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Multiscale model to predict fatigue crack propagation behavior of thermoset polymeric nanocomposites

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Abstract

In this study, we develop the methodology to predict the fatigue crack growth of the thermoset polymer nanocomposites, based on multiscale approach. The experimentally observed microscopic energy dissipating mechanisms (nanoparticulate debonding, the subsequent plastic yield of nanovoids, and localized shear banding) are reflected in the proposed methodology. The predicted results show satisfactory agreements with respect to experimental data. In addition, the extrinsic crack closure effects are considered, and their influences on the fatigue crack propagation are investigated. The achievement of this study is expected to elucidate the complex phenomenon of fatigue crack growth as well as provide high efficiency with satisfactory predictions.

Keywords

A Nanocomposites; A Polymer-matrix composites (PMCs); B Fatigue; C Damage mechanics

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