

Preparation and characterization of bio-nanocomposites from biobased thermoset resin and montmorillonite.

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Abstract:

Bio-nanocomposites are a new class of particle-based composites that have attracted much attention due to their environmental and economic advantages these years [1, 2]. In this study a biobased thermoset resin based on lactic acid was used and reinforced with montmorillonite (MMT). This resin consists of star-shaped oligomers of lactic acid, end-capped with methacrylate groups [3]. Thus, the resin can be cross-linked by a free radical polymerization. MMT consists of 1 nm thick aluminosilicate layers. Due to the high surface area, MMT has been evaluated as a reinforcement for several commercial polymers. While most commercial resins are non-polar, MMT is intrinsically polar. Therefore, MMT is usually surface treated in order to make it less polar. However, the resin used in this study is relatively polar and the purpose of this study was to evaluate if untreated MMT could be used to reinforce this resin.

The curing was studied with isothermal differential scanning calorimetry (DSC) and the obtained composite were characterized by dynamic-mechanical thermal analysis (DMTA). Also transmission electronic spectroscopy (TEM) was used to characterize the structure. The result showed some improvements in mechanical properties. The DMTA results showed that the storage modulus and also loss modulus of the nanocomposite improved with respect to neat resin. Intercalated structures could be seen from the TEM micrographs.

Keywords: Bio-nanocomposites; Nanoclay; Biobased thermoset resin.

References

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