CHAPTER I
INTRODUCTION

PolyHIPE polymers are highly open porous polymeric foams obtained from high internal phase emulsion (HIPE) (Barby *et al.*, 1985). This microporous material has been defined as polymer from the polymerization of an emulsion, where the internal phase occupies more than 70-90% of the total volume. Due to their outstanding properties (such as high porosity, high surface area, and high degree of interconnectivity), the polyHIPE porous foams are considered for many applications such as a scaffold for biomedical applications, an ion exchange membrane, a filtration media, and a catalyst support. PolyHIPE materials normally do not have a very high surface area (typically around 20 m^2/g), while with the addition of more cross-linking agent, the addition of porogenic solvents (Cameron *et al.*, 2000) or the addition of mixed surfactants to the monomer phase (Barbetta *et al.*, 2004) the surface area can rise significantly. However the materials with highest surface areas also had a non-cellular morphology and were very weak mechanically. This could be rectified by the addition of inorganic filler to get good mechanical properties.

There are a number of inorganic filler materials that can be used to improve mechanical performance of polyHIPE foams. Glass fiber is filled to increase the reinforcement of the polymer matrix (Paul *et al.*, 2008). Carbon black with nanosized particles is filled to increase the reinforcement of the polymer matrix (Menner *et al.*, 2006). Nanosized silica particles are filled to enhance the reinforcement of the polymer phase that silica particles were covalently incorporated into the polymer network (Haibach *et al.*, 2006). Because of easily available of clay in Thailand, moreover, it can be used for retention of gases at room temperature conditions, many of industrial used of clays materials are related to adsorptive capacity which increase with acid activated clay (Volzone, 2007). In this study, acid treatment of clay additive will be examined to solve the weak mechanical properties problem and also to increase the adsorption of polyHIPE. However, the efficient adsorption of polyHIPE is different in terms of the amounts of mixed surfactants in polymer matrix of polyHIPE.

The purpose of this work is to prepare polyHIPE by varying the composition of three surfactants —SPAN80, DDBSS, and CTAB— in a series of five mixed ratios —4.3:0.4:0.3, 6.3:0.4:0.3, 7.8:0.4:0.3, 9.3:0.4:0.3, and 11.3:0.4:0.3, respectively— using acid-treated organo-modified bentonite (0 and 10 %wt) as inorganic reinforcement to elevate the surface area and mechanical properties of the poly(DVB)HIPE for use as an adsorbent for CO_2 gas which is harmful to the environment, then determine the suitable composition of three surfactants, and look at the effect on CO_2 gas retention property of the obtained polyHIPE.