

EFFECT OF CONTACT INTERACTION CONDITIONS ON IMPACT SIMULATION RESULTS OF CFRP LAMINATE

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Abstract

Finite element based contact impact analysis is an important tool to design composite structures for ballistic impact applications. In the current study, a user-defined material subroutine (VUMAT) that supports 3D solid elements based on Hashin damage criteria for fiber and Puck damage criteria for matrix failure is used for numerical impact analysis. Impact on carbon fiber reinforced laminate (CFRP) of 3.6 mm thickness with [0,90,0]_{3s} stacking configuration is carried out both in Abaqus/Explicit and Ansys/Explicit. The impact simulations are carried out to check the effectiveness of different contact interaction conditions to simulate projectile impact problems. The residual velocities of the projectile from the numerical simulations are compared with experimental results from the literature [1]. The contact interaction condition that gives residual velocities close to experimentally observed residual velocities is evaluated under three initial conditions. The simulations are also carried out in Ansys/Explicit to compare the effectiveness of simulating the same impact problem.

Keywords: Composite Impact Performance, Abaqus/Explicit, Ansys/Explicit, Contact Interaction Conditions