

CHAPTER V

CONCLUSIONS AND RECOMMENDATIONS

5.1 Conclusions

Dowfax#8390 in an aqueous solution formed a Winsor Type I microemulsion, the formation microemulsion Type I to III, IV, and II occurred on scanning with CaCl_2 concentration. Gel formation occurred in the some Type II microemulsions at low surfactant concentration due to the presence of octanoic acid as the co-surfactant at the high concentration of CaCl_2 electrolyte needed for the Dowfax#8390. The gel disappeared at high surfactant concentration due to the reduction of the electrolyte and electrolyte activity. The presence of gel phase prevents the use of surfactant at lower concentration and renders use of this system problematic for soil remediation. At fixed electrolyte and 24 °C, the reduction of octanoic acid ($R = 0.75$) had little effect on gel formation. Gel formation still occurred at 35 °C and 45 °C and with use of a mixed electrolyte.

A type IV microemulsion which has a low viscosity and a maximum solubilization of oil and water is the most effective for mobilization and is most suitable for solubilization of oil contaminant in the subsurface in Surfactant Enhanced Aquifer Remediation (SEAR). The minimum Dowfax#8390 producing a Type IV, which gave a clear microemulsion with a low viscosity, could be made by adding electrolyte into the middle phase microemulsion. The selection of the optimum microemulsion system needs compromise between the use of surfactant, viscosity, and solubilization of oil.

5.2 Recommendations

In this study, octanoic acid co-surfactant was used to replace flammable alcohol co-surfactant, however, it was sensitive to hardness ions results in gel formation. The recommendations given for future work are following,

- 1) Development of the Type IV microemulsions should be done with a different co-surfactant to reduce the amount of Dowfax#8390 used.

- 2) Use with Dowfax#8390 of mixed co-surfactant such as alcohol and octanoic acid or use of a branched acid or a di-acid should solve the formation of gel phase. A less hardness sensitive non-alcohol co-surfactant should be studied.