CHAPTER 1
INTRODUCTION

The origins of surfactants currently available can be classified into two groups: oleochemical surfactants, also referred as natural surfactants, are derived from plant oils or animal oils and fats, while petrochemical surfactants, also known as synthetic surfactants, are derived from petroleum. At the presence, most surfactants are produced from petroleum because of the low prices. However, the uses of natural surfactants have been rising because they are environmental friendly and can be produced from renewable resources.

The main problem of using alcohol ethoxylates (AEs) for the replacement of petrochemical surfactants is lack of basic information of their properties. Basically, all surfactants have a similar basic structure: a hydrophilic (water-loving) "head" and a hydrophobic (fat-loving or water-hating) "tail" which is generally a long chain of carbon atoms, the carbon chains of natural feedstock (fatty alcohols) are always linear and even-numbered, for example, palm oil (providing C_{16} to C_{18} chains), and palm kernel and coconut oils (as the laurics, C_{12} to C_{14}), while synthetic feedstock may have branched carbon chains and contain even or odd number of carbon atoms. These differences can have a significant impact on cleaning performances in mixed surfactant systems. Therefore, different hydrophobic structures in both surfactants affect the performance properties.

In AEs production process, the number of EO group in the surfactant products can be controlled by the modification of catalysts. Alcohol ethoxylates with a series of ethylene oxide group can be produced, therefore, obtaining a range of performance properties for versatile applications. Moreover, the alcohol ethoxylates do not give off an offensive odor due to a small amount of residual unreacted alcohol, has a high cloud point, and is highly soluble in water and produces a narrow gelling region in an aqueous solution. The alcohol ethoxylate also has a low pour point and great ability to reduce interfacial tension. In addition, alcohol ethoxylates show excellent foaming, penetrating, solubilization, and detergency.

The hydrophilic and hydrophobic parts—alkyl chain and polyethylene oxide (POE) chain, respectively—of AEs dominate the interfacial properties, for example,

critical micelle concentration (CMC), liquid/vapor surface tension at the CMC (γ_{CMC}), adsorption, and wettability. These properties are important in cleaning performance: CMC tell the point at which many properties change their trends; low surface tension at the CMC generally assists cleaning; adsorption tells how surfactant molecules interact with the surface and amount of surfactants adsorb on; and wettability relate to detergency.

In this work, the physico–chemical properties of oleochemical AEs with a series of POE group (EO5 to EO9) was studied and compared with commercial nonionic surfactant and anionic surfactant—nonylphenol ethoxylates 9 (NPE-9) and methyl ester sulfonate (MES), respectively. Critical micelle concentration (CMC) and liquid/vapor surface tension at the CMC (γ_{CMC}) have done by using tensiometer with Wilhelmy plate method. The adsorption and wettability of studied surfactants on different hydrophobic surfaces was also evaluated. Adsorption has been done by solution depletion method, whereas wettability has been done by contact angle measurement with sessile drop method. In addition, correlation between wettability and adsorption was determined in order to obtain a better understanding of role of surfactants.