CHAPTER I

INTRODUCTION

1.1 The Interest and Progress of the Polymer Composite Materials

Nowadays, the industrial development is expanding tremendously and rapidly to acquire the convenience of mankind. In the field of materials, polymer composites are the product from one of the most promising industries, polymer processing which provides endlessly useful applications, such as structural materials, sports equipment, auto parts, aircrafts etc. Polymer composites are combinations of polymer and other materials present as separate phases and combinations to form desired structures so as to take advantages of certain desirable properties of each component. Reinforced polymer composites are most widely used because of their high strength and stiffness. The things that make the reinforced polymer composites play a significant usefulness generally fall into the following categories: (1) The reinforcement has high strength and stiffness, and the matrix serves to transfer stress from one fiber to the next to produce a fully dense structure. (2) The matrix, polymer, has many desirable intrinsic physical, chemical, or processing characteristics; and the reinforcement serves to improve certain other important engineering properties, such as tensile strength, creep resistance, or tear resistance. (3) Emphasis is placed on enhancing the economic attractiveness of the matrix, e.g. by mixing or diluting it with materials that will improve its appearance, processability, or cost advantages while maintaining adequate performance.

1.2 The Potential Use of Natural Fiber as a Resource for Reinforcement in Polymer Composites

The tropical countries are almost endowed with substantial renewable resources of many natural fibers like coir, banana, sisal, talipot, palmyrah and screwpine for many hundred-thousand tones per year[1]. At present, only small fractions of the fibers produced are being

used in preparations of mats, mattings, brushes as fancy articles. This is due mainly to the uneconomical methods of extraction adopted, resulting in fibers of poor quality, lack of understanding of their structures and properties, including engineering properties, etc. Synthesized fibers like glass and carbon fibers which are used as reinforcement in making structural components are not suited for common applications like storage of consumer goods, low cost housing, etc. In addition to the development of high performance composites reinforced with very strong and stiff fibers, polymers reinforced with natural fibers such as cellulose are among them and the significant attention that followed is a better utilization for the renewable fibrous biomass. Particular interest is concentrated on producing and applying such composites in developing countries.

1.3 Objectives of the Research Work

The objectives of this work fall into the following categories:

1.3.1 The interfacial adhesion of the two phases of coir fiber-unsaturated polyester composites will be enhanced by a coupling reaction of 2-diallylamino-4,6-dichloro-s-triazine, the coupling agent on the fiber.

1.3.2 The existence of interfacial adhesion will be investigated.

1.3.3 The reinforced polyester composites will be appropriately fabricated to be tested and to achieve best mechanical properties under coir fiber reinforcement.

1.4 Scopes of the Research Work

Cellulose and wood fibers have drawn much attention as possible reinforcements in a variety of polymeric matrixes[2-6]. The bare coir fiber has shown significantly to be used as reinforcement in thermosetting plastics without enhancing interfacial adhesion by the coupling agent providing fair mechanical properties[2]. Many scientists[5-6] have tried to treat cellulose fiber with a variety of the coupling agents to induce a chemical reaction between the interface of fiber and polymer matrix but no one has obviously proved that a coupling reaction occurs at the interface. This research work covers the following topics.

1.4.1 Investigation of chemical composition, structure and mechanical properties of the coir fiber.

1.4.2 The ways to improve the coir fiber to possess suitability in both chemical composition and mechanical properties for fabrication of composites.

1.4.3 Synthesis of the coupling agent and treatment of the coir fiber surface with the coupling agent.

1.4.4 Proof of the interfacial adhesion between the coir fiber and unsaturated polyester matrix.

1.4.5 Determination of the optimum condition to make the coir fiber reinforced-unsaturated polyester composites to possess highest working properties.