CHAPTER III
EXPERIMENTAL

3.1 Materials

Sodium dodecyl sulfate (SDS) at a purity of 99% and cetyltrimethyl ammonium bromide (CTAB) at a purity of 99% were purchased from Aldrich Chemical Company. t-Cetylphenol polyethoxylate (Triton X-114) at a purity of 99% was purchased from Lab-Scan (Asia) Co.,Ltd. High density polyethylene (HDPE) was donated from Thai Polyethylene Co.,Ltd. Polypropylene (PP) was donated from Thai polypropylene Co., Ltd. Sodium hydroxide and hydrochloric acid were purchased from Lab-Scan Co., Ltd. All chemicals were used as received.

3.2 Methodology

3.2.1 Adsorption Isotherm

Adsorption experiments were carried out using different concentrations of surfactant aqueous solution. Surfactant stock solutions were prepared and diluted with deionized water to form a series of 20 ml solutions with varying surfactant concentrations. These surfactant solutions were added to vials containing 0.5 g of plastic. The mixtures were allowed to equilibrate at 30° C in a shaker bath for 48 hr. After equilibrium, the supernatant was separated from the mixture by syringe filter and the bulk phase concentration of surfactant was measured using a total organic carbon analyzer (TOC) (Shimadzu, TOC 5000).

The adsorption of surfactant onto plastic was determined by simple mass balance. The experiments were carried out at 3 different pH values (4, 6 and 10) and an ionic strength of 0.1 M. The pH of the solution was adjusted by NaOH or HCl solution and ionic strength was adjusted by NaCl.

Calculation of the amount of surfactant adsorbed

The adsorption of surfactant onto plastic was studied by measuring the surfactant concentration before and after equilibrium using Total Organic Carbon analyzer (TOC). The different between initial and equilibrium concentration was used to calculate the amount of surfactant adsorption using equation 3.1.

$$C_{ads} = \frac{\left[\left\{(C_I - C_{eq})/1000\right\}\ V_{sol}\right]}{W_{plastic}} \qquad (3.1)$$

where:

C_{ads} = Adsorption of surfactant, (μmol/g)

C_I = Initial concentration of surfactant solution, (μM)

C_{eq} = Equilibrium concentration of surfactant, (μM)

V_{sol} = Volume of solution, (ml)

$W_{plastic}$ = Weight of plastic, (g)

3.2.2 Zeta Potential

The zeta potential measuresents of solid particles were carried out by using Zeta meter Model 3.0+. The mixture of plastic and surfactant solution was placed in electrophoresis cell. Electrodes placed in each end of the cell are connected to a power supply, which creates an electric field, causing the charged colloid to move. Individual particles are tracked as they travel under a grid in the eyepiece of the microscope. All of the experiments were controlled at constant temperature (30° C).