สำนักงานวิทยทรัพยากร
จุฬาลงกรณ์มหาวิทยาลัย

CHAPTER I
INTRODUCTION

Lipase has long been known as the powerful and versatile catalyst, which can be found in several sources such as microorganisms, mammalian cells, and plants. In addition to its ability to catalyze natural reactions of fat hydrolysis, lipase can be used in the other reactions such as esterification, tranesterification of esters as well as organic carbonation, and amidation. This is attributed to a wide variety of its substrates, which can be employed in reactions. Moreover, lipase possesses high regioselectivity and sterioselectivity for its catalyzed reactions. Thus, there are a number of industrial applications of lipase, especially in food and pharmaceutical industries.

The most important lipase-catalyzed reactions are esterification and tranesterification reactions in low-water content media using free fatty acid and alcohols as substrates. In high-water content media, lipase presents very low activity for esterifiactions. Water present in system not only affects the enzyme activity but also causes increasing undesired products and competition of hydrolysis reaction. Several approaches have been used to achieve low-water content media such as emulsion or immobilized enzymes on supports. However, low activity and denature of enzymes have still been shown in some systems. From this perspective microemulsions have recently been explored as another approached to overcome these limitations.

Winsor II microemulsions (or reverse micelles) are dispersion of water in oil, which small drop of water is stabilized by surfactant molecules. Enzymes, such as lipase, can be entrapped in micro-droplets of water while remaining their catalytic ability. Moreover, large interfacial areas of oil and water can be provided for lipase to catalyze the reactions. Thus, it is not surprising that there are a large numbers of research, which investigated the esterification reactions catalyzed by encapsulated lipase in microemulsion to increase the activity and selectivity of lipase. However, most of these investigations have focused on the microemulsion systems of bis-(2-ethylhexyl) sulfosuccinate (AOT) in various organic solvents as media for lipase-catalyzed esterifications. Thus, further studies on other microemulsion systems using

different surfactant types should be conducted in order to gain deeper understanding about lipase-catalyzed esterifications in microemulsion system, which should bring us to the potential applications of lipase technology.

The present work focused on the esterification reaction catalyzed by lipase encapsulated in microemulsion system of NaDEHP/iso-octane/aqueous phase of NaCl. In this study, the various chain length of fatty acids and alcohols were used as substrates in the reaction, in order to investigate the effect of nature of the substrates to the catalytic activity of lipase encapsulated in NaDEHP reverse micelles. Fatty acids used were caprylic, palmatic, and oleic acids while alcohols used were 1-propanol and 2-propanols, and *n*-hexanol. Moreover, the effect of various system parameters such as pH, salt concentration, and water to surfactant ratio (W_o) on the activity of lipase in reverse micelles were also investigated in relation to the reverse micellar structure and its selectivity.