

ACOUSTIC EMISSION DETECTION OF MICROCRACK INITIATION IN CFRP UNDER SHEAR STRESS

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Summary: Acoustic Emission was applied for detection of microcrack initiation in carbon fibre reinforced epoxy composites. Materials were prepared from PES bonded 1D NCF and 2D plain-weave carbon fibre fabrics, using the RTM technology. Small rectangular composite samples were cut from plates with [0]_n, [90]_n, [0/90]_n and [+45]_n fibre layout. Fibre volume content of composite plates varied from small (34 for 2D/38% for 1D), through medium (51%) to high (68%). Side surfaces of selected samples were polished for microscopic observations. Short beam strength tests were performed on small samples (l/h=4) subjected to quasi-static 3-point bending tests, with two AE sensors attached to their surfaces for monitoring of damage initiation. Continuous control of selected AE parameters allowed to interrupt the loading sequence before the final failure. The Historic Index appeared to be the most efficient AE parameter in this regard. Details of microcracks developing on polished composite side-surfaces were observed under the SEM. Direct microscopic evidence confirms the fibre debonding to be the principal mechanism of crack initiation in these materials before any further damage.