CHAPTER I
INTRODUCTION

The formation of asphaltic sludge precipitates after acidizing treatment is a serious problem. Sludge can plug an oil production tubing or rock formation. Especially, in the presence of Fe^{2+} and Fe^{3+} ions, this problem is more serious. Strong acids such as hydrochloric acid seem to destabilize the colloidal dispersion and cause asphaltene precipitates and rigid film emulsions.

This problem has been recognized over the crude of Western Canada such as the Beahill Lake crude, in Alaska and California as well as in the San Andres crude of West Texas and the Smackover crude of Mississippi (Jacobs, 1989). Aromatic solvents are usually used for asphaltene removal. However, because of the environmental concerns, there is still a need of developing effective and non-hazardous substitutes for the chemical treatment of asphaltene precipitates and deposits. Studies on the dissolution of asphaltenes using non-aromatic solvent have been undertaken in recent years (Permsukarome, 1995).

Chang and Fogler (1994) used a series of alkylbenzene-derived amphiphiles to investigate the asphaltene-amphiphile interaction and the stability behavior of asphaltene in amphiphile/alkane solutions. It was concluded that the criteria for amphiphile molecules effective to stabilize asphaltenes in apolar media were the association of amphiphiles to asphaltenes surfaces by the headgroups of amphiphiles and the establishment of a steric layer around asphaltenes by the tail group of amphiphiles. A mechanistic study on the interaction between asphaltenes and two types of alkylbenzene-derived

amphiphiles, namely, p-alkylphynol and p-alkylbenzene sulfonic acid, was carried out using Fourier infrared transform spectroscopy to characterize the acid-base interaction between asphaltenes and amphiphiles and Small-angle X-ray scattering techniques to study the physical structure of asphaltene colloids in these amphiphile solutions.

In a previous study, a variety of additives have been proposed over the last several years to prevent the sludging problem. However, their effectiveness is limited by the need to obtain a compatible combination of additives and a lack of understanding of the complex chemistry involved in the asphaltic sludge precipitation reactions (Permsukarome, 1995).

With the expected trend of the petroleum industry toward heavier and more asphaltic crude, the economics of petroleum recovery, production and processing is bound to get worse. The economic recovery of oil from some reservoirs, even during primary production, has been seriously challenged by the asphaltene deposition problem. The petroleum industry is being forced to direct more attention and capital to research of asphaltene deposition because of the threat it poses to the economic recovery of oil (Leontaritis, 1989).

In this study the asphaltic sludges were synthesized using different precipitating conditions by varying the concentrations of ferric chloride and hydrochloric acid in acidic solution. Asphaltenes precipitated from asphaltic sludge were characterized to study the asphaltic sludge precipitation. In conjunction, the dissolution kinetics of various asphaltene precipitates was studied using amphilphile/alkane solution.