Abstract title: Can the outdoor properties of natural fiber reinforced bio-based composites be improved?

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Abstract:

Natural fiber composites are known to absorb more moisture than glass or carbon fiber reinforced composites. The hybrid natural fiber composites prepared in this study have relatively less moisture absorption than natural fiber composites. The composite laminates were manufactured by compression molding technique. A bio-based resin known as acrylated epoxidized soybean oil (AESO) was used as a matrix, while jute fiber, regenerated cellulose fiber (Lyocell and viscose) and glass fiber were used as reinforcements.

The composite laminates were prepared at temperature between 160-170°C and pressure of 40 bar with natural fiber reinforcement between 30-60 wt% of the fiber. Specimens were cut from the laminates with a laser cutting machine according to standard. The effect of pre-treatment of natural fiber and regenerated cellulose fiber using 4% NaOH solution was investigated and discussed. The amount of water absorbed by the composites was determined by soaking the specimens in distilled water for 10 days. To see the influence of water absorption on mechanical properties of the composites, specimens were immersed in distilled water for 10 days before testing. Dry specimens were also tested for reference. Charpy Impact testing was performed on the composite laminates in order to calculate the energy absorbed by specimen during fracture.

Water absorption behavior of the natural fiber composites was reduced by manufacturing hybrid composites with glass and Lyocell fibers. Tensile, flexural and impact properties of the natural fiber reinforced composites were improved by the inclusion of glass or Lyocell fiber. Tensile and flexural properties of natural fiber reinforced composites were affected largely by the influence of water and it could be improved by hybridization. Viscoelastic properties of the composites and hybrid composites were studied by dynamic mechanical thermal analysis.

Keywords:

Natural fiber, regenerated cellulose fiber, acrylated epoxidized soybean oil (AESO), water absorption, and dynamic mechanical thermal analysis (DMTA).