Fatigue evaluation and dynamic mechanical thermal analysis of sisal fibre–thermosetting resin composites

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Abstract

Sisal composites were manufactured in a hot press from as-received and 0.06 M NaOH treated sisal fibres with polyester and epoxy resin matrices. Tensile tests were conducted on the composites to establish loading levels for fatigue testing. A fatigue evaluation of the sisal fibre–thermosetting resin composites was undertaken at loading levels of 75%, 60%, 50% and 35% of static tensile strength and at an R ratio of 0.1. S–N curves for the composites are presented for untreated and 0.06 M NaOH treated sisal fibres. Epoxy matrix composites have a longer fatigue life than polyester matrix composites. The effect of chemical treatment on fatigue life is significantly positive for polyester matrix composites but has much less influence on the fatigue life of epoxy matrix composites. Dynamic mechanical thermal analysis (DMTA) was conducted on samples from failed epoxy resin fatigue specimens and the influence of fatigue history on the Tanδ peak temperatures and Tg of the composites is examined. Significant shifts in Tg are observed following fatigue testing. The fatigue performance of natural fibre composites suggests that they are suitable for use in dynamically loaded structures and may be used as a substitute for Glass Fibre Reinforced Plastic composites in fatigue

Keywords: Fibres; Interfacial strength; Sisal; DMTA; Fatigue