Abstract

A series of off-axis tensile tests at room and elevated temperatures have been conducted up to 316°C (600°F) to determine the elastic and plastic properties of a unidirectional carbon/PMR15 composite as a function of temperature. The transverse tensile and shear strengths of the composite as a function of temperature have also been determined. The effect of the specimen preparation process (type of machining) on the strength properties of the composite has also been evaluated. It has been shown that elastic (with the exception of Poisson ratios $\nu_{12}$ and $\nu_{21}$), plastic, and strength properties of the composite are significantly affected by elevated temperatures. It has also been demonstrated that the quality of machining can noticeably influence the normal and shear strength data at room and elevated temperatures. Even if the quality of machining is very high, failure of the specimens can occur either in the gage or grip sections. At room temperature, all specimens failed in the grip areas influencing the transverse tensile and shear strength measurements. However, the type of specimen failure does not noticeably affect the strength data at elevated temperatures. The transverse tensile and shear strength properties of the composite at room temperature could only be estimated by extrapolating the normal and shear strength vs temperature curves to room temperature.

Keywords: PMR-15; Polyimide composites; Shear strength; 10° off axis test