

Process improvement in the production of oleyl oleate, a liquid wax ester in stirred tank reactor

ABSTRACT

Lipase-catalyzed production of oleyl oleate, a liquid wax ester by esterification of oleic acid with oleyl alcohol was performed in 2 L stirred tank reactor (STR). Process improvement study in reactor operation was carried out in batch mode STR with single impeller mounted on the centrally located shaft. Rushton turbine impeller showed better performance in degree of mixing, as compared to AL Hydrofoil impeller, whereby a high Reynolds number of >104 was achieved at 400 rpm, which exhibit a turbulent flow pattern [1]. Homogenous enzyme particles suspension was obtained at lower impeller speed (200 rpm) by using AL Hydrofoil impeller. However, there was significant effect to the mixing improvement on the enzyme particles distribution by using 2 impellers system with spacing of 30 mm even at lower agitation speed (200 rpm). High stability of Novozym 435 was observed even in the presence of shear forces on the enzyme particles due to the mechanical agitation speed. Wax ester reaction mixture in STR follows Newton's law due to the linear relation between the shear stress (τ) and shear rate (d/dy) [2]. The process was successfully carried out to the highest amount of wax ester that can be produced in 2 L STR whereby, the production and productivity of oleyl oleate were improved from 295.39 g/L/h to 705.76 g/L/h and 310.16 g/h to 952.78 g/h, respectively.

Keyword: Oleyl oleate; Stirred tank reactor; Wax ester