



FLAX FIBER REINFORCED PLA COMPOSITES: STUDIES ON TYPES OF PLA AND DIFFERENT METHODS OF FABRICATION

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Natural fibers are used as reinforcement material for number of thermoplastic/thermoset polymers. The interest in using polylactic acid (PLA) as thermoplastic matrix to produce composites completely from 100% renewable resources has increased in the last decade. It is well known that natural fiber reinforced PLA composites can be prepared by solution casting cum compression molding and injection molding methods. We have prepared flax fiber reinforced PLA (procured from Cereplast Ltd) composites in the presence of amphiphilic compatibilizers by solution casting cum compression molding method and conducted several studies [1-3]. After that flax fiber reinforced composites in presence of same compatibilizers were prepared by injection molding method. Results indicated that injection molded composite specimens showed almost same tensile strength (TS) (~32 MPa) and elongation at break (~2.3%) when compared to composites prepared from solution casting cum compression molding method. On the other hand, injection molded flax fiber reinforced PLA specimens showed higher tensile modulus (TM) (3.0 GPa) than solution cast cum compression molded specimens (1.9 GPa).

In addition, the properties of the composites depend on the nature of PLA used. In the market, pure PLA is commercially available from NatureWorks Inc. and impure PLA is made available by Cereplast Ltd. In impure PLA, the presence of starch as filler in form of microspheres is seen in the fractured morphology of the specimens which distinguishes it from pure PLA. Mechanical properties of PLA procured from two different sources are different. NatureWorks PLA samples showed high mechanical properties (TS=51.8 MPa; TM=1.59 GPa) while Cereplast PLA samples showed low mechanical properties (TS=39 MPa; TM=1.45 GPa). However, elongation at break is almost same for NatureWorks PLA and Cereplast PLA. Thermal stability of PLA procured from Cereplast Ltd was lower with higher char yield in comparison to PLA procured from NatureWorks.

References

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