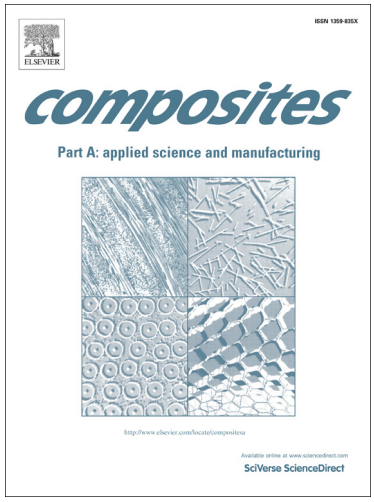

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PII: S1359-835X(14)00378-9
DOI: http://dx.doi.org/10.1016/j.compositesa.2014.11.027
Reference: JCOMA 3794

To appear in: *Composites: Part A*

Received Date: 15 July 2014
Revised Date: 16 November 2014
Accepted Date: 22 November 2014

Please cite this article as: Chou, H.Y., Mouritz, A.P., Bannister, M.K., Bunsell, A.R., Acoustic Emission Analysis of Composite Pressure Vessels Under Constant and Cyclic Pressure, *Composites: Part A* (2014), doi: http://dx.doi.org/10.1016/j.compositesa.2014.11.027

Acoustic Emission Analysis of Composite Pressure Vessels Under Constant and Cyclic Pressure

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ABSTRACT

The use of acoustic emission (AE) for the detection of damage in carbon fibre composite pressure vessels was evaluated for constant and cyclic internal gas pressure loading conditions. AE was capable of monitoring the initiation and accumulation of damage events in a composite pressure vessel (CPV), although it was not possible to reliably distinguish carbon fibre breakage from other microscopic damage events (e.g. matrix cracks, fibre/matrix interfacial cracks). AE tests performed on the carbon fibre laminate used as the skin of pressure vessels revealed that the development of damage is highly variable under constant pressure, with large differences in the rupture life and acoustic emission events at final failure. Numerical analysis of the skin laminate under constant tensile stress revealed that the high variability in the stress rupture life is due mainly to the stochastic behaviour of the carbon fibre rupture process.

Keywords:

A. Polymer-matrix composites (PMCs); C. Finite element analysis (FEA); D. Acoustic emission

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