

CHAPTER I

INTRODUCTION

Many people suffer from bone defects and die due to insufficient ideal bone substitute. The treatment of bone defects has been made in organ transplantation, surgical reconstruction and use artificial prostheses. Currently, the treatment of bone defects is developed using the tissue engineering.

The tissue engineering involves the seeding of cells onto a scaffold that it provides initial support for the cells to attach, proliferate and differentiate, and form extracellular matrix (ECM). The effective scaffold materials have been considered biocompatibility, osteoconductivity, porosity, biodegradability and mechanical properties. The important processes occurring on the surface of implanted materials are protein adsorption, cell attachment and the formation of tissue. The adsorption of proteins on surfaces occurs immediately after insertion biomolecules (proteins) into the body. Biomolecules start to adsorb and attach to the cells. Then, communication between cells will lead to the formation of tissue. Preparation method to fabricate scaffolds is solvent-casting technique because of the simplest and cheapest methods.

The common biodegradable polymers have been using or studying as a scaffold such as polycaprolactone (PCL), polylactic acid (PLA), polyglycolic acid (PGA) and polyfu-marates (PF). PCL is attractive because of its good biocompatibility, slow biodegradability and nontoxic by-products. However, drawback of PCL is a high hydrophobicity; it is not suitable for supporting cells applications. One way in order to improve surface hydrophilicity and cytocompatibility of PCL is an immobilization protein on the surface of PCL, such as collagen, fibronectin, laminin and glycosaminoglycans, in which these proteins can improve cells adhesion, proliferation and differentiation.

In previous work of my senior, she studied the surface topography and crystallinity in different surface of PCL film. Her thesis found that the PCL film casted from 40:60 (%v/v) EtOH:THF had the roughest surface and provided significantly higher amount of protein adsorbed. Furthermore, the MC3T3-E1 cells preferred attachment and proliferation on the rough surface in present bovine serum albumin. Therefore, the objective of my thesis are the continuous project from my

senior. This work studied the effect of different surface topography of PCL films in present bovine serum albumin and another protein (collagen). Chloroform and 40:60 (v/v) EtOH/THF were used as the solvents to prepare PCL films. My thesis focused on the effect of different surface topography (smooth and rough surface) of PCL film to protein adsorption in pre-adsorbed BSA and following adsorbed collagen. Surface topography of films was characterized using AFM, SEM and cells applications. The effect of cells adhesion and proliferation of these materials (BSA, collagen type I and neat PCL) was studied on the corresponding of the growth of mouse osteoblastic cells (MC3T3-E1).