CHAPTER I
INTRODUCTION

Surfactants are widely used in several industrial products especially in household products in large volumes. But surfactants are still presence in sewage effluents and sludges which are normally discharged into surface waters or disposed of on lands, thus impacting the ecosystems. Nowadays, awareness of the ecological impacts of surfactants is growing owing to increased interest in environmental issues. Surfactants that are friendly with environment and rapidly biodegradation should be interested for used in any application.

Moreover, the price of petrochemicals has increased so the renewable resources surfactants have become more attractive to replace petroleum-based alkyl phenol ethoxylates surfactant because they have less toxic after biodegradation. Surfactants are downstream products from petrochemical plants and can be directly produced from natural products; they become more valuable and are used in many applications.

These are many reasons why alcohol ethoxylates are being evaluated. Alcohol ethoxylates are nonionic surfactant so they are more tolerant of high ionic strength and hard water than anionic surfactants. They biodegrade more readily than linear alkyl benzene sulfonate (LAS) which are currently common surface active agents. Moreover, they are excellent detergents for removal of oily soil and are often used in laundry products. They are also excellent emulsifiers and suspending agents in numerous industrial applications, where they compete with alkylphenol ethoxylates which completely biodegrade under aerobic conditions, the rates are slower than alcohol ethoxylates. The aerobic biodegradation intermediates are toxic to fish and other aquatic organisms.

In addition, microemlsion formation of alcohol ethoxylates is an interested property because microemulsion applications span many areas including enhanced oil recovery, pharmaceutical, agrochemicals, cosmetic ingredients, and household products. The widespread interest in microemulsions and use in these different industrial applications are based mainly on their high solubilization capacity for both of hydrophilic and hydrophobic compounds, their large interfacial areas, the ultra-low interfacial tensions achieved when they coexist with excess aqueous and oil phases, and their long-term stability.

The application potential of microemulsions was recognized at an early stage and has started a buildup of knowledge about the phase behavior of oil-water-surfactant systems, which called fish diagram. At low surfactant concentrations, there is a sequence of equilibrium between phase may be in equilibrium with excess oil (Winsor type I), excess water (Winsor type II) or with both excess phases (Winsor type III, or middle phase microemulsion). For nonionic surfactants, the I→III→II→V transition may occur by raising the temperature (Holmberg *et al.*, 2002). The use of medium-chain alcohols as cosurfactants in the microemulsion formation is, therefore, to improve the solubilization capacity of the water phase in the oil phase and vise versa. In the case of nonionic surfactants, the ability of the alcohol is typically to balance their affinity for water and oil. Thus, lower the interfacial tension between the water and oil phases will occur.

The purpose of this work is to investigate the microemulsion formation of motor oil with mixed of alcohol ethoxylates having different EO groups and lipophilic linker under various temperatures. Nevertheless, microemulsion formation of alcohol ethoxylates by obtaining fish diagram of oil/surfactants/hydrophilic surfactant/lipophilic linker/water system to form Winsor type I–III–II–IV will be set up. In order to enable to choose the suitable conditions for a specific application, the effects of number of ethylene oxide (EO) groups of ethoxylates and methyl ester salfonate (MES) as hydrophilic surfactant, Span80 as lipophilic linker and temperatures on microemulsion formation and solubilization will be studied.