CHAPTER I
INTRODUCTION

Tissue engineering is a new technology for the treatment of disease and injury that applies methods from materials engineering and life sciences to create artificial constructs for new tissue regeneration (Williams, D., 2004).

Biodegradable synthetic polymers provide a number of advantages over other materials for developing scaffold in tissue engineering. Synthetic polymers are also attractive because they can be fabricated into various shapes with desired pore morphologic features inducing tissue regeneration. Moreover, polymers can be designed with chemical functional groups that can induce tissue regeneration.

Among the families of synthetic polymers, the polyesters have been attractive for these applications because of their ease of degradation by hydrolysis of ester linkage, degradation products being resorbed through the metabolic pathways in some cases. Polyesters have also been considered for development of tissue engineering applications (Hubbell, 1995; Thomson *et al.*, 1995a, Yazemski *et al.*, 1996; Wong and Mooney, 1997), particularly for bone tissue engineering (Kohn and Langer, 1997; Burg *et al.*, 2000).

Polycaprolactone (PCL) is a biodegradable polyester that has been proved to be biodegradable by microorganisms (Helmut *et al.*, 1990) and enzymes (Tokiwa *et al.*, 1976). PCL has also proves to be a nontoxic polyester in nature and found to be cyto-compatible with a several body tissues that makes it an ideal material for tissue engineering (Pathiraja *et al.*, 2003). Early in the 1970s, it was shown that PCL is easily biodegraded and utilized as biomaterials for playing a crucial role in tissue engineering by serving as 3D synthetic frameworks commonly referred to as scaffolds leading to new tissue formation. A biodegradable polymer can be degraded into low molecular weight molecules due to the action of micro- and or macro-organisms or enzymes that can be absorbed in the body or metabolized (Xiong *et al.*, 2004). The application of biodegradable polymers in the field of solving plastic waste problems and biomedical areas has been extensively studied.

For biomedical application, degradation properties are of crucial importance in biomaterial selection and design. The degradation rate may affect a range of processes, such as cell growth, tissue regeneration, drug release, and host response. An enzyme is one of many factors that can affect to the degradation of polyester. Especially, the enzyme lipase which can hydrolyzes the ester bonds along the polyester chains and accelerates the degradation process.

The purpose of this work is to compare the *in vitro* degradation behavior of neat, activated and protein-immobilized PCL which produced by electrospinning technique using lipase from *Pseudomonas sp.*