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Quasi-static damage in Fibre Metal Laminate Adhesive Joints: Experimental Investigations

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Abstract

The progressive damage and fracture behaviour of Glare® fibre-metal laminates (FMLs) containing adhesive joints (splices and doublers) was investigated experimentally. A series of specimens of both types were tested under quasi-static tensile loads. Tests were monitored using digital image correlation (DIC) for visualisation of three-dimensional full-field displacements whilst acoustic emission (AE) monitoring enabled the detection of damage events. Large numbers of AE events were recorded at the splice and doubler joints during elastic and elastic-plastic regimes, suggesting that the AE techniques used is suitable for the monitoring of matrix cracks in addition to delaminations initiation and growth in the internal features in Glare® laminates. Finally, good correlation was observed between the fibre breakage and a rapid increase in cumulative AE energy, demonstrating that as well as indicating interlaminar damage, AE monitoring is able to indicate quite clearly when the bulk material damage was occurred.

Keywords: Fibre Metal Laminates, Tensile, Delamination, Acoustic Emission, DIC.