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Dynamic analysis and damage of composite layered plates reinforced by unidirectional fibers subjected low velocity impact

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Abstract: In the recent years a big focus is subjected to the response of structures subjected to out-of-plane loading such as blasts, impact, etc. Currently, for wave propagation modeling in composite structures at low and high speeds are used mainly Finite Element Method (FEM), BEM, Fast Multipole BEM, respectively, Finite Volume Method (FVM), meshless formulations and recently connection of FEM and element free based formulations. For the analysis of dynamical problems commercial program systems LS-DYNA, AUTODYN and PAM CRASH etc. are used in practice. In the present study, low-velocity impact response of composite laminates was studied using ABAQUS/Explicit and ANSYS APDL finite element code (FEM) to investigate damage by employing various damage criteria. The basic material properties in and transverse to the fiber directions, such as the elastic moduli, strains at failure, and plastic moduli among others are determined by simple tests in tension, compression, and shear. The material properties AS4/PEEK was used in numerical simulations and have been taken from the literature. Plate consists of layers which are reinforced with unidirectional fibers in hexagonal and square array. Layer is considered as homogeneous transversely isotropic and layer stacking sequence is symmetrical or unsymmetrical. In the plates examined, von Mises's stress and damage caused shear stress in the matrix and fiber were evaluated. From the results obtained, it was found that the von Mises stress was approximately the same for all types layer stacking sequence.

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