

FAILURE MODES IN T700 CARBON EPOXY COMPOSITES: STUDY OF AE WAVE FORMS BY ACOUSTIC EMISSION TESTING

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Abstract

Acoustic emission testing is an effective NDE tool for online health monitoring of composite structures under stressed condition. The interpretation of AE data for composite structures needs an extensive data base to differentiate the various failure mechanisms like matrix cracking, fiber breakage and inter layer de-lamination. These failure mechanisms have been characterised with acoustic emission testing for T700 carbon epoxy composite by testing unidirectional laminate specimens in longitudinal and transverse direction of the fiber. The amplitude distribution, cumulative amplitude distribution, cumulative signal strength and duration distribution parameters have been studied with respect the applied load and AE data has been analysed with different correlation plots to study the different failure mechanisms. In addition to resonant sensors for AE data acquisition wide band sensors have been used during the entire load cycle to record the AE wave forms. FFT analysis of these wave forms gave an insight in to the distinctive features with respect the significant frequency contents for different failure mechanisms. The range of frequency is 50 to 273 KHz for matrix cracking with a peak frequency range of 80 to 165 KHz. The fiber breakage is represented by a frequency range of 57 to 448 KHz and the peak frequency range is 168 to 437 KHz. The de-lamination AE hits have frequency range of 52 to 253 KHz with a peak frequency range of 89 to 153 KHz.