PREPARATION AND CHARACTERISATION OF NATURAL FIBRE/CO-POLYESTER BIOCOMPOSITES

TH Mokhothu[1], BR Guduri[2] & AS Luyt[1]

[1] Department of Chemistry, University of the Free State, Private Bag X13, Phuthaditjhaba, 9866 (e-mail: MokhothuTH@qwa.ufs.ac.za)
[2] Materials Science and Manufacturing, CSIR, 4 Gomery Avenue, Summerstrand, Port Elizabeth, 6001

ABSTRACT

The effects of natural fibre modification with sodium hydroxide, silane and Disperal nano-powder were investigated for copolyester/kenaf fibre biocomposites. The kenaf fibre was modified with sodium hydroxide followed by silane at different concentration (3, 6 and 9%). The 3% silane modified fibre was further modified with Disperal at different concentrations (4, 6, 8 and 10 wt%) as an additive. The biocomposites were prepared by a melt mixing process using a Haake Rheomix mixer. The biocomposites were characterized for their morphology, thermal properties, mechanical properties, thermomechanical properties, biodegradability and the amount of crosslinking. The properties were determined using scanning electron microscopy (SEM), differential scanning calorimetry (DSC), thermogravimetric analysis (TGA), tensile testing, dynamic mechanical analysis (DMA), biodegradability testing and gel content determination. Compatibility of the natural fibre and the copolyester (CP) matrix is necessary as morphology has a significant effect on the composite properties. The SEM images show less fibre pullout for the silane modified composites with increasing concentration. DSC results show that the silane treated composites had a slight shift in the melting temperature due to reduced chain mobility as a result crosslinking or grafting. The melting enthalpy values were too scattered to make definite conclusions on changes in the crystallinities for the silane and Disperal modified composites. The TGA results showed improved thermal stability for the NaOH treated composite compared to both the silane and Disperal modified composites. The DMA results were in line with the other thermal analysis results, and will also be discussed. The biodegradability tests confirmed the biodegradability of the systems.