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Effect of Inter- and Intralaminar Damage on the Compressive Fracture of Hyperelastic Materials

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The present analysis investigates a mechanism of compressive fracture for heterogeneous non-linear materials undergoing large deformations under uniaxial or equi-biaxial loading. Special attention is given to accounting for the presence of both, inter- and intralaminar defects. The upper and the lower bounds for the critical load are examined. In order to calculate the bounds, the 3-D problem of the internal instability is considered within the model of a piecewise-homogeneous medium. The analytical solution is found for different types of interlaminar boundary conditions. The characteristic determinants are derived for the first four modes, which are more commonly observed. The results obtained for composites consisting of hyperelastic layers described by the simplified version of Mooney's potential (namely, by the neo-Hookean potential) show that the bounds present a good estimation for the particular modes and material properties.

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