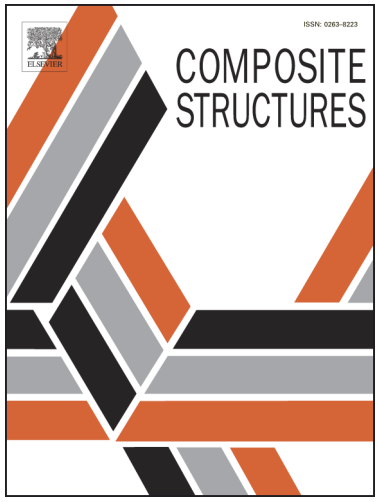

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Correlation of acoustic emission with optically observed damage in a glass/epoxy woven laminate under tensile loading

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ABSTRACT

It is a challenge to determine connection between acoustic emission (AE) events and the corresponding damage modes. In the present study AE events registered during tensile loading of a plain weave glass/epoxy laminate are correlated to actual damage, which is observed optically. Cracks in the transparent laminate, visible in the backlight images, are counted during the tensile test. Transversal and longitudinal cracks in the yarns and localised delaminations are distinguished. AE events are classified according to the amplitude and peak frequency of the signal into low frequency – low amplitude, low frequency – high amplitude and high frequency clusters. The latter (high frequency) AE events are assumed to be connected to the fibre breakage. The cumulative number of transversal and longitudinal matrix cracks corresponds well to the number of AE events in the low frequency – high amplitude cluster, and the number of delaminations – with low frequency – high amplitude cluster. The study validates use of cluster analysis of AE for identification of damage models in woven glass fibre reinforced laminates.

KEYWORDS:

Glass fibres; Polymer-matrix composites (PMCs); Acoustic emission