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Abstract:

It has recently been proved that interleaving electrospun nanofibers between composite layers has a significant effect on their fracture toughness. In this study, a non-destructive method, Acoustic Emission (AE) technique, was applied to evaluate the effect of nylon 66 nanofibers on failure modes such as matrix cracking and fiber breakage. For this aim, mode-I and mode-II fracture tests were conducted on the non-modified and modified samples. Two various methods (peak frequency based method and wavelet transform) were utilized to analyze AE signals, and at last, their results were compared. According to the outcome of fracture tests, by applying nylon 66, mode-I and mode-II fracture toughness enhanced 46% and 65%, respectively. On the other hand, AE analysis showed that damages decreased significantly in the nanomodified laminates. For instance, matrix cracking, fiber/matrix debonding, and fiber breakage decreased 82%, 53%, and 64% by the wavelet transform method. SEM images were also provided to investigate the failure modes occurred during fracture tests.

Keywords: Composite laminates; Electrospun nanofibers, fracture tests, Acoustic emission technique.