CHAPTER I
INTRODUCTION

Nowadays, the environmental concerns have made effort of the decreasing use of petroleum energy resources and increasing the use of renewable biofuels. Vegetable oils have been considered as such an alternative fuel source owing to its nontoxic and renewable nature. Several vegetable oils have been used to replace diesel fuel which used in engine for vehicles and industries. Among there, vegetable oils such as palm oil, canola oil and soybean oil, castor oil, have received increased interest in several researches. However, the utilization of vegetable oil in diesel fuel has a limitation problem that is high viscosity of vegetable oil, therefore, the use of vegetable oil in diesel engine causes engine's performance problem. As a result, the technology of reducing vegetable oil viscosity has been widely developed which is vegetable oil-based microemulsions because it is simple, less CO and NO_x emission, and burn more completely. Microemulsion biofuel is direct combination between diesel fuel and vegetable oil or animal fat with surfactant as emulsifier to form single phase microemulsion.

Ethanol is a renewable energy source from agricultural feedstocks such as corn and sugar cane crops. So, ethanol with diesel and vegetable oil mixture can be used in diesel engines without engine modification. In micellar microemulsion system, ethanol is used in place of the polar phase and it can reduce viscosity of vegetable oil and diesel mixture. However, limitation of ethanol and diesel blends is immiscible. Surfactants can be used as emulsifiers to stabilize between ethanol and diesel phase. Therefore, formation of vegetable oil/diesel blends with ethanol can be stabilized and formed Winsor Type II microemulsion by solubilization of reverse micelles.

In previous study, many types of surfactants were used to form microemulsion fuels such as anionic carboxylate based extended surfactant, renewable based nonionic surfactant. Nonionic surfactant system has better performance than anionic surfactant system in cases of no salt required, more oil soluble, and no phase separation and precipitation at low surfactant concentration.

The aim of this research is to formulate hybrid biofuel with vegetable oil/diesel blend using nonionic surfactant reverse micelle microemulsion. Hence, this research also focuses on compatibility between nonionic surfactant and cosurfactant. The structure of surfactants and cosurfactants are varied in salt-free microemulsion system for phase behavior studies.