

“Monte Carlo Simulation of Steady State Creep of a Fiber Tow”

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Abstract

Fatigue of reinforced ceramics at elevated temperatures was evaluated with a fiber creep model. A Monte Carlo solution of fiber creep in a uniaxially loaded tow was used to simulate the statistical response observed in elevated temperature fatigue. The simulation generated a Weibull distribution of fiber strengths, and Gaussian distributions of fiber modulus and radius. The simulation assumed that creep occurred in rapid loading rate region that can be approximated by a power-law relationship. Power law exponents in the range of 3-10 for a selected SiC/SiC system at stress levels of 150, 170, and 200 MPa were evaluated. The predicted failure response was compared to literature data that suggests a stress dependent creep process could be used to model experimental data and possibly evaluate the failure mechanism of reinforced ceramic test items.