

MELT-SPUN NANOCOMPOSITE FIBRES BASED ON CELLULOSE WHISKERS AND POLYLACTIC ACID (PLA): PROCESSING AND PROPERTIES

Maya Jacob John^{1,3}, Rajesh Anandjiwala^{1,3}, Kristiina Oksman² and Aji P Mathew^{2*}

¹*CSIR, Materials Science and Manufacturing, Polymers and Composites, Port Elizabeth, South Africa*

²*Department of Applied Physics and Mechanical Engineering, Division of Wood and Bionanocomposites, Luleå University of Technology, 97187 Luleå, Sweden*

³*Department of Textile Science, Nelson Mandela Metropolitan University, P.O. Box 1600, Port Elizabeth 6000, South Africa*

Abstract

This study deals with the development of bio-nanocomposite fibres from poly (lactic acid) PLA and cellulose nanowhiskers (CNW's) by the process of melt spinning. Master batches of PLA and cellulose nanowhiskers were prepared in acetone-chloroform solutions. The masterbatch in varying ratios was subjected to melt compounding using a twin-screw extruder to obtain reinforced pellets. Subsequently, nanocomposite fibres of cellulose nanowhisiker reinforced PLA were prepared by melt spinning of the pellets in a bi-component filament extruder under optimized processing conditions. The effects of cellulose whisker loadings on the mechanical properties of the fibres were investigated. The thermal properties of the fibres were analysed by differential scanning calorimetric analysis (DSC). Thermogravimetric results revealed that the thermal stability of the fibres was found to increase with addition of cellulose whiskers. Scanning electron microscopy (SEM) was carried out to observe the morphology of nanocomposite fibres.

Key words

Melt spinning, polylactic acid, cellulose nanowhiskers, mechanical properties, thermal properties, shrinkage

***Corresponding author**

E-mail: aji.mathew@ltu.se, Ph: +46-920493336 Fax: +46-920491399