CHAPTER I
INTRODUCTION

A key component in tissue engineering for bone regeneration is scaffold that serves as a template for cell interactions and formation of bone-extracellular matrix to provide structure support to the newly formed tissue. Scaffolds for bone regeneration should have certain criteria to serve this function, including suitable mechanical properties, biocompatibility, and biodegradability. Moreover, the material that used as the scaffolds has to specific and suitable with bone cell. There are many researchers mention about the aliphatic polyester used as a scaffold for bone regeneration because of its good properties. The examples in the group of aliphatic polyester are polycaprolactone (PCL), poly(1,4-butylene succinate) (PBSu-DCH), poly(lactic acid) (PLA), poly(3-hydroxybutyric acid) (PHB), poly(3-hydroxybutyric acid-co-3-hydroxyvaleric acid) (PHBV), etc.

The technique used to fabricate a scaffold for tissue engineering should give a scaffold with an interconnected structure of well distributed pores with appropriate sizes for guide cell attachment, proliferation and tissue regeneration which without affecting the biocompatibility of the material. Solvent casting and particulate leaching is a method for producing the three-dimensional porous structures which can be used for bone tissue engineering. In the leaching of soluble particulates, porosity can be controlled by variation of the amount of leachable particles and the pore size of the porous structure can be adjusted by use particles of desired sizes.

For biomedical applications, it is very important to understand the degradation characteristic of scaffolds because the different bone defects need different times for treatment. 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 degradation behavior of aliphatic polyester films and sutures (microfibers) in aqueous media has been widely investigation of the time, temperature, crystallinity, and pH level for properties such as molecular weight and mechanical strength. However, comparative studies of the properties of three-dimensional porous scaffolds from different polyesters are rare.

The purpose of this work is to compare the *in vitro* degradation behavior of PCL, PBSu-DCH, PLA, PHB and PHBV three-dimensional scaffolds, which produced by solvent casting and salt particulate leaching method, by use lipase from *Pseudomonas sp.* Moreover, we compare the potential to use these scaffolds in bone regeneration application which be evaluated *in vitro* by investigating the response of human osteoblastic cells (SaOS-2) on the scaffolds.