สำนักงานวิทยทรัพยากร
จุฬาลงกรณ์มหาวิทยาลัย

CHAPTER I
INTRODUCTION

The adsorption of surfactant at the solid-liquid interface is of wide interest in various fields of applications, such as surfactant-based separation, enhanced oil recovery, detergency, cosmetics, and pharmaceuticals. Adsorption of cationic surfactants occurs initially via electrostatic interactions between the cationic headgroup and the anionic surface. Once the extent of adsorption is sufficient to neutralize the surface charge, the so-called hemimicelle concentration, with further increases in bulk concentration, adsorption continues cooperatively via interaction between the hydrophobic tails.

The presence of the hydrophobic core within the adsorbed surfactant aggregates (admicelles) provides sites capable of solubilizing water-insoluble components, a process that has been termed "adsolubilization". The enhanced sorption/adsolubilization of organic compounds in adsorbed surfactant on solid surfaces is an important phenomenon for several applications such as surfactant-based separation and remediation. Many factors affect adsolubilization, such as the molecular structure of the surfactant, the pH of the aqueous phase, and the ionic strength.

Numerous studies have examined the adsorption of single ionic surfactant from an aqueous solution onto oppositely charged substrates (i.e. porous alumina or silica) and adsolubilization behavior of the adsorbed aggregates. But in the widespread uses, surfactant mixtures are most commonly used to provide optimal performance and to minimize costs. Despite their extensive use, the behavior of mixed surfactants at interfaces remains poorly understood. Surfactant mixtures provide several advantages over single surfactants, because the adsorption of surfactants on particles can be controlled using appropriate surfactants and solution properties. It has been reported that mixtures of cationic and nonionic surfactants also exhibit properties superior to those of the constituent single surfactants due to synergistic interactions between the different surfactant species.

This study investigated the surfactant adsorption and adsolubilization of organic solutes using a binary system of a cationic surfactant and two nonionic

surfactants with different hydrocarbon chain lengths in order to examine the effect of tail length and packing structure on the adsolubilization behavior of the admicelles. The system conditions were fixed at pH = 8 and ambient temperature. In the first part, the adsorption of single and mixed surfactant systems was studied using cetyltrimethylammonium bromide (CTAB), and nonionic surfactants with various chain lengths (Triton X-165 and Triton X-305) on precipitated silica. In the second part, the adsolubilization of toluene and acetophenone was examined in the single-surfactant and mixed-surfactant systems of CTAB and the two nonionic surfactants at various surfactant mixture molar ratios. The results from this study provided a better understanding the effect of admicelle composition on the adsolubilization behavior of mixed cationic-nonionic surfactant admicelles.