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Multi-scale analysis of the effect of loading conditions on monotonic and fatigue behavior of a glass fiber reinforced polyphenylene sulfide (PPS) composite

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ABSTRACT

In this paper, two kinds of PPS/GF composite samples (PPS-0°, PPS-90°) were prepared with two different fiber main orientations related to the injection direction. A wide range of their properties were discussed. Using DMTA analysis, it was shown that the PPS/GF composite under study obeyed the time-temperature equivalence principle. Moreover, Perez model was verified and gave a good estimation of the viscoelastic properties of the PPS/GF. Monotonic and fatigue behaviors and fatigue life of PPS/GF were investigated. Fiber's orientation, applied amplitude and loading frequency effects were emphasized. Self-heating effect on fatigue strength was also analyzed. SEM fracture surface observations allowed analyzing, at the local scale, the main deformation mechanisms occurring during mechanical loading. No evident damage development was observed for both monotonic and fatigue loading. PPS matrix plasticity appeared to be the predominant deformation mechanism until a semi-ductile or semi-brittle final failure depending on the loading conditions and local microstructure.

Keywords: Poly-Phenylene Sulfide (PPS), composite, glass fiber, fatigue behavior, self-heating.

1. Introduction

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