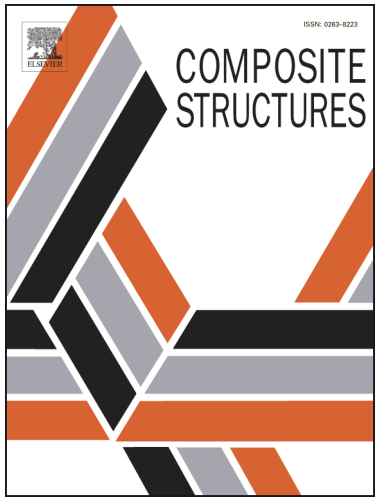

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Strength estimation of hybrid single-*L* bonded joints by the eXtended Finite Element Method

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Abstract

High-strength composites are widely used in several industries, such as aeronautical, automotive and naval, and they can be combined with metals to provide significant advantages in structural design. The application of adhesive bonding to these assemblies supposes the existence of reliable design tools to accurately analyse the joints' behaviour. In this context, the eXtended Finite Element Method (XFEM) is a recent possibility to predict bonded' joints fracture behaviour. This work aims to study by XFEM single-*L* adhesive joints between aluminium components and carbon-epoxy composites under peeling loads, considering the variation of the *L*-shaped adherend's thickness (t_{P2}) and adhesives of distinct ductility. The XFEM analysis was either based on stress or strain criteria for assessment of damage initiation, and different damage law types for crack propagation. Validation was undertaken with experimental data. The XFEM analysis revealed that this method is very accurate when using the stress-based quadratic initiation criterion and the triangular propagation law. It was shown that the *L*-shaped adherend's geometry and the adhesive type are the most important parameters affecting the joints' strength.

Keywords: Fracture; Finite element analysis; eXtended Finite Element Method; Bonded joint.

1 – Introduction

Structural bonding using adhesives has been increasing in recent years because of the advantages that this joining method presents over more traditional joining methods such as fastening, welding and riveting. The aeronautical industry is the one that most contributed to the use and development of adhesives. Good results were obtained in various applications of adhesive joints in this industry, which allowed the growth of adhesive

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