

CHAPTER III EXPERIMENTAL

3.1 Materials

3.1.1 Chemicals

The cationic surfactant, cetylpyridinium chloride (CPC, 99% purity), was obtained from Zealand Company. The anionic surfactant, 4-octylbenzenesulfonate sodium salt (NaOBS) was purchased from Sigma. And the nonionic surfactant, Polyoxyethylene octyl phenyl ether (OPEO₁₀) was from Fluka. All chemicals were used without further purification.

3.1.2 Plastics

Acrylonitrile butadiene styrene (ABS) was from Thai ABS Co., Ltd., while polymethyl methacrylate (PMMA) was obtained from Diapolyacrylate Co., Ltd. And polyhexamethylene adipamide (Nylon6,6) was from Global Connections Co., Ltd.

3.2 Methodology

3.2.1 Plastics Preparation

First, plastic pellets were grinded into powder by a grinding machine. Then the powder was sieved to get the particles that were in the range of 45-125 μm in diameter. This powder was further used in adsorption experiment.

3.2.2 Adsorption Isotherm

Adsorption experiments were carried out using different concentration of aqueous surfactant 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 placed into a screw capped containing 0.25 g of plastic. The filled vials were allowed to equilibrate at 30 °C in a shaker bath for 24 hours. After equilibrium, the supernatant was separated from the

mixture by centrifuged at 2000 rpm for 10 minutes and was then analyzed for the bulk phase concentration of surfactant using a UV-Vis Spectrometer (Shimadzu, Lamda 10). The amount of surfactant adsorbed was determined using the solute depletion method.

3.2.3 Surface Tension Measurement

The surface tension of surfactant solutions was determined by wilhelmy plate technique using tensiometer. All surface tension measurements were controlled at 30°C. The solution was first half filled into 20-ml vessel, then a platinum plate with the surface being tested. It was slowly immersed in the solution in order to register the height at which this occurred as the 'zero depth of immersion'. The plate was then be wetted to a set depth to insure that there was indeed complete wetting of the plate (zero contact angle). When the plate was later returned to the zero depth of immersion, the force it registers could be used to calculate surface tension.

3.2.4 Contact Angle Measurement

The contact angles were measured using the sessile drop technique by the contact angle measuring instrument (Krüss, DSA10). The fresh plastic pellet was first compressed into a smooth sheet and cut to an appropriate size. A 10 μL drop of surfactant solution was then placed onto the plastic sheet and the contact angle was measured after 2 minutes in order to allow equilibrium to occur. During the measurement, the chamber was kept at 30°C and saturated with water vapor to prevent drop evaporation effect.

3.2.5 Brunauer-Mmmett-Teller (BET)

The surface areas of the plastics were measure by using the Quantachrome Autosorb-1. It measures the quantity of gases absorbed onto or desorbed from a solid surface at some equilibrium vapor pressure. Nitrogen with cross sectional area $16.2 \times 10^{-2} \text{ m}^2/\text{molecule}$ was employed as an adsorbate at the liquidified nitrogen temperature (77K).

The plastic amount of 0.7 g was dried and out gassed in the sample cell at 80 °C for at least 24 hours before the adsorption. The specific surface area of each plastic was evaluated from the five adsorption isotherm. The results were analyzed using the Autosorb-1 ANAGAS software Version 2.10.