CHAPTER I
INTRODUCTION

In recent years, tissue engineering has gained more attention for use as a cure the patients who have failure of vital tissues and organs. The important properties for tissue engineering are they can provide a physical support for cell attachment, proliferation, nutrient transport and new tissue infiltration (Akay *et al.*, 2002). Currently, metal and ceramic were chosen in orthopaedic surgery but they are not closely matches healthy cellular structure with tissue (Burg *et al.*, 2000). So, many researchers try to find appropriate biomaterials and techniques to make better tissue engineering.

The use of 3D polymer scaffolds has shown increasing potential for tissue engineering. PolyHIPE polymer is the material that is a good candidate for used in tissue engineering application (Busby *et al.*, 2001) because it has a 3D structure, highly porous with interconnected pore and very low density (Pakeyangkoon *et al.*, 2013). PolyHIPE polymer is a porous material prepared through a high internal phase emulsion (HIPE) polymerization route. PolyHIPE can easily be modified by addition of chemicals with the desired properties, e.g. hydroxyapatite to increase cell attachment and penetration into polyHIPE porous foams. There are many year studies to investigate the use of polyHIPE polymer as a tissue engineering scaffolds. Akay *et al.* (2004) reported the use of polyHIPEs as support structures for cell growth in the patent literature. However, PolyHIPE are usually made from polystyrene (PS) which is a hydrophobic polymer, which is improper for supporting the cell-scaffold interaction and poor adhesion between scaffold and living.

Layer-by-Layer (LbL) technique is one method to modify the surface of polymer by the additional of a functionalizable comonomer onto polymer. Layer-by-Layer (LbL) of polyelectrolyte is an approach for selective surface modification by building up a multilayer ultrathin-film coating of macromolecules. McCarthy and co-worker (1997) reported the surface modification of poly(ethylene terephthalate) (PET) using layer-by-layer deposition. Surface of PET can be modified to contain carboxylate and ammonium functionality. Therefore, it is possible to modify surface of poly HIPE by using LbL technique.

In this study, we describes the synthesis of poly(S/EGDMA)HIPE loaded with hydroxyapatite (HA). Furthermore, we show surface modification by using layer by layer technique to improve hydrophobic of polyHIPE. We expects that improved poly(S/EGDMA)HIPE can support cell growth and can be another alternative for tissue engineering.