CHAPTER III
EXPERIMENTAL

3.1 Materials and Equipment

Equipment:

1. Tensiometer (Easydyne model)

Chemicals:

Surfactant

1. C15-18 internal olefin sulfonate (C15 -18 IOS, obtained from Shell)
2. C19-23 internal olefin sulfonate (C19 -23 IOS, obtained from Shell)
3. C24-28 internal olefin sulfonate (C24 -28 IOS, obtained from Shell)
4. C16-17 alcohol alkoxy sulphate (AAS with 7PO, obtained from Shell)
5. Sodium dodecyl benzene sulfonate (SDBS, obtained from Sigma Aldrich)
6. Alcohol ethoxylate with 8EO group (AE 8EO, obtained from BASF)
7. Alcohol ethoxylate with 5EO group (AE 5EO, obtained from Thaiethoxylate)
8. TWEEN 80 (obtained from Sigma Aldrich)

Brine

1. Sodium Chloride (purity 99 % AR grade, obtained from RCI labscan.)
2. Calcium Chloride

Gas

1. Air zero (purity 99.99 % will be obtained from Praxair Inc.)

Alkane

1. n-hexane (purity 99 % AR grade, obtained from RCI labscan.)
2. n-dodecane (obtained from Merck)
3. n-hexadecane (obtained from Merck)

3.2 Experimental Procedure

3.2.1 Critical Micelle Concentration Measurement

Surface tension measurement: Surface tension of surfactant solutions will measured by Wilhelmy plate method from tensiometer (Easydyne model). In order to fine CMC. The surfactant solutions will be prepared with deionized water.

3.2.2 Surfactant Solution Preparation

a. 1 wt.% stock solution was prepared.

b. Stock solution was diluted to prepare 5 concentrations of each surfactant by following Equation (3.1).

$$C_1V_1 = C_2V_2 \quad (3.1)$$

C1 = Concentration of stock solution

C2 = Final concentration after dilution

V1 = Volume needed to be diluted

V2 = Final volume after dilution

3.2.3 Foam Stability Test

Foam stability test was performed by two different methods.

3.2.3.1 Shaking Method

This method will be followed Lee *et al.* (2014)

a. Before testing, 50 mL glass cylinder will be cleaned by detergent and then rinsed well with acetone and de-ionized water respectively to eliminate all organic matters.

b. 50 mL of surfactant solution was poured into glass cylinder. Rubber cork will be used to seal the top of glass cylinder.

c. Glass cylinder was shaken 20 times vigorously.

d. The foam height was detected as a function of time.

In shaking method, 0.5 wt.% of all surfactants will be tested to compare the foam stability at the same concentration.

3.2.3.2 Column

a. Before testing, glass column will be cleaned by detergent and then rinsed with acetone and de-ionized water respectively to eliminate all organic matters.

b. The apparatus composes of glass chromatographic column with a diameter of 30 mm and length 600 mm, air tank and flow meter. The bottom of column is connected to a flow meter, and air tank.

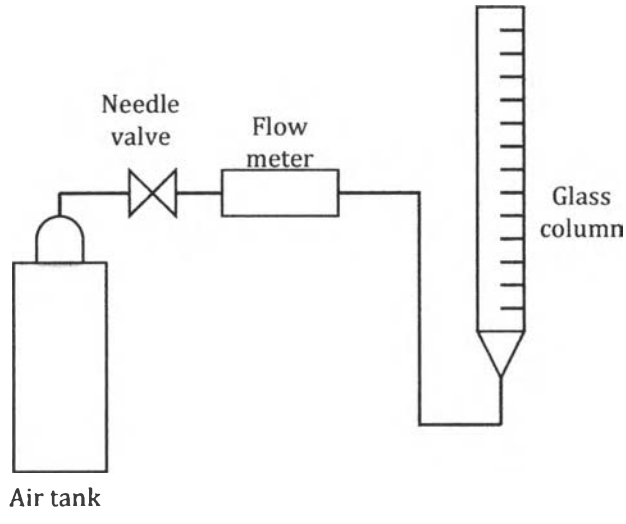

Figure 3.1 Schematic of foam column apparatus.

c. Air will be purged to the column at the bottom through surfactant solution in the column to generate foam at room temperature (25±2 °C). The height of the foam will be measured as a function of time. The solution used is 50 mL and the gas flow rate is 250 mL/min.

