CHAPTER I
INTRODUCTION

Porous polymeric foams are well-known materials and have been fabricated by a wide range of techniques. However, the most important method is based on high internal phase emulsion polymerization (HIPE), which gives porous materials with a more regular structure compared to other methods. The generic term polyHIPE was coined by Unilever researchers to describe these foams. The obtained material is highly porous, with a very low density, and a permeable structure. Due to several unique properties, polyHIPE porous foams are used in several applications such as the absorbents (Wakeman *et. al.*, 1998), filtration media (Bhumgara *et. al.*, 1995), and scaffold for biomedical applications (Busy *et. al.*, 2001). In this work, we interested in tissue engineering scaffold.

The most crucial issue in tissue engineering is the development of appropriate materials or scaffolds. Scaffolds must allow cells to seed and allow tissues to subsequently grow. The effective materials must have high porosity and high interconnectivity in order to increase the area for cell attachment and tissue in-growth. Furthermore, the scaffold must be biocompatible materials with cells and the surface must provide sites for cell attachment. PolyHIPEs also have highly porous structure and three dimensional structures. Ethylene glycol dimethacrylate (EGDMA) has good compatibility with cells, low cytotoxicity as well as high water uptake (Gibson *et. al.*, 2005). Ethylene glycol dimethacrylate (EGDMA) has been widely used in tissue engineering. Therefore; poly(styrene/ethylene glycol dimethacrylate can be considered as the interesting materials for bone tissue engineering.

In this study, we focus on poly(styrene/ethylene glycol dimethacrylate) polyHIPEs. PolyHIPEs can easily be modified by addition of chemicals with the desired properties. PolyHIPEs coated with hydroxyapatite can remarkably increase ability of cell to penetrate and migrate into the polyHIPE porous foam, make the scaffold more biocompatible as well as increase new bone formation (Akay *et. al.*,

2004). Modification of polyHIPE by coating hydroxyapatite onto the surface of the material was investigated in this research.