CHAPTER I
INTRODUCTION

Perchloroethylene (PCE) is classified as a hazardous substance. It is widely used in various applications. This compound must be removed from contaminated sites.

Surfactant Enhanced Aquifer Remediation (SEAR) is a technique which can be used to clean up organic contaminant. Microemulsion formation of surfactant gives two different mechanisms (i.e., surfactant-enhanced solubilization and surfactant-enhanced mobilization) for cleaning up contaminated sites. Utilizing surfactants in pump-and-treat or exsitu soil washing techniques can substantially increase the solubilization of organic contaminants, therefore decreasing the time and saving the cost when properly implemented. Minimizing surfactant loss is critical to the implementation of this remediation technique (Krebbs-Yuill et al.,1995). Previous studies have shown mono and dialkyl diphenyloxide disulfonate (DPDS) surfactants to be good candidates for enhanced remediation, due to their minimal sorptive losses, their favorable operating characteristics (Rouse et al., 1993), and their successful use in field demonstrations (Knox et al., 1997). Nevertheless, this advantage is compensated by the higher solubilization potential of the other surfactants, with middle phase microemulsions having the highest solubilization potential. A recent study (Carter et al., 1997) has shown the enhancement of the solubilization potential of DPDS by using an electrolyte and an alcohol as co-surfactant to produce microemulsion. However, alcohol is on organic air pollutant and produces an explosion hazard. Alcohol should rather be

considered as co-solvents that distribute between the aqueous and the oil rich bulk phases, and the interfacial layer, thereby decreasing the effective hydrophilicity of the amphiphile as well as the effective hydrophobicity of the oil (Kahlweit et al., 1991). The phase diagram that deals with quinary mixtures are difficult to represent in a three dimensions. Particularly, mixtures of oil and alcohol as well as ionic amphiphile and alcohol are poor pseudocomponents where adding too much alcohols makes the mixture become weakly structured (Kahlweit et al., 1994).

Ionic microemulsion on temperature scale can be prepared by means of a lipophilicity scan, that is, by using a sufficiently lipophilic double tail ionic amphiphile and varying its effective lipophilicity by adding either a less lipophilic single tail or a more lipophilic double-tailed ionic surfactant (Kahlweit, 1995). In this study, alcohol free microemulsion formation with perchloroethylene (PCE) and a commercial DPDS, DOWFAX#8390, was accomplished by varying its lipophilicity through adding octanoic acid, which is more hydrophobic than alcohol; different ratios of DOWFAX#8390 to octanoic acid were investigated. This paper also investigated the effect of using single electrolyte and mixed electrolyte on phase behavior of this system at different temperature to avoid gel formation through precipitation of the surfactant with octanoic acid.