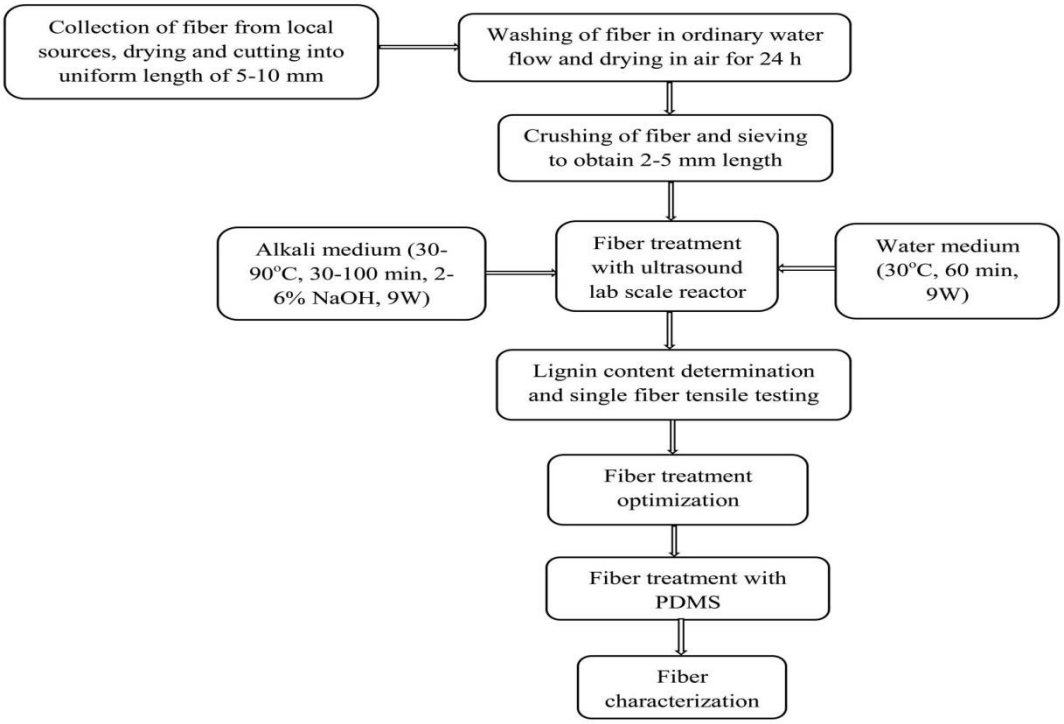
CHAPTER 3

MATERIALS AND METHODOLOGY

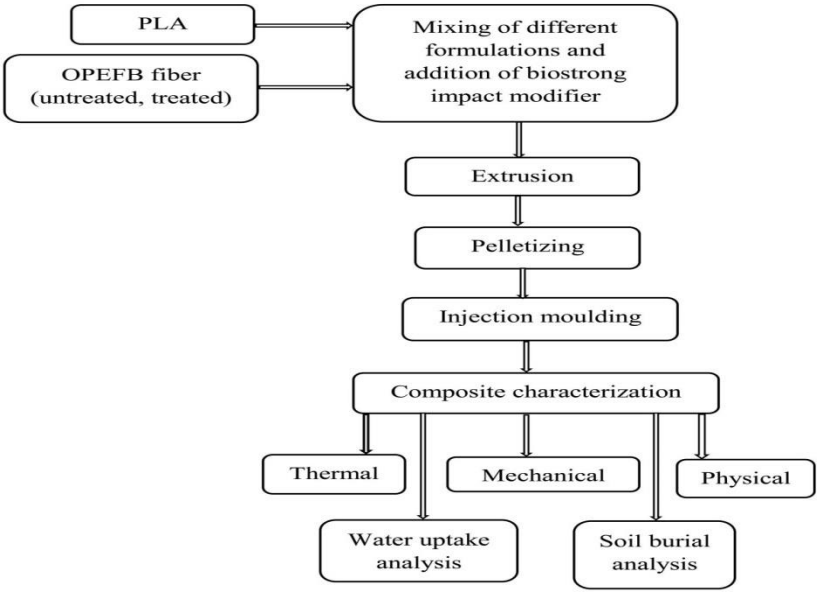
3.1 INTRODUCTION

In this research, composites were from oil palm empty fruit bunch fiber (EFB) and poly (lactic) acid (PLA) matrix. The selection of materials and experimental procedures were selected based on literature review as discussed in Chapter 2. Modifications were made to the surface of oil palm empty fruit bunch (EFB) through ultrasound treatment in both water and alkali medium. Composites were prepared from EFB fiber and PLA matrix. To further enhance the adhesion of fiber to the matrix, silane coupling agent; poly (dimethylsiloxane), chlorine terminated (PDMS) was used incorporated onto the fiber surface. Improvements were offered to make up for the brittleness of the poly (lactic) acid (PLA) matrix through the incorporation of impact modifier. Different characterization procedures were carried out in order to study the effect of surface treatment on performance of EFB fiber reinforced poly (lactic) acid composites, as well as the influence of impact modifier on the composite.

This chapter describes the various materials used for the research as well as the experimental procedures, the different treatment methods applied to the fiber surface, the composite fabrication steps, the characterization and standard testing methods such as ASTM, ISO, etc. as well as little details on the equipment and machines implored for the various testing. The flow process of the experimental design is as represented in Figure 3.1.



(i)



(ii)

Figure 3.1: Experimental flow of research methodology showing (i) fiber treatment and characterization and (ii) composite fabrication and characterization

3.2 MATERIALS

3.2.1 Polymer Matrix

The polymer matrix used for this research is thermoplastic poly (lactic) acid resin. It is a Poly lactic acid of Natureworks Ingeo™ Biopolymer 3051D grades supplied by Unic Technology Ltd, China. It has a density of 1.24 g/cm^3, melt flow index of 30-40g / 10 min. (190^{o}C/2.16kg) and a melting temperature of 160-170^{o}C.

3.2.2 Reinforcing Fiber

The fiber used is oil palm empty fruit bunch (EFB) fibers which were collected as waste materials from LKPP Corporation Sdn. Bhd., Kuantan, Malaysia.

3.2.3 Chemicals

The chemicals used for this research and the suppliers are listed in Table 3.1.

Table 3.1: List of chemicals

Chemical	Supplier
Acetone	Merck
Acetic acid	Sigma
Sodium hydroxide (NaOH)	Merck
Potassium Bromide (KBr)	Merck
Tetraoxosulphate (VI) acid (H_2SO_4)	Sigma

3.2.4 Impact Modifier

The impact modifier used (Biomax® Strong 120) was collected for experimental purposes from Dupont, Switzerland. Dupont™ Biomax® strong (biostrong) is an ethylene-epoxy based copolymer specially designed to be grafted on to modify PLA.