CHAPTER I
INTRODUCTION

One of the most commonly found problems in the atmosphere is high levels of gases like pollutants; coming from different sources, mainly released by industrial activities and gasification processes. Therefore, it is very important to design adsorbent materials that would adsorb such gases before being liberated into the environment.

PolyHIPE polymers are highly porous materials produced by polymerizing the continuous phase of a high internal-phase emulsion (HIPE) (Barby *et al.*, 1985). Such an emulsion has a volume fraction of droplets of at least 74%, and can exceed 99% of the emulsion volume. Many applications of porous materials, such as arsenic adsorptive filtration (Katsoyiannis *et al.*, 2002), supports in solid-phase peptide synthesis (Cameron *et al.*, 1997), filtration processes of sub-micron aerosol particles (Walsch *et al.*, 1996). The highly porous materials obtained by this process have a well-defined cellular morphology. The structure of polyHIPE is characterized by the presence of numerous cells interconnected by smaller pores. In addition, features of the morphology such as cell size, interconnecting hole sizes and porosity can be efficiently controlled. PolyHIPEs have significantly higher porosity but tend to possess low surface areas due to their relatively large cell size. The highest surface areas were obtained when inert diluents (porogen) (Barbetta *et al.*, 2000) and mixed surfactants were added to the monomer phase (Barbetta *et al.*, 2004). However, the main problem of cellular materials with highest surface areas is their poor mechanical properties.

There are several techniques to minimize the weak mechanical properties. A series of 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). Silica beads are filled to retain structure during calcinations that the silica was homogeneously dispersed in the crosslinked polymer (Haifei *et al.*, 2003). Because clay is popular and available filler in Thailand, moreover, it can be used for retention of gases at room temperature conditions, also many of industrial uses of clays minerals are related to their adsorptive capacity, which increases with acid treatment (Volzone, 2007).

In this study, clay treated with acid will be incorporated into poly(DVB)HIPE polymer to increase the adsorption of poly(DVB)HIPE nanocomposites (preparing mixed surfactant) and to solve their weak mechanical properties. The purpose of this work is to prepare poly(DVB)HIPE filled with acid-treated clay and determine the suitable amounts of added clay for adsorption of toxic gases from gasification process.