Chapter 10

Novozym 435 Reusability Summary
10.1. Introduction

Biotransformation is currently considered as a useful alternative to conventional process technology in industrial and analytical fields. Unlike chemical catalysts, enzymatic transformations can achieve complex chemical conversions under mild reaction conditions with high substrate specificity and efficiency. Despite these advantages, an industrial application of enzymes has been limited by various factors. These include high cost of the enzymes and their instability to process conditions. Enzyme immobilization helps multiple reuses making them economic for industrial development of continuous bioprocesses. Hence, it was thought desirable to discuss in detail and summarize reusability of Novozym 435 studied in this work for various industrially relevant processes.

10.2. Summary of reusability studies

The reusability of Novozym 435 under optimized process parameter conditions for the reaction schemes studied in this work is summarized (Fig. 10.1). The conversion was found to be decreased marginally after three reuses of Novozym 435 in most of the cases. This may possibly be because of the loss of enzyme during handling. No makeup catalyst was added. However, butyl-4-methyl-3-oxopentanoate (BIBA- RSM optimized) synthesis showed no significant decrease in the enzyme activity after three reuses of Novozym 435. Here, weight loss during handling was adjusted by making

![Figure 10.1: Novozym 435 reusability profile for reaction schemes studied](image)
up the weight to the original enzyme loading. This clearly indicated that Novozym was quite stable after three cycles. In ketorolac resolution, an enantiomeric excess of above 99% for (R)-ester was observed. Enantioselectivity and enantiospecificity was found to be unaffected after three reuses of enzyme. Thus, Novozym 435 used in this study for various trans/esterification reactions showed good reusability and is a good alternative to chemical catalysts for industrial applications.