process, and to determine the optimum conditions (stirring rate, temperature, residence time and separation strategies) to reduce the enzyme consumption in long time operations. The project will be focused on smaller tasks described below.

Task :

1. Determination of enzyme deactivation rate during conti process and total enzyme consumption rate.
2. Optimization of stirring condition, reaction rate and residence time.
3. Development of novel separation process for enzyme retention in the process.
4. Evaluation of economic feasibility of conti process compared to batch process.

Start : April 2019 or with appointment

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