CHAPTER I
INTRODUCTION

Tissue Engineering is the study of the growth of new connective tissues, or organs, from cells and a collagenous scaffold to produce a fully functional organ for implantation back into the donor host. The replacement of a bone defect requires the foreign materials which is called scaffold. The materials, which used to fabricate the substrate, should be biocompatible, biodegradable and also should have good mechanical properties. Aliphatic polyesters are a good candidate. Moreover, they also bear properties that promising cell attachment, proliferation and differentiation as reported in multiple literatures. Polycaprolactone (PCL), which has been approved by the Food and Drug Administration (FDA) is commonly used as scaffold, is a semicrystalline polymer with low glass transition and melting temperatures and it is soluble in a wide range of common organic solvents. On the other hand, Poly(3-hydroxybutyrate-co-3-hydroxyvalerate) (PHBV), the most common polymeric variant of Poly(3-hydroxybutyrate) (PHB), is also a semicrystalline polyester produced naturally in certain strains of bacteria.

Since the interaction of materials with biological environment such as protein, proteoglycan receptors on cell surfaces and biological molecules normally present in the extracellular matrix (ECM), though their interfaces are largely dependent on the surface chemistry and topography of the materials. Protein adsorption on the material surface is believed to be the initial state when a material contact with a biological environment. These mechanisms will influence the subsequent biological reactions including cell adhesion and proliferation. However, polymeric materials with different surface properties such as hydrophilicity or hydrophobicity, smooth or roughness surfaces may provide the different of cell response in vitro and in vivo. Therefore, understanding the influence of protein adsorption and surface properties is critical, for consideration regarding the design of biocompatible surfaces.

In this work, blended films were prepared by varying PHBV content up to 50% via solution casting and study the effect of blending composition on the protein adsorption. The potential for use of these mats as bone scaffolds was further assessed in *vitro* in terms of attachment and proliferation of mouse-calvaria-derived preosteoblastic cells (MC3T3-E1). To further understands the influence of protein, BSA-coated and uncoated-PCL/PHBV blended films of all compositions were prepared and tested.