CHAPTER I
INTRODUCTION

Precipitation of surfactants from aqueous solution is one of their most important properties. It can be considered, either directly or indirectly, in application of ionic surfactant mixtures. The precipitation of ionic surfactants is an important phenomenon in areas such as detergency, surfactant based separation processes, wastewater treatment and enhanced oil recovery. In detergency, the precipitation is undesirable and considerable effort has been expanded to develop formulations with high hardness tolerance to permit washing in hard water. So phosphate builders are often added to household detergents to minimize the effects of hardness (Coons et al. 1987).

Builders sequester multivalent ions so that they are no longer available to precipitate the surfactant. On the other hand, the tendency of surfactants to precipitate can be useful in such applications as recovery of surfactants from surfactant based separations and surfactant – enhanced water flooding of oil reservoirs. Most reservoirs have a high brine concentration, which can cause the surfactant to precipitate. This results in less surfactant reaching the oil, a lower recovery, and therefore greater costs to produce the oil (Donaldson et al, 1989).

For the process to be economical, surfactant must be recovered and recycled. The recovery of surfactant can make a separation process economically attractive by reducing raw material cost. The material being removed from the original aqueous stream by the surfactant – based separation (e.g., dissolve organic or heavy metal pollutant) is often easier to recover or concentrate further once the surfactant is removed and recycled into the process. (Brant et al, 1989).

Soap and synthetic anionic surfactants have traditionally been major constituents in many cleaning agents. An important characteristic of anionic surfactants is their tendency to precipitate from hard water.

Precipitation of anionic surfactants can inhibit their use in many applications and can affect formulation compositions substantially. The use of surfactant mixtures can have synergistic advantages over the use of a single surfactant in cases such as detergency,where surfactant precipitation is detrimental. Understanding the interactions between different surfactants can increase ability to improve detergent formulations, especially as environmental laws become more restrictive .

Soap tends to form oily precipitates. Therefore, one might hypothesize that the precipitate of mixed anionic / soap systems might form more easily than in surfactant systems which result in more crystalline type precipitate (Fan et. Al.,1985, Peacock and Matijevic, 1980, Matheson et al, 1985). It is also important to note that the soap solution properties are very pH dependent since the carboxylic acid can protonate at low pH.

The study of precipitation of anionic surfactant and soap is also important in cleaning industries. Soap and synthetic surfactants have traditionally been major constituents in many cleaning agent. They must have good characteristics of cleaning such as good wettability, high surface spreading, low surface tension, or low contact angle. Therefore, the study of the contact angle of soap and anionic surfactant is done by measurement of the surface spreading coefficient. When the substrate is a solid, the spreading coefficient must be evaluated by indirect means, since surface and interfacial tensions of solids can not be measured directly. The method of doing this involves measuring the contact angle that the substrate makes with the liquid in question (Rosen, 1989).

Therefore, the purpose of this study is to understand the tendency for mixtures of synthetic anionic surfactant (sodium dodecyl sulfate, SDS) and soap (sodium octanoate, SO) to precipitate in the presence of calcium at different pH and mole ratios of soap / anionic surfactant and the contact angles.