LYOCELL FIBER-REINFORCED CELLULOSE
ESTER COMPOSITES - SURFACE AND
CONSOLIDATION CONSIDERATIONS, AND
PROPERTIES

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ABSTRACT

The objective of this thesis was to further develop the polymer composite system consisting of cellulose acetate butyrate (CAB) and high modulus, continuous, regenerated cellulose fiber (lyocell). Of particular concern were both the interfacial adhesion between the fiber and matrix and the consolidation process in the manufacture of these composite materials.

Interfacial adhesion was found to be substantial due to the relative lack of the fiber pull-out phenomenon observed after tensile failure in the unmodified fiber composites. This result was then supported in the second study in which similar unmodified fiber composites experienced very little fiber pull out with evidence of a large amount of cohesive failure of the matrix accompanied by matrix particles adhering to the fiber surfaces.

Void volume formation was mitigated to a small extent by the use of optimal consolidation conditions. Composites formed at moderate temperature (200 °C), low consolidation pressure (11.8 p.s.i.) and high consolidation time (13 min.) were found to have the lowest void volume formation of ca. 2.8 %. These composites were generally found to have the highest interfacial shear strength, ca. 16 MPa. A tensile modulus of 22 GPa and an ultimate strength of 246 MPa was obtained for this composite having a fiber volume content of ca. 62 %.
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