Development of Aromatic Copolyester Liquid Crystal Polymer Fiber and Polyimide Composite Materials

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The use of high strength aromatic copolyester thermotropic liquid crystal polymers in fibrous composite structures with polyimide adhesives, as binding materials, can eliminate directional mechanical property differences while retaining much of the original mechanical strengths. In this research, the liquid crystal polymer fiber orientation was controlled by aligning each of the fibrous layers in different directions. With this approach, an isotropic liquid crystal polymer composite material can be obtained from the highly anisotropic liquid crystal polymer fiber.

Kinetics of imidization of the polyamic acid for bonding LCP fibers have been evaluated at 225°C, 275°C and 325°C. Dynamic mechanical analysis of composites shows that higher polyimide content leads to good binding of the fibers and gives lower loss factor materials. Sound velocity measurement was employed in order to determine the specific modulus of each sample. Sound velocity measurement of composites shows that higher polyimide content leads to good binding of the fibers and gives high modulus materials. Tensile properties are presented on the fibrous composite structures obtained. The highest mechanical properties were obtained on composites containing 30% LCP fiber and 70% polyimide.