CHAPTER I
INTRODUCTION

Asphaltene deposition has been studied for many decades but still the least understood phenomena. Asphaltene deposition is a serious problem frequently happened in the oil industry over the world and makes large problems. Asphaltenes cause severe information damage in wellbore, porous media, and production pipelines plugging, and coke in refining processes (Wattana *et al.*, 2004)

Asphaltenes are brown and black powdery solid and insoluble in light alkanes, such as heptane or hexane and soluble in aromatics, such as toluene or benzene. Asphaltenes are typically composed of polyaromatic chains and heteroatoms such as oxygen, sulfur, nitrogen, and traces of nickel, vanadium and Iron (Chang *et al.*, 1994).

Typically, asphaltene molecules are stable in crude oil by another natural component in crude oil, called resins. These resin molecules adsorbed on the asphaltenes to form micelle-like aggregates and stabilize asphaltenes (Chang *et al.*, 1994). As long as asphaltenes molecules are remained stable in the micelle-like aggregates, no precipitation occurs. However, changes in temperature, pressure, and chemical composition disturb the asphaltene-resin equilibrium and induce asphaltene precipitation (Al-Sahhaf *et al.*, 2002).

The scarcity of resins can be enhanced by introducing of compounds of similar structure to nature resin. These chemicals can be natural resins extracted from crude oil or insoluble-synthesized chemicals (amphiphilic molecules or alkylbenzenes). Extensive works have been investigated the effect of alkylbenzenes on asphaltene precipitation by introducing alkylbenzene to asphaltene system at high concentrations up to higher than 10,000 ppm. Those studies suggest that alkylbenzene molecules such as dodecylbenzenesulfonic acid (DBSA), and nonylphenol effectively stabilize asphaltenes (Chang *et al.*, 1994).

Nevertheless, preliminary results from this work indicate that low concentrations of alkylbenzenes which less than 1,000 ppm universally destabilize asphaltene. This new finding has not been discovered in literature. One possible hypothesis is that degree of destabilization of asphaltene is induced by basic strength of alkylbenzenes. Hence, the main goal of this work is to investigate the relationship between basicity of alkylbenzene and degree of destabilization of asphaltenes.

Investigating this hypothesis will improve the understanding of the asphaltene itself and alkylbenzene-asphaltene interaction. In this work, potentiometric titration and microscopy experiment were used to investigate basic strength of basic alkylbenzenes and degree of destabilization of asphaltenes, respectively.