CHAPTER I
INTRODUCTION

Asphaltenes are commonly classified as the most polar part of crude oil that are insoluble in normal alkanes such as n-heptane but soluble in aromatic solvents such as toluene (Speight 1999). Asphaltenes can be destabilized during oil production due to variations in temperature, pressure, and oil composition. Destabilized asphaltenes lead to serious problems in oil industries. For example, during crude oil transportation, asphaltene deposition can plug transportation pipelines, which leads to a significant loss in productivity and high cost of remediation (Leontaritis *et al.*, 1994). In order to solve these problems, it is necessary to understand the mechanisms of asphaltene deposition to improve prediction and prevention of deposits.

Asphaltene instability, which causes asphaltene deposition, has previously been investigated by several techniques. The minimum amount of precipitant that causes asphaltenes to precipitate has been defined as the precipitation onset volume (Pina *et al.* 2006). Recently, Maqbool *et al.* (2009) revealed that asphaltenes are unstable at conditions below onset volume but it may take days or months to completely precipitate. The capillary deposition technique is one possible approach to detect the instability of asphaltenes more quickly than batch aggregation processes (Hoepfner, 2010). Most of the previous capillary deposition work has largely studied asphaltene deposition near and past onset volume and assumed that oil-precipitant mixtures are stable if no asphaltenes were detectable after waiting fixed times (Wang *et al.*, 2004; Maqbool *et al.*, 2006). Hoepfner (2010) investigated asphaltene deposition below the onset point and revealed that asphaltenes are destabilized and have ability to deposit before the instability can be identify by microscopy.

The main objective of this work is to study asphaltene deposition in a capillary at low heptane concentration, obtain images of the deposit and evaluate the deposition thickness along the length. Further goals were to investigate the mixing in the capillary deposition apparatus, the location of the deposit and the mechanism of asphaltene deposition. Additionally, the deposition of different types of crude oil was investigated to check for applicability of the results in different reservoirs.