The procedure of column will be following:

1. Types of surfactant: Each of surfactant will be prepared at lower, higher CMC point, at CMC point, 5 times of CMC and 10 times of CMC.

2. The effect of brine concentration: Brine solution was prepared. NaCl:$CaCl_2$ ratio is 8:2 by weight. The concentration of brine was varied at 5 wt.% and 10 wt.% in surfactant solution. The brine solution was mixed with surfactant

solution at the concentration that gives the most stable foam from step 1 before testing in column.

3. The effect of alkanes:1 wt.% of alkanes was mixed with surfactant solution that gives the most stable foam from step 1 before testing in column.

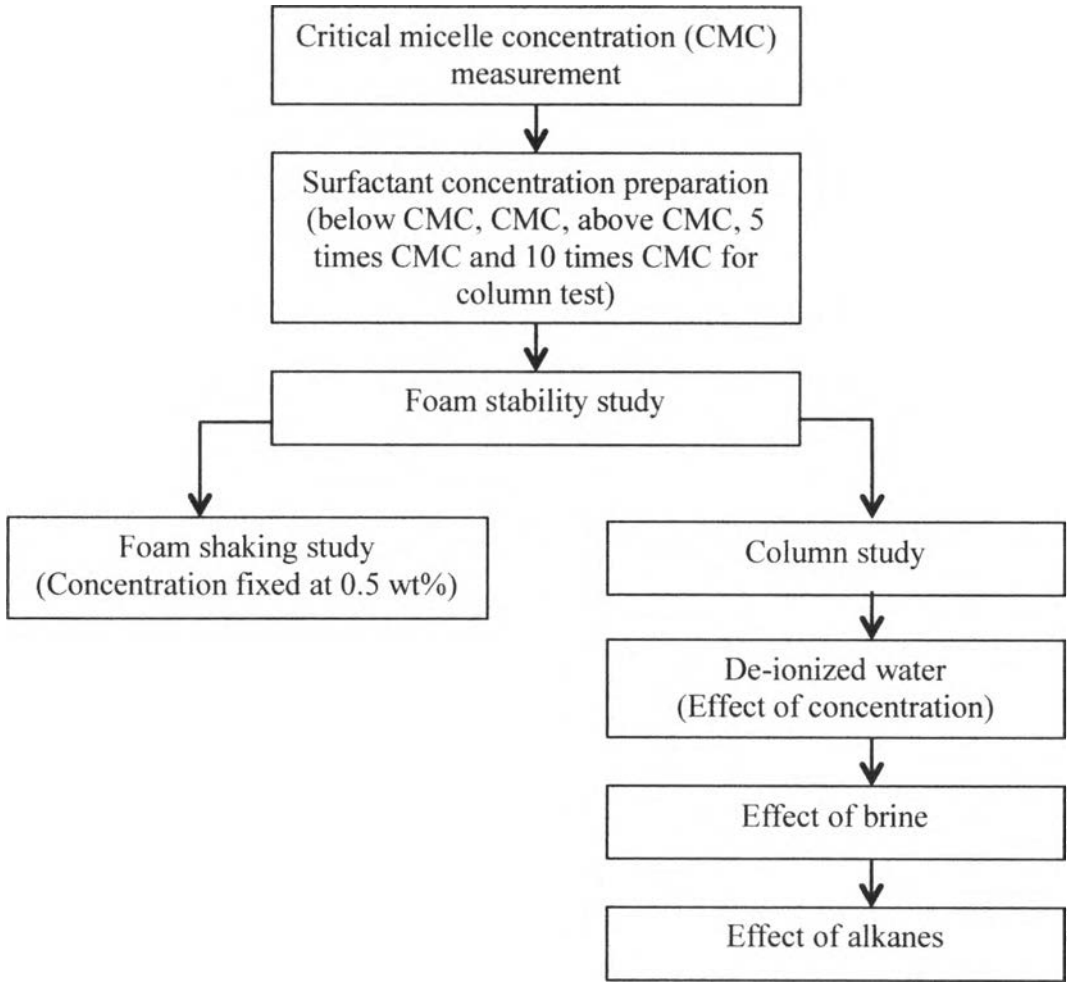

Figure 3.2 Procedure diagram of this study.