CHAPTER I

INTRODUCTION

1.1 Background

Since pump and treat systems have limitations, many studies have focused on surfactant – based processes for environmental application (West and Harwell, 1992; Sabatini et al., 2000). For instance, in surfactant – based separation processes, micellar solubilization is used for contaminant extraction such as NAPL removal, and surfactant-modified materials are used for subsurface barriers or landfill liners for groundwater remediation (Harwell and O' Rear, 1989; Rouse et al., 1993; Sun and Jaffe, 1996; Butler and Hayes, 1998; Sabatini et al., 1998 and 2000; Harwell et al., 1999; Cheng and Sabatini, 2001). In addition, surfactant-coated mineral oxides can be used in the solid-phase extraction (SPE) for sample preparation method (Merino et al., 2003). In these applications, surfactant – based adsorption processes have been widely investigated and it is of interest.

Based on the surfactant adsorbed onto solid oxide surface, they can be considered as a two–dimensional solvent attached to the surface, and organic solutes can partition into the adsorbed surfactants. This phenomenon is called adsolubilization and has now been widely studied because it has been used in many applications. For example, modifying silica by admicellar polymerization has been used to improve rubber physical properties such as increasing tear strength and improving elongation to break. In addition, it has been used to form hydrophobic cotton that would repel water while allowing water vapor to be transported through the fabric (Pongprayoon et al., 2002 and 2003; Wang et al., 2006). Admicellar-enhanced chromatography (AEC) is a new fixed-bed separation process by inducing organic solutes partitioning into surfactant from aqueous phase (Harwell and

O'Rear, 1989). In addition, adsolubilization has been used to remove pollutants for water and soil remediation including surfactant – enhanced oil recovery (Esumi et al., 2000; Luciani et al., 2001).

Although surfactant-based adsorption processes can be used in many applications, economic considerations often limit the viability of these systems. Surfactant loss, due to such phenomena as precipitation, sorption, etc., is one of the problems that are typically recognized (Rouse et al., 1993; Thakulsukanant et al., 1997; Sabatini et al., 2000; Gadelle et al., 2001). Moreover, desorption is the phenomenon whereby surfactants are detached from adsorbent because of heating, difference pH of solution and dilution of surfactant concentration. Thus, it is necessary to fix the surfactants on the adsorbent. Polymerization of polymerizable surfactants is a remarkable technique that has the potential to make the surfactants adsorbed strongly on the adsorbent.

1.2 Objectives

The overall objectives of this study are to investigate adsorption of polymerizable surfactants onto positively charged aluminum oxide surface, to determine adsolubilization of organic solutes into polymerized and non-polymerized admicelles, and to evaluate to the desorption potential of polymerized admicelles. In this study, temperature, electrolyte concentration and pH of solution were held constant. The specific objectives of this study are:

1) To investigate the surfactant adsorption of both polymerizable surfactants and non-polymerizable surfactants;
2) To investigate the adsolubilization capacity of organic solutes into polymerized and non-polymerized admicelles;
3) To evaluate the effect of polarity of organic solutes on the adsolubilization;
4) To evaluate the stability of surfactant adsorbed on the alumina after polymerization of the admicelles.