PR 434

MECHANICAL PROPERTIES OF CARBON COMPOSITES WITH VARYING RESIN CONCENTRATION

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Carbon composite materials are favorable in numerous applications because of their light weight and high strength properties. In an effort to maximize strength and modulus, experiments were conducted to determine the optimum mechanical performance as a function of resin content. Samples were fabricated using T1000G-12k carbon fiber tow impregnated with b-stage BMI 5250-4 resin with target resin contents of 25, 28, and 32% by mass. Single towpreg samples were wound, cured, and tensile tested. Cylindrical composite rings were fabricated using traditional winding, bagging, and autoclave techniques from the same towpreg samples. The composite rings were internally pressurized to failure, measuring the yield and ultimate mechanical properties. Tensile test results show ultimate strengths of 1039, 1075, and 1143 ksi for the 25, 28, and 32% target resin contents, respectively. Strain to failure varied from 1.91 to 2.17% and modulus values varied from 48 to 54 msi for single tow tensile tests. Composite ring hydroburst tests show comparable ultimate strengths of 616, 664, and 686 ksi for the 25, 28, and 32% target resin contents, respectively. Composite strain to failure ranged from 1.58 to 1.66% and modulus ranged from 39 to 42 msi. A translation efficiency referring to the conversion from towpreg mechanical properties to composite matrix performance was determined based on the ratio of moduli ranging from 71 to 82%.

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