

FRACTURE TOUGHNESS AND SHEAR BEHAVIOR OF COMPOSITE BONDED JOINTS: THE EFFECT OF THERMAL TREATMENT, AGEING AND ADHESIVE THICKNESS*

CH.V. KATSIROPOULOS

*Laboratory of Technology & Strength of Materials
Department of Mechanical Engineering & Aeronautics, University of Patras
Patras, 26500, Greece
xkatsiro@mech.upatras.gr
<http://www.mech.upatras.gr/~ltsm>*

A.CHAMOS

*Laboratory of Technology & Strength of Materials
Department of Mechanical Engineering & Aeronautics, University of Patras
Patras, 26500, Greece
hamosa@mech.upatras.gr
<http://www.mech.upatras.gr/~ltsm>*

K.I. TSERPES[†]

*Laboratory of Technology & Strength of Materials
Department of Mechanical Engineering & Aeronautics, University of Patras
Patras, 26500, Greece
kit2005@mech.upatras.gr
<http://www.mech.upatras.gr/~ltsm>*

G. LABEAS

*Laboratory of Technology & Strength of Materials
Department of Mechanical Engineering & Aeronautics, University of Patras
Patras, 26500, Greece
labeas@mech.upatras.gr
<http://www.mech.upatras.gr/~ltsm>*

Abstract

Adhesive bonding is contemplated as an alternative method to mechanical fastening for joining composite aerostructures. A part of the research conducted in this area is focused on the development of new adhesives with high fracture toughness, shear behavior and durability. In this work, an experimental programme has been conducted to compare the performances of two epoxy aerospace structural adhesives, namely the newly developed LMB adhesive and the Epibond 1590 A/B adhesive. The comparison has been performed on the basis of the effects of thermal treatment, wet ageing and adhesive thickness on the fracture toughness and shear behavior of bonded joints between CFRP laminates. Two adhesive thicknesses namely, 0.5 and 1.5 mm, were used. Mode-I and II fracture toughness was measured through normal tensile and 3-point bending tests on the double-cantilever beam specimen. The shear behavior of the joints was assessed through static and fatigue double-lap shear tests. The experimental results show a higher fracture toughness and a better shear behavior for the LMB adhesive.

Keywords adhesively bonded joints; fracture toughness; thermal treatment; wet ageing; double-cantilever beam; double-lap shear.

1. Introduction

Currently in aerostructures carbon-fiber reinforced plastics (CFRPs) are being mainly assembled by mechanical fasteners. This type of design implies weight penalties emanating from the need to deal with the stress concentrations developed around the bolts. Adhesive bonding serves as the most compatible alternative joining