

PREPARATION OF BIOBASED NANOCOMPOSITES OF POLY(FURFURYL ALCOHOL) WITH SISAL WHISKERS BY *IN SITU* POLYMERIZATION

EEM Ahmad and AS Luyt

Department of chemistry, University of the Free State (Qwaqwa campus), South Africa
(E-mails: essamailmoh@gmail.com, LuytAS@qwa.ufs.ac.za)

ABSTRACT

The present study has dealt with the preparation and properties of biobased nanocomposites of poly(furfuryl alcohol) with sisal whiskers. *In situ* polymerization was used to prepare the nanocomposites. Sisal whiskers were obtained by acid hydrolysis and the final aqueous suspension was freeze-dried. The dried whiskers were added to the furfuryl alcohol monomer (1, 2, and 3 %), followed by a sonication step of 20 minutes, and subsequently heated at 100 °C with constant stirring for polymerization to take place. The resulting black viscous liquid was poured in a mould, heated in an oven at 100 °C for two hours, and then followed by an additional curing step at 150 °C. The end of the curing step was confirmed by DSC. Pure poly(furfuryl alcohol) was also prepared for the sake of comparison by using citric acid (0.25 phr) to catalyze the polymerization process. The formation of poly(furfuryl alcohol) was confirmed by NMR and ATR-FTIR. The mechanical, dynamic mechanical and thermal degradation properties of the polymer and its nanocomposites will be presented.

In addition, biocomposites of sisal fibres as a reinforcement and poly(lactic acid) (PLA) as a matrix were prepared by melt mixing and hot melt pressing in the presence of dicumyl peroxide as crosslinking/grafting initiator. Different fibre loadings (10, 20, and 30 %) were used to prepare the treated and untreated bio-composites. The morphology, as well as thermal, mechanical, and dynamic mechanical properties of the bio-composites will be presented.