INFORMATICS JOURNALS

Print ISSN : 0022-2755

Journal of Mines, Metals and Fuels

Contents available at: www.informaticsjournals.com/index.php/jmmf

Fabrication and Mechanical Testing of Glass Fiber Reinforced Epoxy Matrix Composites Modified with Powdered Metallic Fillers

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Abstract

Composite materials made up of polymer matrix reinforced with synthetic fibers have gained popularity of late owing to their enhanced mechanical properties. However, very little work is reported to date on metals being used as filler material. Research gaps were obtained pertaining to the use of metallic fillers in synthetic fiber reinforced polymer composites. This paper demonstrates an attempt to fabricate composites made of Epoxy polymer matrix and E-glass fiber reinforcement with Mild Steel in its powdered form as fillers. Composites are prepared in varying weight percentages of the filler in the order of 2 wt. %, 4 wt. % and 6 wt. %. Hand layup method is employed for fabricating these composites which are later subjected to compression. Further, the samples are machined according to ASTM D3039 standard for tensile test and ASTM D256 standard for Izod impact test. Hardness test is also performed using a Shore D Durometer and these properties are compared with the unfilled samples. The results indicated that the weight percentage of the filler clearly influenced the mechanical properties of the developed composites. This study also revealed that the hardness and tensile strength of these composites improved with the incorporation of fillers up to 2 wt. % whereas, the impact strength improved up to 4 wt. %. Thereafter, there was a decline in their impact and tensile properties. However, hardness marginally increased beyond 4 wt. %. This area is open for research with regard to their usability under tribological, high temperature or magnetic conditions.

Keywords: *Glass Fiber, Hand Lay Up, Mechanical Testing, Metallic Filler, Polymer Composite*

1.0 Introduction

Composite materials, also called as composites, are a class of materials formed when two or more dissimilar materials, each possessing its own characteristics, are combined to form a unique material whose properties are higher than that of the original constituents for a particular application. Development and application of composite

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