ΙΤΕ/ΕΙΧΗΜΥΘ

ΣΕΜΙΝΑΡΙΟ

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ΘΕΜΑ: Notch Sensitivity of Composite Laminates Under Bi-Axial Compression-Tension Loading

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ΩΡΑ: 12:00

ΠΕΡΙΛΗΨΗ:

The uniaxial tensile or compressive behaviour of composite laminates with an open hole have been given considerable attention in the literature. However, very few studies have been reported for the evaluation of notched strength of laminates under biaxial loading. Strength prediction methods have been almost entirely limited to uniaxial loading. Daniel extended the average stress failure criterion, developed by Whitney and Nuismer for uniaxial tensile loading, to solve the problem of a quasi-isotropic notched laminate under equibiaxial tensile stress; the method was complex and did not result in a simple solution suitable for use in design.

In this talk, a cohesive zone model developed recently by Soutis and co-workers will be discussed and used to predict the notched strength of carbon fibre reinforced plastic (CFRP) laminates under tension-compression loading, where final failure is due to 0° fibre microbuckling; the 0° plies are parallel to the compression load. The model is based on the stress intensity factor, K_I, for cracks emanating symmetrically from the edge of the hole and the stress distribution adjacent to the hole. The latter can be calculated by using either analytical or computational (Finite Element) methods. The stress distribution near a circular hole, in orthotropic plates under biaxial in-plane loading has been examined analytically and is based on the complex variable mapping approach. However, this solution is cumbersome to apply without the use of an electronic computer. A simple polynomial expression for the stress distribution will be described and compared with the exact one. It is based on the limiting characteristics of the exact solution and is an extension of the polynomial expression developed by Konish and Whitney for the uniaxial loading case. The new expression is then employed with the fracture mechanics model (Soutis *et al*.) to examine the notch sensitivity of CFRP plates under biaxial compressive dominated loading. Using the independently measured laminate parameters of unnotched strength and in-plane fracture toughness, the model successfully predicts the notched strength of multidirectional laminates under various biaxiality ratios.