CHAPTER I
INTRODUCTION

Surfactants are widely used in households and industry in large volumes and some of the surfactants still remain in the 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 biodegradable have been increasingly gained more and more interests for various applications. Furthermore, in recent years as the price of petrochemicals has increased, the renewable resources for producing surfactants have become a more attractive option to replace petrochemical raw materials.

These are several reasons why alcohol ethoxylates are increasingly of interest. One of them in that alcohol ethoxylates can be produced from plant oil including plam oil which considerately cheap and available in Thailand. Fatty alcohol can react with ethylene oxide (EO) known as ethoxylation to produce alcohol ethoxylates as nonionic surfactant. Alcohol ethoxylates have better biodegradation than alkylphenol ethoxylates and linear alkyl benzene sulfonate (LAS) which are under pressure from environmentalists for the advance impact on the environment. Moreover, alcohol ethoxylates 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.

To replace the common surface active agents by a group of alcohol ethoxylates, the knowledge of basic physico–chemical properties is necessary for applying these knowledge in selecting surfactants, ingredient and conditions for any given applications such as powered detergents, dishwashing liquids and industrial cleaning agents.

Microemlsion formation of alcohol ethoxylates with various oils is an important property for a wide range of application including enhanced oil recovery, the dispersion of drugs and food stuffs, agrochemicals, cosmetic ingredients, and detergency. The widespread interest in microemulsions for these different industrial applications are based mainly on their high solubilization capacity for both hydrophilic and lipophilic compounds, their large interfacial areas, the ultra-low interfacial tensions and their long-term stability.

The potential application of microemulsions based on the knowledge about the phase behaviour of oil-water-surfactant systems. At low surfactant concentrations, there is a sequence of equilibria between a microemulsion phase in equilibrium with an excess oil phase (Winsor Type I microemulsion), with an excess water phase (Winsor Type II microemulsion), or with both excess phases (Winsor Type III, or middle phase microemulsion). For nonionic surfactant systems, the I-III-II transition occurs by raising temperature whereas the transition of ionic surfactant systems can be induced by increasing salinity. (Holmberg *et al.*, 2002)

The purpose of this work was to study microemulsion formation of alcohol ethoxylates by obtaining phase diagrams of oil/water/surfactants system to form different types of microemulsions (Winsor Type I–III–II–IV), the so-called fish diagrams. Microemulsion studies were first carried out using both single alcohol ethoxylates, nonionic surfactants and mixed surfactant systems of alcohol ethoxylates (EO3) and methyl ester sulfonate (MES) with n-butanol as a cosurfactant. For single nonionic system, EO3 was used to form microemulsions with motor oil at different temperatures (20–40 °C). For the mixed system, EO3 was mixed with MES for a weight fraction of MES = 0.02 at different NaCl concentrations. Moreover, solubilization parameters and IFT (interfacial tension) were determined, in order to enable to choose the right conditions for any specific application.