CHAPTER I
INTRODUCTION

The ability of surfactants to modify the wetting or contact angle of an aqueous solution on a variety of solid surfaces is well-known (Rosen, 1989). Improved wetting or spreading of water is an important aspect application of surfactant science. In this study, the contact angle of an aqueous surfactant solution onto solid ionic surfactant surface at equilibrium is investigated. Surprisingly, this is a topic which has received either or no attention.

There are several important technological implications of this research. One explanation for the antifoam properties of fatty acids in hard water is that the hydrophobic nature of the particles of calcium/magnesium precipitate with the soap destabilizes foam lamellae through a dewetting mechanism (Garrett, 1993). Conversely, hydrophilic particles can aid in foam stabilization (Pugh, 1996). Precipitate of fatty acids in paper deinking by flotation process has been hypothesized to be responsible for attachment of ink particles to air bubbles and the resulting separation from paper fibers (Garrett, 1993, Borchardt, 1994). Obviously, the contact angle between the air/soap precipitate/solution would be important in this mechanism. There are fundamental scientific issues involved also. Adsorption of surfactant onto a solid is a primary cause of solid/liquid interfacial tension reduction and decrease in contact angle (wetting) (Rosen, 1989). Surfactants are widely used in general crystallization technology and kinetics of crystallization to adjust crystal particle size through adsorption onto crystal faces during the precipitation process (Stein, 1996, Homma *et al.*, 1997). Adsorption of surfactant onto surfactant crystals during the precipitation

process can affect both the kinetics of surfactant precipitation (Garti and Zour, 1997) and the surfactant crystal habit (Lin *et al.*, 1998, Hind *et al.*, 1999). Adsorption of surfactant from solution onto precipitated solid surfactant may likewise affect contact angles, as we will prove in this work.

Fatty acid precipitated by hardness ions is called soap scum (Draelos, 1998, Jackson, 1994). It is greasy to the touch, unlike most other single component anionic and cationic surfactants which form highly structured salt crystals. The greasy soap scum is expected to have a high contact angle with aqueous solution. A central question which has led to this line of inquiry is "How hydrophobic is soap scum?"