Strain Rate Dependent Deformation and Strength Modeling of a Polymer Matrix Composite Utilizing a Micromechanics Approach

By National Aeronautics and Space Administration (NASA)

Biblioscholar Mrz 2013, 2013. Taschenbuch. Book Condition: Neu. 246x189x5 mm. This item is printed on demand - Print on Demand Neuware - Potential gas turbine applications will expose polymer matrix composites to very high strain rate loading conditions, requiring an ability to understand and predict the material behavior under extreme conditions. Specifically, analytical methods designed for these applications must have the capability of properly capturing the strain rate sensitivities and nonlinearities that are present in the material response. The Ramaswamy-Stouffer constitutive equations, originally developed to analyze the viscoplastic deformation of metals, have been modified to simulate the nonlinear deformation response of ductile, crystalline polymers. The constitutive model is characterized and correlated for two representative ductile polymers. Fiberite 977-2 and PEEK, and the computed results correlate well with experimental values. The polymer constitutive equations are implemented in a mechanics of materials based composite micromechanics model to predict the nonlinear, rate dependent deformation response of a composite ply. Uniform stress and uniform strain assumptions are applied to compute the effective stresses of a composite unit cell from the applied strains. The micromechanics equations are successfully verified for two polymer matrix composites. IM7/977-2 and AS4/PEEK. The ultimate strength of a composite ply is...

Reviews

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