CHAPTER III
EXPERIMENTAL

3.1 Materials

Castor oil (C) was purchased from Hong Huat Co. Sunflower oil (S) was purchased from Thanakorn Vegetable Oil Product Co., Ltd. Sorbitan monooleate (Span 80) was purchased from Sigma-Aldrich Chemical. Fatty alcohol C12-14 approx. 2 mole EO, 5 mole EO, and 7 mole EO were obtained from Thai Ethoxylate Co. Ltd., Thailand. Ethanol (Ethyl alcohol) absolute, 1,2-Propanediol (Propylene glycol), and Glycerol about 85 % were purchased from Merck & Co. All materials were used as received.

3.2 Methodology

3.2.1 Screening of Components

Different oil phases were screened on the basis of similar structure and molecular weight for miscible blend. Surfactant was screened on the basis of Hydrophilic-lipophilic balance of surfactant (HLB). When lower HLB value was used, higher lipophilic or oil soluble the surfactant. Co-surfactants are screened on the basis of increasing the number of hydroxyl groups as we changed from ethanol to glycerol to investigate the influence of co-surfactant on the formation, properties, and stability of microemulsion.

3.2.2 Preparation of Microemulsion

Microemulsion formation was carried out using a method based on a spontaneous emulsification procedure (Saberi *et al.*, 2013). Spontaneous emulsification was performed by mixing surfactant and co-surfactant at fixed surfactant/co-surfactant weight ratio (S/C) (1/4, 1/6, 1/8 and 1/32) in a 10 mL glass vial while magnetically stirring (600 rpm) at ambient temperature. Oil phase (Castor oil and Sunflower oil) and the surfactant mixture were then mixed at the volume ratios. The sample was mixed until homogeneous dispersion. Then each mixture

system was use double distilled water as a water phase. All samples were stored in sealed containers to avoid problems with evaporation during treatment or storage. The clear phase transform to turbid solution were observed by the naked eyes, and the composition was remarked as the phase boundary. Each set of experiment was repeated three times, and the average of the values obtained was used for data analysis.

3.3.3 Construction of Pseudo-Ternary Phase Diagram

In order to study phase behavior and miscibility of the microemulsion, the concept of pseudo-ternary phase diagram representing three-component system were used. A pseudo-ternary phase diagram was an equilateral triangle which consists of three vertices of three phase (oil phase, surfactant and co-surfactant mixture phase and water phase) (Fernando *et al.*, 2005). Two vertices at the bottom of triangle represented the surfactant and co-surfactant mixture at a constant ratio and mixture of castor oil and sunflower oil at the left side and the right side, respectively, while the upper vertex represented the amount of water. The composition at each point in a ternary phase diagram demonstrated the volume percent of the three components.

3.3.4 Characterization of Microemulsion of Castor Oil

3.3.4.1 Particle Sizing and Zeta Potential Measurement

To study the stability and cleansing efficiency of microemulsion by using a dynamic light scattering instrument (Malvern Zetasizer Nano series). The measurements were performed at ambient temperature.

3.3.4.2 Viscosity Measurement

To investigate the properties such as water content and droplet size of microemulsion by using rheometer model DV-III, Brookfield at ambient temperature at speed 250 rpm.

3.3.5 Study of Cleansing Efficiency

The efficiency of cosmetic cleansing was studied by using porcine skin as a skin test (Herron, 2009). To test the cleaning efficiency of various samples,

red lipstick of 0.03 grams in length 2.5 cm was applied on porcine skin and 1 gram of the prepared mixture was used to remove the applied lipstick (Wangkuntham *et al.*, 2011). Number of rubbing and volume of water used were used as a measure for cleansing efficiency of each products.