

Intermediate Modulus Low Cost Carbon Fiber Based Composites

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An important and essential component of manufacturing low cost carbon fiber reinforced composites involves the use of suitable carbon fiber as it amounts to more than half of the cost of reinforced composite and a substantial portion of embodied energy corresponds to the fiber manufacturing. The Institute for Advanced Composites Manufacturing Innovation (IACMI) recently introduced the availability of such low cost carbon fiber technology for its members for applications involving automotive, wind energy, and compressed gas storage. This carbon fiber typically has roughly intermediate modulus fiber properties and comes in a large tow (in excess of 300K) configuration. In this research, textile fabric was prepared in collaboration with Chomorat in +/- 45 lay-up configuration. Using these textile carbon fiber form, flat panels were produced using VARTM technique utilizing epoxy resin and suitable sizing for the carbon fiber. For comparison, using identical procedures, Zoltek based low cost carbon fiber was also considered. Appropriate samples were obtained from these large flat panels using water jet cutting to obtain the stress-strain properties in tension, compression, and flexure, and interlaminar shear properties. This paper/presentation summarizes mechanical properties and failure behavior considering microstructure for these low cost carbon fiber composites. The present study considered manufacturing of the composite flat panels using vacuum infusion technique with and without consolidation stress to evaluate the relative effects on mechanical properties. The micro and mesostructure of the composites is evaluated using polished samples with optical microscopy and non-invasively using high resolution computed tomography.