REPLACEMENT OF SYNTHETIC FIBER IN FIBER REINFORCED PLASTIC COMPOSITES WITH NATURAL FIBER OF *Pandanus ceylanicus*

By

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Dedicated to

My

Beloved Parents

Declaration

"The work described in this thesis was carried out by me under the supervision of Dr. Jagath K. Premachandra and a report on this has not been submitted in whole or in part to any University or any other institute for another Degree / Diploma"

M.G.D.E.Prematunga

Declaration

"I certify that the above statement made by the candidate is true and that this thesis is suitable for submission to the University for the purpose of evaluation."

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ABSTRACT

The objective of this project was to study *Pandanus ceylanicus* for its mechanical properties and to explore the potential to use the fiber as a reinforcement material for fiber reinforced polymer composites.

Generally fiber reinforced polymer composites are reinforced by synthetic fibers. Though they demonstrate many advantages such as better structure related physical and chemical properties and higher compatibility between individual components, the major limitation in synthetic fibers is the high cost. The manufacturing of these synthetic fibers are very expensive, hence the fiber reinforced polymer composites produced using them are also expensive.

One good alternative to overcome this problem is to replace the high cost synthetic fiber with low cost natural fibers. For the most part natural fibers derived from plants are used and the inherent properties of them to survive in nature are maximized to improve the composite structure. Nowadays many synthetic fibers in fiber reinforced polymers are replaced by natural fibers like Jute, Sisal and Coir.

Therefore in this project *Pandanus ceylanicus* a highly abundant tropical species was studied for its mechanical properties and the possibilities of being used as reinforcement material for fiber reinforced polymer composites. The unsaturated polyester resin was used as the matrix material for the fiber reinforced polymer composite structures. Different ratios of *Pandanus* fiber : unsaturated polyester resin was used to prepare samples and the mechanical properties were analyzed.

Depending on the size and size distribution of the particles and the concentration of fiber as a percentage by weight incorporated into the composite, the tensile properties, maximum strain and the hardness vary. It was concluded that the size, diameter and length and inherent properties of the *Pandanus ceylanicus* fiber particles and the chemical composition of the matrix and reinforcement material contribute to the tensile properties, maximum strain and ultimate hardness.

By analyzing the results obtained for the tensile strength, the maximum strain and the hardness, it was observed that the maximum percentage weight of the *Pandanus ceylanicus* fiber particles which can be incorporated into the resin is 20 percent. The optimum results were obtained when the fiber particle incorporation by percentage weight ranges from 2.0 % to 5.0 %.