

## DEVELOPMENT OF A MILITARY HELMET USING COCONUT FIBER REINFORCED POLYMER MATRIX COMPOSITE

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### ABSTRACT

Coconut fiber reinforced polymer composite was used to investigate its suitability for the production of a military helmet. The coconut fiber, otherwise known as the coir fiber was used as the reinforcement while epoxy resin (*bisphenol-A-diglycol*) served as the matrix. Seven specimens were produced having 20%, 40%, 50%, 60%, 70%, 80% and 85% coir fiber content in the composite and their mechanical properties (tensile strength, impact strength, flexural strength and hardness strength) were evaluated. Specimen helmets were formed from blanks that were produced by simple hand lay-up technique adopting the formulation that offered the most acceptable combination of mechanical properties. Specimen E, having a fiber content of 70% in 28% resin offered remarkable combination of properties: impact strength of 8.733J/mm<sup>2</sup>, hardness strength of 30.03HRF, tensile strength of 13.81N/mm<sup>2</sup> and a flexural strength of 31.88N/mm<sup>2</sup>. Since impact test result is the most critical test in this research, and specimen E offered the highest, it was adopted for the production of the sample military helmets in this work. The impact strength showed by specimen E (70% coir fiber in 28% resin), which was 8.733J/mm<sup>2</sup> clearly implies that the composite material can be used for the production of military protective helmets. Therefore, coir fiber can be used comfortably as reinforcement in polymer matrix composite for the production of Military helmet.

**Keywords:** Military helmet, Protective helmet, Coconut fiber, Coir fiber, Polymer matrix composite, Fiber reinforcments, Epoxy resin.