CHAPTER V

CONCLUSION

The coir fiber has a potential as a resource of reinforcement in unsaturated polyester due to its high stiffness and natural abundance. The removal of lignin from the coir fiber is useful in two ways: first the tensile strength and modulus can be increased and second the cellulose area at coir fiber surface is increased leading to a higher probability for the coupling reaction of the coupling agent and the coir fiber surface to take place. The removal of lignin was obtained by extraction with 0.1 M NaOH solution at 100°C. The residual lignin content which was obtained by determination of the Kappa Number of the ground coir fiber was decreased significantly with increasing time of treatment with NaOH solution. The relation between the Klason lignin content of the coir fiber and tensile strength showed significant dependence. The tensile strength of the coir fiber were higher when the Klason lignin content was reduced to about 6.09% which corresponded to the time of treatment of about 4 hours. 2-Diallyl-4,6-dichloro-s-triazine, the coupling agent, was synthesized from cyanuric chloride and diallylamine based on the Thurston's method. The product yield was 85%.

This research indicated the possibility of the existence of chemical interfacial bonding between the coupling agent and the fiber; and the treated fiber and the matrix. The coupling agent can possibly induce the coupling reaction between coir fiber surface and styrene monomer, a crosslinking agent of the unsaturated polyester matrix, was elucidated by making use of the Diffuse Reflectance Technique in FT-IR spectrophotometry. The IR spectrophotometric experiment consisted of, (1)analysis of the IR peaks obtained from the Diffuse Reflectance Technique of the coir fiber reacted with the coupling agent. (2)analysis of the copolymer produced from the copolymerization reaction of the coupling agent and styrene monomer; and (3)analysis of the Diffuse Reflectance IR peaks of the graft-copolymer obtained from styrene monomer-UP reacted the coir fiber surface treated with the coupling agent. The existence of the important IR peaks in each experiment is a good

verification that 2-diallylamino-4,6-dichloro-s-triazine should technically be a coupling agent for enhancement of interfacial adhesion between the coir fiber and the unsaturated polyester.

In the analysis of Differential Thermal Analysis(DTA), the new peaks of melting transition temperature of the coupling reaction phase region observed in the presence of the coupling agent. This indicated that chemical bond between the treated coir fiber and UP matrix may have been occurred. The presence of the micro fibrils linked between the treated coir fiber and the matrix, and the fiber fracture themselves of the impact fracture surface evidenced by Scanning Electron Microscopy (SEM) also indicated the possibility of the existence of chemical bond between the fiber and the matrix.

It is generally approved that the adhesion between interface of fiber and a matrix can enhance mechanical properties of the composite due to the increment of the ability to transfer load from the matrix to the fiber. The better mechanical properties (tensile, compressive and flexural properties) of the treated coir fiber composites than the untreated one indicated that the crucial function of adhesion between the fiber surface and unsaturated polyester matrix. The increased mechanical properties resulted from 2% treated to 8% treated coir fiber composites indicated more or less the respective increment of the interfacial adhesion.

Impact strength showed an increasing trend of strength. It was increased by the addition of the coir fiber reinforcement because the coir fiber could blunt the crack growth by its more ductility than the matrix. More coupling agent content could improve the impact strength steadily from non-treated to 8% treated coir fiber-UP composites.

The effect of the amount of coir fiber content on other mechanical properties apart from the impact strength gave the following conclusions. The mechanical properties were increased gradually from 10% to 30% fiber loading. Beyond 30% fiber loading, the properties dropped drastically. The roles of fiber in the UP matrix were the interfacial adhesion and voids.