Mechanics of Materials

Guide for Authors

Submit Your Paper

Track Your Paper

Order Journal

Access Full Text

Journal News

Conferences

Recent Articles

Special Issues

Most Downloaded Articles

Most Cited Articles

Most Cited Mechanics of Materials Articles

3

Most cited articles published since 2007, extracted from SciVerse Scopus.

A continuum damage model for composite laminates: Part I - Constitutive model

Volume 39, Issue 10, October 2007, Pages 897-908
Maimí, P. | Camanho, P.P. | Mayugo, J.A. | Dávila, C.G.

A continuum damage model for the prediction of the onset and evolution of intralaminar failure mechanisms and the collapse of structures manufactured in fiber-reinforced plastic laminates is proposed. The failure mechanisms occurring in the longitudinal and transverse directions of a ply are represented by a set of scalar damage variables. Crack closure effects under load reversal are taken into account by using damage variables that are established as a function of the sign of the components of the stress tensor. Damage activation functions based on the LaRC04 failure criteria are used to predict the different failure mechanisms occurring at the ply level. © 2007 Elsevier Ltd. All rights reserved.

Mechanical properties of kenaf fibers and kenaf/PLA composites

Volume 40, Issues 4-5, April 2008, Pages 446-452
Ochi, S.

This paper describes the cultivation of kenaf and application to biodegradable composite materials. The unidirectional biodegradable composite materials were made from kenaf fibers and an emulsion-type PLA resin. Thermal analysis of kenaf fibers revealed that tensile strength of kenaf fibers decreased when kept at 180 °C for 60 min. Therefore, biodegradable composites were fabricated at a molding temperature of 160 °C. The unidirectional fiber-reinforced composites showed tensile and flexural strengths of 223 MPa and 254 MPa, respectively. Moreover, tensile and flexural strength and elastic moduli of the kenaf fiber-reinforced composites increased linearly up to a fiber content of 50%. The biodegradability of kenaf/PLA composites was examined for four weeks using a garbage-processing machine. Experimental results showed that the weight of composites decreased 38% after four weeks of composting. © 2007 Elsevier Ltd. All rights reserved.

A continuum damage model for composite laminates: Part II - Computational implementation and validation

Volume 39, Issue 10, October 2007, Pages 909-919
Maimí, P. | Camanho, P.P. | Mayugo, J.A. | Dávila, C.G.

This papers describes the computational implementation of a new damage model for laminated composites proposed in a previous paper. The objectivity of the numerical solution is assured by regularizing the energy dissipated at a material point by each failure mechanism. A viscous model is proposed to mitigate the convergence difficulties associated with strain softening constitutive models. To verify the accuracy of the approach, analyses of coupon specimens were performed, and the numerical predictions were compared with experimental data. © 2007 Elsevier Ltd. All rights reserved.

Concurrent multi-level model for damage evolution in microstructurally debonding composites

Volume 39, Issue 3, March 2007, Pages 241-266
Ghosh, S. | Bai, J. | Raghavan, P.

This paper develops an adaptive concurrent multi-level computational model for multi-scale analysis of composite structures undergoing damage initiation and growth due to microstructural damage induced by debonding at the fiber-matrix interface. The model combines macroscopic computations using a continuum damage model developed in a preceding paper [Raghavan, P., Ghosh, S., 2005. A continuum damage mechanics model for unidirectional composites undergoing interfacial debonding. Mech. Mater. 37 (9), 955-979.] with explicit micromechanical computations of stresses and strain, including explicit debonding at the fiber-matrix interface. The macroscopic computations are done by conventional FEM models while the Voronoi cell FEM is used for micromechanical analysis. Three hierarchical levels of different resolution adaptively evolve in this to improve the accuracy of solutions by reducing modeling and discretization errors. Three levels include: (a) level-0 of pure macroscopic analysis using a continuum damage mechanics (CDM) model; (b) level-1 of asymptotic homogenization based macroscopic-microscopic RVE modeling to monitor the breakdown of continuum laws and signal the need for microscopic analyses; and (c) level-2 regions of pure micromechanical modeling with explicit depiction of the local microstructure. Two numerical examples are solved to demonstrate the effectiveness and accuracy of the multi-scale model. A double lap bonded composite joint is modeled for demonstrating the model's capability in handling large structural problems. © 2006 Elsevier Ltd. All rights reserved.

Constitutive modeling of the finite strain behavior of amorphous polymers in and above the glass transition

Volume 39, Issue 1, January 2007, Pages 39-52
Dupaix, R.B. | Boyce, M.C.

A constitutive model is developed to capture the rate-dependent stress-strain behavior of an amorphous polymer (poly(ethylene terephthalate)-glycol (PETG)) at temperatures in and above the glass transition (θg). As a polymer goes through its glass transition, it exhibits a dramatic decrease in elastic modulus and yield stress, and continues to show strong dependence on strain rate and temperature. The mechanical recognition of the glass transition phenomenon itself depends on the applied deformation rate. The model is able to capture this strong dependence on temperature, strain rate, and strain state for uniaxial and plane strain compression experiments to very large strains. In particular, it captures the dramatic drop in modulus from below to above θg and the corresponding drop in yield or flow stress. The model also captures the dependence on rate, temperature, and state of deformation of strain hardening, including the dramatic stiffening that occurs at very large strains. The model predictions are additionally compared to stress-strain data for poly(ethylene terephthalate) (PET) to identify the areas where strain-induced crystallization plays a role in its compressive mechanical behavior. No significant modifications are needed for the model to capture the behavior of PET in uniaxial compression, in spite of the fact that PET undergoes strain-induced crystallization upon deformation near θg and PETG does not. This suggests that the primary