CHAPTER III
METHODOLOGY

3.1 Materials

All chemicals were used without further purification. Polypropylene (PP) was purchased from liackseng trading Group Limited, Acrylic acid monomer was purchased from Merck, Thailand, Wood flour was purchased from VP wood Group Limited, and acetone from Labscan asia Co., Ltd., Thailand.

3.2 Equipments

3.2.1 Thermalgravimetry Analysis or TGA (Perkin Elmer, TGA7)

3.2.2 Scanning Electron Microscopy or SEM (Hitachi S-4800)

3.2.3 Differential Scanning Calorimeter (Perkin-Elmer DSC 7)

3.2.4 Pendulum Impact Tester (Zwick 5113)

3.2.5 Universal Testing Machine (Instron 4206)

3.2.6 Twin Screw Extruder (Collin, T-20)

3.2.7 Injection Machine

3.2.8 Beaker

3.2.9 Stainless Tray

3.3 Methodology

3.3.1 Grafting of Acrylic acid onto Wood Flour

The Acrylic acid grafted Wood Flour (AAc-g-WF) with 2, 6 and 10 wt% of AAc was prepared via external mixing process. For 300 g of WF, 20 g of AAc for 2 wt%, 60 g of AAc for 6 wt% and 100 g of AAc for 10 wt%, were dissolved in 1 L of acetone together with 4 g of benzoyl peroxide, respectively. And 400 g and 500 g of WF were do as same as 300 g of WF. After that, WF was immersed into the acetone solution

completely then placed it in the hood overnight and 12 hours in oven at 60°C for acetone volatilization. After acetone completely evaporated, AAc and BPO were coated on WF's surface.

3.3.2 Compounding

The WF was dried in oven at 70°C overnight for reducing humidity and processed with polypropylene in a twin screw extruder, with the mixed ratio of WF: PP were 30:70 wt%, 40:60 wt% and 50:50 wt% , respectively. The temperature profile was set at 160-170-170-175-175-180-180-180-185-185°C and the screw speed at 35 rpm. All materials after extrusion were pelletized by rotating blader.

3.3.3 Specimens Preparation

Specimens were prepared by injection molding. The temperature profile was set at 195-200-210-200°C and maximum injection pressure was 65 bars. Study the mechanical properties at room temperature and humidity 50%.

3.4 Characterizations and Testings

3.4.1 Characterizations

3.4.1.1 Thermogravimetric Analyzer

The thermogravimetric analyzer (Perkin Elmer, TGA7) was used to determine the thermal behavior of wood plastic composite. The experiment was carried out by weighting a powder sample of 5-10 mg and placed it in a platinum pan, and then heated it under oxygen flow with the heating rate 20 °C/min from 30-600°C.

3.4.1.2 Tensile Test

Tensile test were tested according to the ASTM Standard Test Method (ASTM D638) with a Universal Testing Machine.

3.4.1.3 Flexural test

Flexural tests were performed on the samples of 12.7 mm in width and the as-molded thickness of around 4 mm conforming to the ASTM D790 standard.

3.4.1.4 Impact test

Notched Izod impact experiments were carried out following the ASTM D256 standard.

3.4.1.5 Scanning Electron Microscope (SEM)

Crack surface morphology of wood plastic composite was investigated by using scanning electron microscope, Hitachi S-4800, surface morphology of wood plastic composite with an accelerating voltage of 20 kV. Samples were coated with platinum under vacuum before observation.

3.4.1.6 Differential Scanning Calorimetry (DSC)

Differential Scanning Calorimeter (DSC), Perkin-Elmer DSC 7, The samples were heated from 20 °C to 200 °C at a heating rate of 10 °C/min under N2 atmosphere with a flow rate of 10 ml/min.

3.4.2 Water Absorption

Treated and untreated wood plastic composites samples of approximate dimensions (6.35×1.27×0.27 cm^3) were used for the measurement of water absorption and thickness sweeling. Measure the constant weight of samples and then immersed the samples in a static deionized water bath at 70°C and held in water for 30 days

Water absorption (WA) was calculated according to the following formular

$$WA(\%) = (M_e - M_o) / M_o \times 100,$$

Where M_e is the mass of the sample after immersion (g); M_o is the mass of the sample before immersion (g).

The thickness sweeling (TS)was calculated as follows:

$$TS(\%) = (t_e - t_o) / t_o \times 100,$$

Where t_e is the thickness of the sample after immersion (m); t_o is the thickness of the sample before immersion (m).