Yamamoto, S.; **Ikeda, T.**; **Senba, A.**

Effect of temperature on crack kinking and jumping in a cross-ply laminated beam. (English)

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Summary: To understand the mechanisms of crack kinking and jumping that occur within the 90° layer of a cross-ply fiber reinforced plastic laminated plate, double cantilever beam tests were performed at several temperatures for laminated plates with two types of stacking sequences. The crack kink angles were calculated using a bi-layer shear-deformable beam model. Furthermore, the interlaminar shear stresses were calculated using finite-element models to clarify the mechanism of the repeated jumps. The following results were obtained from these experiment and analysis; (i) a crack at the center tended to propagate in a self-similar manner more stably at higher temperatures, (ii) the applied load at which value the crack at the center started propagation decreased as the 90° layer became thicker, and (iii) the crack along a 0°/90° interface jumped to the other interface because the shear force along the 0°/90° interface due to the thermal stress decreased as the crack propagated along the interface.

MSC:

74R10 Brittle fracture
74F05 Thermal effects in solid mechanics
74K10 Rods (beams, columns, shafts, arches, rings, etc.)
74E30 Composite and mixture properties
74-05 Experimental work for problems pertaining to mechanics of deformable solids

Keywords:

laminated plate; crack propagation; crack kinking; crack jump; thermal stress; analytical modeling

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