Thermal Residual Stresses in Aluminum Metal-Matrix Antisymmetric Laminated Plates Under Uniform Temperature Distribution

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ABSTRACT: Thermal stresses are of great importance in composite structures. In this investigation, a thermal elastic-plastic stress analysis is carried out in $(0°/90°)_2$, $(30°/-30°)_2$, $(45°/-45°)_2$, $(60°/-60°)_2$, $(15°/-15°)_2$, $(15°/30°)_2$, $(15°/45°)_2$, $(15°/60°)_2$ antisymmetric aluminum metal-matrix laminated plates. Temperature is chosen to be constant along the cross sections of the plates. The residual stress components of σ_x, σ_y and τ_{xy} are illustrated in the layers of the laminated plates for different thermal loading. Elastic-plastic and residual stress components are given in tables. When the absolute value between the orientation angles of the layers is increased, the magnitude of the residual stress components becomes high. The strength of the laminated plates can be increased by using residual stresses. Tsai–Hill criterion is used as a yield criterion. Differential equations are solved numerically with a sufficiently large number of integration intervals of the temperature. The composite material is assumed to be linearly strain hardening.

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