Evaluation of Magnetic Nanoparticles as Support to Lipase Immobilization

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Enzymes are highly specific and its properties, application forms can be enhanced using methods of immobilization. For use of enzymes immobilized be economically feasible considers type of support and method that must have a high influence on activity and reuse of enzyme in biocatalysis [1]. Among the available enzymes, lipases can hydrolyze triglycerides (TAG) into glycerol and fatty acids. The support´s choice to immobilize enzymes were nanoparticles magnetic. This support enables use of magnetic separation for recovery of enzymatic derivative, reduces costs of enzymes and allows being used in continuous systems. In this context, the goal to this work was to immobilize porcine pancreatic lipase (PPL) on magnetic support (SP-APTS), that can provide a reduction in cost and better yield of synthesis in several cycles. The magnetic support was obtained by dissolving $FeCl_2.4H_2O$ and $FeCl_3.6H_2O$ in diethylenoglycol/dietanolamide with addiction of NaOH [2]. After this process, PPL was immobilized in SP-APTS using glutaraldehyde and polyethyleneglycol. The solution was stirred for 16 hours (6 °C). The solution SP-APTS-LPP was washed to remove free PPL. For infrared spectra, SP-APTS showed bands relating to Fe-O bonds and N-H vibrations (amine groups). In the SP-APTS-PPL spectrum showed a strong band that refer to amides. For thermal analysis was possible to analyze the enzymatic activity of immobilized LPP (559.5 U/g) compared to free LPP (1439 U/g). This results confirmed the nanoparticles functionalization with amine groups and immobilization of PPL. The thermal analysis allowed to quantify amount of PPL which effectively bind to magnetic support.

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