CHAPTER I
INTRODUCTION

1.1 Motivation

For the past 10 years, many researchers have focused on the synthesis of nanoparticles because it is believed that nanoparticles have a unique ability to improve mechanical, electrical, optical, and chemical properties as compared with conventional polycrystalline materials. New physical properties such as high hardness combined with good fracture toughness and corrosion resistance for coating industries, high contact area for the oxidation and reduction with the surrounding environment for catalytic applications, and high surface area which promote rapid interactions of active material with surrounding media have been discovered. Properties such as these motivate further study (Xiao *et al.*, 2000, Wu *et al.*, 1999). It has been found that the properties of nanoparticles depend on the method of preparation. A variety of synthesis methods, such as hydrolysis, sol-gel processing, bulk-precipitation, spray-drying, freeze-drying, hot-spraying, laser vaporization and controlled condensation (LVCC), hydrothermal techniques, and microemulsion (or reverse micelles) have been studied to prepare nanoparticles. Among these methods, the microemulsion technique is the most interesting because it allows for easy control of particle size.

Water-in-oil (w/o) microemulsion, the aqueous phase is dispersed as microdroplets surrounded by a monolayer of surfactant molecules in a continuous hydrocarbon phase, has been used as a constraint microreactor for synthesizing ultrafine particles with a narrow size distribution by controlling the growth inside of a water drop. It is interesting to know how the reverse micelle influences the final particle sizes and their properties. Factors influencing the size of nanoparticles can be the conditions of preparation and an intermicellar exchange rate. The preparation conditions are calcination time and temperature, reaction time and temperature, and composition of the microemulsion solution. In addition, the intermicellar exchange rate involves organic solvent, organic additive, and volume ratio of water to oil, nanosize reactor or molar ratio of water to surfactant, and structure of reverse micelles.

Many researchers have studied these factors that influence the size of nanoparticle synthesis from microemulsion type II, for examples; water content, temperature, and salt. So far nobody has studied the scanning effect of these factors across three types of microemulsions to understand the change of particle size along with the change of microemulsion phases and their effects on physical properties such as surface area, size and shape, and morphology.

1.2 Objectives

This work focused on the effects of salinity scans transormation from microemulsion type I to type II at constant temperature on the synthesis of nanoparticles. Titanium dioxide nanoparticles were synthesized using a microemulsion system containing sodium bis (2-ethylhexyl) sulfosuccinate (AOT) anionic surfactant, with n-heptane as the oil phase and titanium salt solution as the aqueous phase. The method of adding a second reactant was used to prepare titanium dioxide nanoparticles in the microemulsion. Dynamic light scattering (DLS), coulometer, x-ray diffraction (XRD), scanning electron microscope (SEM), transmission electron microscope (TEM), and surface area analyzer (SAA) were used to characterize the oxide product particles.