CHAPTER I
INTRODUCTION

Asphaltenes are constituents of the most polar and heaviest component of crude oil. On the basis of solubility, asphaltenes are soluble in light aromatics such as benzene and naphthalene, but insoluble in light aliphatics such as pentane and heptane. Asphaltene particles are thought to be stabilized in crude oil by resins, another component of the crude. Resin molecules resemble surfactant molecules orient themselves towards the polar surface of the asphaltene particle, with their hydrocarbon tails extending into the oil phase, thus forming a micellar structure (Yen, 1981). Therefore, asphaltenes in crude oil is, in fact, a colloidal system. Light alkanes preferentially dissolve resins, thus breaking the micellar structures. The asphaltene particles then aggregate due to the attractive forces between them and subsequently precipitate.

Asphaltene precipitation manifests itself in almost all the facets of production, transportation and processing of the crude (Lichaa and Herrera, 1975). Precipitation normally occurs due to changing in the system parameters such as temperature, pressure and pH. Reservoir flooding by light hydrocarbons (LHC) and carbondioxide matrix acidization causing asphaltene polymerization are commonly encountered processes which cause asphaltene precipitation (Jacob, 1989).

Heavy organic deposition during oil production and processing is a very serious problem in many areas throughout the world (Leontaritis and Mansoori, 1988). In the Prinos field in North Aegean Sea, some wells completely ceased producing oil in the matter of a few days after commencing production with the initial rate of up to 3000 BPD. The economic implications of this problem can cost over half a million dollars today. In Venezuela, the formation of heavy organic (asphaltic sludge) after shutting in a well temporarily (after stimulation treatment by acid) resulted in partial or complete plugging of the well (Lichaa, 1977). At the Hassi Messaoud field, Algeria, deposit of heavy organics in the tubing was reported a very serious production problem (Haskett and Tartera, 1965).

Due to the serious economic nature of these problems, numerous studies have been done on asphaltene precipitation. Aromatic-based fluids (polyaromatics, naphthalene, xylene, and toluene) are effective in cleaning asphaltene deposit in reservoirs. However, aromatic fluids are known to be expensive due to the large volume required to immerse the formation. Studies on stabilization of asphaltenes using non aromatic-based liquids have been undertaken for recent years. Chang and Fogler (1993 and 1994) found that the asphaltene could be completely stabilized in alkane-based solution containing a sufficient amount of alkylbenzene-derived amphiphiles. Deboer and coworkers (1995) also found that alkylbenzene sulfonic acid with a sufficiently long alkyl tail could effectively reduce the precipitation of asphaltenes in near-wellbore regions.

A major problem in the study of asphaltenes is the lack of defining their exact structure. Asphaltene structure differs from source to source. This study, thus, focused on the characterization of asphaltene providing meaningful insights into linking properties of asphaltenes from different crudes. In this study, simulation to get the different characteristics of asphaltenes was performed from a particular crude oil. Due to the extremely complex structures of asphaltenes, several characterization techniques were employed in this study to identify both chemical and physical structures. In this study, Brunauer-Emmett-Teller (BET), ICP-90, elemental analysis, furier transform spectroscopy (FTIR), and UV/VIS spectroscopy were employed.