

CHAPTER I

INTRODUCTION

The adsorption of surfactant at the solid-liquid interface is critical for many processes such as detergency, wetting and mineral flotation. There have been a number of articles published on the equilibrium adsorption of cationic quaternary ammonium surfactants to oppositely charged surfaces. From these, the following mechanism has emerged, primarily from the shape of the adsorption isotherms. First, adsorption of individual molecules occurs initially via electrostatic interactions between the cationic headgroup and the anionic surface. At some point, referred to as the critical hemimicelle concentration (CHC) or critical admicelle concentration (CAC), aggregates begin to form on the surface and the slope of the isotherm increases due to cooperative interactions between the hydrophobic tails. At some point the extent of adsorption is sufficient to neutralize the surface charge and the slope of the isotherm decreases. Finally, maximum adsorption occurs at approximately the critical micelle concentration (CMC). Above this concentration any added surfactant forms micelles in solution (Rosen, 1988). The interior of the adsorbed surfactant aggregates (admicelles) at the solid/aqueous solution interface provides hydrophobic regions in which sparingly soluble compounds may solubilize, a process called adsolubilization. The adsolubilization phenomenon has opened up a variety of applications in both separation, reaction processes, surface engineering and nanotechnology (Scamehorn and Harwell, 1988). Surfactant adsorption is strongly affected by pH, ionic strength, surfactant structure, and the type of structural groups on the solid surface (Behrends and Hermann, 1988, Chorro *et al.*, 1999 and Velego *et al.*, 2000).

We have examined the impact of pH and ionic strength on the adsorption of cetyltrimethylammonium bromide (CTAB) on silica and the adsolubilization of organic solutes of varying polarities into these CTAB admicelles. First we studied the adsorption of cationic surfactant on precipitated silica at various surfactant concentrations. We then systematically examined adsolubilization of toluene and acetophenone at different values of pH and ionic strength.