CHAPTER I

INTRODUCTION

Deposition of heavy organic compound, called asphaltenes, has been one of the most common problems in petroleum production, processing and transportation. Asphaltene deposition on the pore surfaces of oil reservoirs during enhanced oil recovery (EOR) processes reduces the permeability of the pore space, leading to the eventual isolation of oil from the flowing fluid in the reservoir (Rassamdana,1996). Deposition of asphaltenes on the pore surface can also alter the wettability of the reservoir from the original water-wet toward the oil-wet condition. This wettability reversal may also reduce the efficiency of oil recovery (Mansoori et.al,1990). Besides those problems, asphaltenes can deposit on the surface of distillation column, pipelines, tanks, and other equipment, resulting in distillation column and pipeline pluggage, tankage capacity loss and equipment malfunction. It is also considered to be a cause of catalyst deactivation. (Leontaritis,1989)

Due to the problems caused by asphaltene deposition and the increasing trend toward the utilization of heavier crude oil and the use of secondary and tertiary methods in oil recovery, more attention and fund has been directed to the research of asphaltene deposition. Intensive studies on the nature of asphaltenes and the mechanism of their deposition have been carried out. Various models of asphaltene precipitation have been proposed

in the hope that this will lead to the better understanding and allow the modification of asphaltene - deposit removal process.

Various of methods have been used to treat the problems. Mechanical methods, such as pigging, cutting, and scraping, can remove organic deposits effectively but they are time-consuming methods and fraught with practical problems. Another approach is by using chemical treatment. Chemicals designed to dissolve deposited asphaltenes are usually the mixtures of aromatic solvents and surfactants, which will act as peptizing agents in the disperse system.

In this thesis, the research was divided into two parts. The first part was the kinetic study of dissolution of deposited-asphaltene by fluid composed of amphiphiles and alkane. The purpose of this part was to identify the factors affecting the kinetics of asphaltene dissolution. The influence of the effect of the composition and flow rate of amphiphile/alkane fluids on the rate of dissolution of asphaltene deposits was systematically investigated. The major variables evaluated were the flow rate of micellar fluids, the fluid temperature, the concentration of amphiphiles in the fluid, the type of amphiphiles, and solvents in the fluid. Understanding the kinetics of dissolution of deposited asphaltenes will help us establish the guideline for the dissolution of asphaltene deposit using amphiphile/alkane solution.

The second part was the study of stability of different asphlatene fractions in the selected amphiphile/alkane solutions. The objective of this part was to provide more definite data about the structure of asphaltenes which was considered to be complicated both in structure and polydispersity. In this part asphaltene fractions were prepared by further fractionated from the asphaltene sample freshly precipitated from Mobil crude oil.

In both parts two oil-soluble amphiphiles, dodecylbenzene sulfonic acid (DBSA) and nonylphynol (NP), were selected to study because these two derivative chemicals have been found effective in stabilizing asphaltenes in alkane media.