289y Immobilization of Lipase Onto Mesoporous Silica: Study of Kinetic Parameters and Mass Transfer Effects Using a Continuous Micro Reactor Setup

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Immobilized enzymes offer several potential advantages, such as ease of product recovery from reaction mixture, operational flexibility and reusability. Immobilized enzymes with packed-bed reactor configuration are attractive for biochemical processes because of longer solid retention times and ease of operation and relatively high reaction rates. Recent advances in molecular engineering of ordered materials with tunable surface chemistries and their integration into macroscopic architectures offer new opportunities to design highly efficient biocatalytic systems. Ordered mesoporous silicates with uniform pore size distributions and high surface areas are a promising class of host materials for enzyme immobilization.

In this study we investigated mass-transfer effects on the performance of immobilized lipase in a continuous flow micro reactor. Pseudomonas cepacia lipase was immobilized onto SBA-15, which was used as a model ordered mesoporous silicate. The activity of free and immobilized lipase was measured by assaying the hydrolysis reaction of p-nitrophenol acetate. The influences of external film mass-transfer resistance, internal pore diffusion and axial dispersion on the apparent kinetic parameters were investigated. The behavior of immobilized lipase was studied with an appropriate mathematical model that took into account simultaneous mass transfer and reaction kinetics. The effects of particle size (20-50 ìm) , enzyme loading (1-20 mg/gm) and operating parameters, such as flow rate (4-10 cc/min) and inlet substrate concentration (25-800 ìM), on the activity of immobilized lipase were studied.