Секция «Механика композитов»

Experimental analysis of effects of voids onto fatigue Mode I fracture toughness of unidirectional carbon/epoxy composites

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Delamination and interlaminar failure are the most critical failure mode observed in fiber reinforced composite structures. Delamination might cause a lack of local stiffness, that can preclude buckling failure [1]. This paper investigates the impact of voids on static and fatigue interlaminar fracture behavior under static and fatigue loading of fiber reinforced polymer composites. Specimens with various void volume fractions within 0.25% - 5% have been fabricated by vacuum infusion under 20% (-6 inHg), 50% (-15 inHg) and 100% (-30 inHg) vacuum pressure levels. Void content was characterized using several techniques such as laser-ultrasonic flaw detection [2], scanning electron microscopy and chemical etching. The impact of voids on Mode I interlaminar fracture toughness under static and fatigue loading were investigated experimentally. It was obtained that voids result in decrease of Mode I interlaminar fracture toughness under static and fatigue loads. The performed microstructural analysis provided description of void morphology. As results, experimental plots were obtained highlighting effects of voids onto interlaminate fracture toughness under static and fatigue loads. As a result of the studies, experimental correlations were established between the depth of the vacuum, the volume content and the morphology of the porosity, and also the Mode I interlaminar fracture toughness.

References

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2) A. A. Karabutov, Nondestruct. Eval., vol. 32, pp. 315–324 (2013)