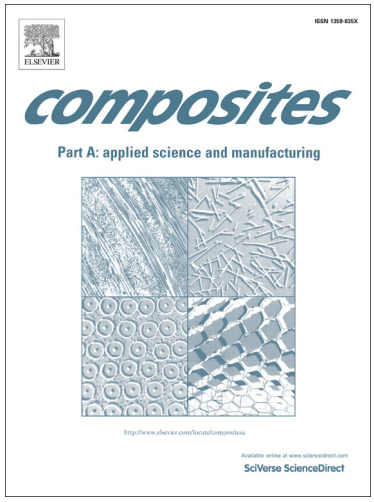

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A quasi-static indentation test to elucidate the sequence of damage events in low velocity impacts on composite laminates

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Abstract

Any attempt to achieve composite laminates with improved damage tolerance to low velocity impacts must depart from the understanding of the sequence of damage mechanisms taking place. To this purpose, a series of quasi-static indentation experiments was conducted on AS4D/TC350 carbon/epoxy specimens. The induced damage at different indenter displacements was characterized using electron microscopy and C-scan, while the residual indentation profiles were captured with a 3D surface roughness machine. The indentation depth was shown to have relaxed after the test, reaching a steady value after 14 days. For the conditions explored, the relaxation was not dependent on the damage extent. The results showed that matrix cracking is in fact the crucial damage mechanism as it is responsible for the first sudden loss of load capacity and triggers the progressive growth of delaminations.

Keywords: A. Polymer-matrix composites (PMCs), B. Impact behaviour, C. Damage mechanics, D. Electron microscopy.

1. Introduction

Carbon fiber reinforced epoxy composites have been introduced in aerospace structures due to their high specific properties like high stiffness or strength to weight ratios and good fatigue tolerance [1–3]. Despite these advantages, externally exposed airframe

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