Shear fracture energy measurement of adhesives using the cut central plies technique

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Introduction

Bonded structures in real applications are mainly subjected to shear loadings. Cohesive zone modelling (CZM) is an advanced tool in numerical assessment of the shear damage within the bondlines. One of the key parameters used in cohesive damage analysis of adhesive joints is the mode II fracture energy ($G_{IIc}$) of the adhesive. The most common method for measuring the $G_{IIc}$ of adhesive materials is the end notched flexure (ENF) test that provides reliable results but possesses some inherent problems specially for brittle adhesives [1]. Due to the lack of a standard approach, measuring the shear fracture energy of adhesives is still a challenge [1]. In this research, a new testing technique for the measuring the $G_{IIc}$ of adhesives is proposed based on the cut central plies (CCP) technique.

Discussion

The CCP results were compared with the shear fracture energy obtained using ENF specimens. Numerical simulations based on the CZM approach were also successfully conducted.

Conclusions

Both the CCP and ENF specimens were evaluated to measure the shear fracture energy of a brittle adhesives. Although, for brittle adhesives the fracture occurs in a single step and the initiation fracture energy and propagation fracture energy are the same but using a CCP method it is possible to reach a more stable crack propagation for brittle adhesives.

Reference