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A combined micromechanical-energy method to predict the fatigue life of nanoparticles/chopped strand mat/polymer hybrid nanocomposites

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Abstract

In the present research, a novel method was developed in order to predict the fatigue life of nanoparticle/chopped strand mat/polymer hybrid nanocomposites. The established model is a combination of the micromechanics and energy method. The special feature of the present model is the capability of predicting fatigue life of hybrid nanocomposites by means of the experimental fatigue data of the same composites without adding any nanoparticles. In order to evaluate the model, a series of tests have been performed at different stress levels on 0.1 wt.% and 0.25 wt.% carbon nanofiber/chopped strand mat/epoxy hybrid nanocomposites. The results obtained by the model are in very good agreement with the experimental data.

Keywords: Fatigue life model, Energy method, Nanocomposites, Carbon nanofiber, Glass short fiber

1. Introduction

Chopped strand mat (CSM) is randomly oriented of short fibers with an emulsion or powder binder and can be used as reinforcement in polymeric matrix due to their intrinsic properties. In many applications, the CSM polymeric composites are under fatigue loading conditions

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