CHARACTERIZATION OF COMPOSITE BONDED JOINTS UNDER PURE MODE II FATIGUE LOADING

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Key words: Composite, Bonded joints, Experimental mechanics, Fatigue.

1 ABSTRACT

The ability of repairing structures in composite material has gain importance in the last years, because structures are being used close to the limit of their properties. For this reason, it is important to understand how the bonded joints behave under fatigue loading. This work is an experimental investigation of adhesively bonded composite joint subjected to Mode II fatigue loading. Indeed, end-notched flexure specimens of graphite/epoxy bonded with a ductile epoxy adhesive were tested. The main purpose was to characterize fatigue crack growth in mode II using End-Notched Flexure (ENF) test (Figure 1). For this purpose, the Paris-law, establishing a relationship between the fatigue crack growth (FCG) rate and the variation of the energy release rate ($G$), was applied. The energy release rate was estimated by means of an equivalent crack length method based on specimen compliance ($C$) and beam theory in order to establish the compliance versus crack length relationship. The proposed method allows including the effect of the adhesive on specimen compliance and overcomes the difficulty associated to crack length monitoring during the test. Additionally, the presence of a non negligible fracture process zone (FPZ) is accounted for, since the equivalent crack is estimated from the specimen compliance, which is influenced by the FPZ presence. This issue is particularly important when adhesives with some ductility are being used in the fatigue tests. Several experimental fatigue tests considering the ENF specimens were performed (Figure 2). It was concluded that the proposed methodology provides experimental advantages relative to classical procedure used in fatigue tests.

Figure 1. Schematic representation of the ENF test.
REFERENCES
