SM13S_10189

XXI International Congress of Theoretical and Applied Mechanics
Warsaw, Poland, August 15–21, 2004

Numerical Evaluation of Mixed Mode Delamination in a U.D. Glass/Epoxy Composite in 2D and 3D States

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In this paper the delamination phenomena in the mixed mode I+II that is one of the important causes of failure in multilayer composites, is studied. The composite is a glass fiber reinforced plastic and is studied under static monotonic loading.Using Irwin-Kies criteria, usual laws of elasticity and VCCT (Virtual Crack Closure Teqhnique), based on finite element method, the SERR (Strain Energy Release Rate) in mode I, mode II, and four ratio mode (GI/GII) is evaluated.The finite element analysis of test bars is carried out using ANSYS5.5 software in two dimensions, and boundary conditions are chosen to bring the analysis in the vicinity of reality. Our numerical results are compared with existing experimental ones and with application of the local effects, such as 3D effect in the width of the test bar with the shape of MMB (Mixed Mode Bending) specimen, the scattering between experimental and numerical results is evaluated and discussed. For the three-dimensional effect, the variation of the stress components in the plan of delamination versus the width of specimen is obtained. Then the variation of strain energy release rate in the different ratio modes, in the width of test bars is calculated.

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