Mechanical Properties and Fatigue Responses of Fiber Metal Nanocomposite Laminates with Double-Edged Cracks

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Abstract

The fiber metal laminates (FMLs) of both Ti/APC-2 neat and nanocomposite laminates were fabricated. The double-edged cracks of both symmetry and anti-symmetry were cut in FMLs. From tensile tests we received the load vs. displacement curves and mechanical properties. From cyclic tests the load vs. cycles (P-N) curves, residual life, and failure mechanisms were obtained. The mechanical properties of symmetrically cracked specimens were slightly lower than those of anti-symmetrically cracked counterparts. As the crack length increasing and inclined angle decreasing, the fatigue life decreased. The enhancement of nano-powder improved the ultimate load and fatigue life. The local stress intensity at the crack tip dominates the fatigue responses. The piece of elliptical part was observed from cyclic tests at failure. Although the attraction of two crack tips accelerated the crack growth rate, however, the delay to failure was caused by forming a small piece of ellipse centrally.

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