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Mechanical characterization of Basalt/epoxy composite laminates containing graphene nanopellets

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Abstract.

This paper presently investigates the influence of graphene nano-pellets (GnPs) inclusion on mechanical properties (tensile, flexural and impact resistance) of basalt/epoxy composite laminates. Variation of mechanical properties was explained by different GnPs loading by weight ratios (0.1, 0.2 and 0.3 wt %) between epoxy and filler, controlling with full basalt/epoxy laminates (unfilled). Failure characteristics of the prepared samples were also presented and compared along with GnPs filler loadings. Results indicated from this study that incorporation of GnPs fillers at 0.1 wt % significantly enhanced the mechanical properties of basalt/epoxy composites due to high bonding strength at the interphase between GnPs-epoxy-fiber interactions.

Keywords: Graphene, basalt fiber, mechanical, epoxy

1. Introduction

In the last few decades, fiber reinforced composites have attracted a great interest in material science and applications because of their higher strength and stiffness to weight ratios compared with conventional materials like metals. Basalt fiber is a natural fiber produced from the volcanic rocks, originating by frozen lava and a melting with a temperature range between 1500° and 1700 °C [1]. With the advent of new and eco-friendly material applications, usage of basalt fiber has been increased and it is candidate for future materials due to its low cost and higher mechanical properties such as good strength and modulus compared with glass fibers. Though having similar chemical composition, the properties of basalt fiber are evenly better than the properties of glass fibers [2-6]. Basalt fiber as an inorganic fiber offers high tensile, compressive strength and modulus besides it exhibits high chemical and thermal stability, good electrical and sound