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Abstract

The unique and exceptional properties of graphene based nanofillers have impelled material scientists for their possible exploitation in fibrous polymeric composites. Present investigation elucidates the effect of environmental temperature on the mechanical response of glass fiber/epoxy (GE) composite loaded with a range of graphene oxide (GO) content. Incorporation of 0.5 wt.% GO in GE exhibited 21.1% improvement in flexural strength. The state of interface (both GO/epoxy and glass fiber/epoxy) and its impact on the flexural behaviour at various testing temperatures has been discussed. The viscoelastic properties of all the materials have been further evaluated in the temperature range of 40 – 200 °C. The Weibull design parameters have been analysed as a function of GO content and testing temperature. Scanning electron microscope (SEM) analysis of fractured surfaces has been carried out to comprehend various interfacial strengthening and failure micro-mechanisms.

Keywords: A. Graphene; A. Polymer-matrix composites (PMCs); B. Interface/interphase; B. Mechanical properties.

1 Introduction

In recent years, significant efforts have been made to enhance the out of plane properties of laminated fibrous polymeric composites. Poor out of plane properties hinder their full potential utilization in various high performance engineering applications. The out of plane/flexural properties of the composite laminates are mainly governed by the matrix and/or the generated interface/interphase. In addition, presence of polymeric phase and the differential response of the constituents towards the external parameters also make them susceptible to various harsh and hostile in-service environments. Hence, in order to improve