

## CHAPTER I

### INTRODUCTION

The adsorption of surfactants at the solid-liquid interface is important in many traditional processes, such as, detergency, dispersion, surfactant-based separation, stability of solids, foaming, froth flotation, wetting and mineral flotation, surfactant-templated polymerization processes, surfactant-based catalysis, newer fields of template surfaces and nanotechnology, water and soil remediation, surfactant enhanced oil recovery, and surfactant-based chromatographic techniques (Pradubmook *et al.*, 2003, Asvapathanagul *et al.*, 2005). Since, various factors, for example pH, electrolyte, and temperature can influence the adsorption of surfactants at the solid-liquid interface, consequently, the adsorption of surfactants has been extensively studied in order to obtain better understanding about the effects of these factors on surfactant adsorption. Numerous studies have examined the equilibrium adsorption of cationic quaternary ammonium surfactants from an aqueous solution onto oppositely charged surfaces such as mineral oxides (alumina or silica). An addition of neutral electrolyte such as NaCl, NaBr causes a decrease in the adsorption of ionic surfactants onto an oppositely charged surface but an increase in their adsorption onto a similarly charged surface. In higher salt concentration system, surfactants compete with electrolyte ions for adsorption sites resulting in a reduction of adsorption when compared with the lower salt concentration systems. However, repulsions between surfactant head group charges are screened by binding electrolyte ions using high electrolyte concentration resulting to an increase in the surfactant adsorption (Howard *et al.*, 2009).

Upon the addition of a solid below the CMC, the surfactant bilayers are arranged as follows: the surfactant head group of the bottom layer is in contact with solid surfaces of the opposite charge and other head groups of the top layer is positioned towards the aqueous solution, called “adsorbed micelles” or “admicelles”. The hydrophobic core of an admicelle is ideal for solubilizing organic solutes, a process known as “adsolubilization”. Although there are many similarities between solubilization and adsolubilization, observed differences in the behavior are caused by different geometrical characteristics of micelles and admicelles. In most cases the

adsolubilization of neutral molecule has been considered (Thakulsukanant *et al.*, 1997). The research on adsolubilization indicated that adsolubilization capacities increase with increasing surfactant adsorption (Asvapathanagul *et al.*, 2005). Furthermore, the adsolubilization of organic contaminants on adsorbed surfactant onto solid surface is an important phenomenon for surfactant-based environment technologies. There are many factors that affect the adsolubilization such as the molecular structure of the surfactant, the pH of the aqueous solution, and ionic strength. On the other hand, the effect of electrolyte types on the adsorption of surfactants has not been widely reported. Therefore, this work investigates the effect of electrolyte types on the adsorption and adsolubilization of acetophenone into cetyltrimethylammonium bromide (CTAB) adsorbed on precipitated silica. Four different types of electrolytes; sodium chloride (NaCl), magnesium chloride (MgCl<sub>2</sub>), magnesium sulfate (MgSO<sub>4</sub>), and sodium carbonate (Na<sub>2</sub>CO<sub>3</sub>) were investigated. In addition, each type of electrolyte was also examined at different concentrations.