

Formation of residual strain in cross-ply fiber reinforced plastics under compression and tension-compression conditions

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Abstract

© 2018 Author(s). On the basis of the results of the conducted experiments it was shown that the behavior of a cross-ply unidirectional fibrous composite under tension and compression conditions differs significantly. It is argued that this difference is due to the fact that, when the $[+45^\circ / -45^\circ]_2$ s specimens are under tension, the fibers of the composite are under shear stresses and tension by normal stresses in the transverse direction. Under compression conditions, the sign of the shear stresses changes, and in the transverse direction the fibers are under compression by normal stresses. When cyclic compression with a maximum stress in a cycle is equal to the tensile stress, higher residual strains are formed in the composite, and the secant modulus of elasticity is lower than under tension. This effect also occurs under tension-compression, when the hysteresis loops are shifted to the region of negative residual strain.

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