

CURRENT RESEARCH AND DEVELOPMENT IN BIOTECHNOLOGY ENGINEERING AT IIUM

VOLUME IV

Editors:

Ma'an Alkhatib
Abdullah Al Mamun
Faridah Yusof



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(VOLUME IV)

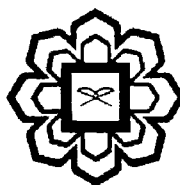
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CHARACTERIZATION OF IMMOBILIZED LIPASE ON MULTI-WALLED CARBON NANOTUBE

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ABSTRACT

Lipase from *Aspergillus niger* was immobilized to multi-walled carbon nanotubes (MWNTs) by using N-(3-Dimethylaminopropyl)-N'-ethyl-carbodiimide that acts as a coupling reagent. Prior to this step, MWNTs were functionalized with carboxyl group by a sonication method. The immobilized lipase was characterized in terms of its activity with respect to temperature, pH, substrate concentration and stability over time. Immobilized lipase has lower activity compare to free lipase. Their characteristic also differs particularly in term of their activity and stability where the optimal temperature for immobilized lipase is 40°C while free lipase is 37°C. However, the optimal pH for both situation is the same, which is pH 7 and immobilized lipase is more stable compare to free lipase with respect to time. The Michaelis constant (K_M) value differs slightly for both situation.

Keywords: lipase, immobilization, carbon nanotubes, activity, enzyme

INTRODUCTION

Nowadays, enzymes are widely applied in different industries and the numbers of its application continue to increase due to its advantages. Examples of enzyme use in industry include food and beverages industry, animal feed, textiles, pulp and paper, detergents, cosmetic, wastewater treatment, pharmaceutical, etc. Therefore, enzymes have shown their importance in both bio-industry and human routine life (Hasan *et al.*, 2006).

There are, however, factors that pose challenges for the applications of enzymes as biocatalyst in industries. For example, despite the vast potential applications of enzymes in industries, many enzymes may not come cheap and have limited operational stability and shelf-storage life, as well as may not be suitable for applications under the extreme conditions of industrial processes: enzymes could be easily denatured when the environmental factors such as temperature, pH, salt concentration and other physical or chemical system were changed. Denatured enzymes will lose their catalytic activities temporarily or permanently due to structure changing or bonding pattern distribution. In addition, it is also difficult to recover and reuse the enzyme.

Lipases are widely used in the processing of fats and oils, detergents and degreasing formulations, food processing, the synthesis of fine chemicals and pharmaceuticals, paper manufacture, and production of cosmetics, and pharmaceuticals. Lipase can be used to