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High Performance Polyurethane - organoclay nanocomposites based on Castor oil polyols: synthesis and characterization

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ABSTRACT

Recently, petroleum based polyurethanes are contributing main portions in the world requirement, the utilization of renewable resources for polyurethane manufacture with comparable physico-chemical properties is in a huge demand, to overcome the environmental issues and price adaptability. Renewable resources containing hydroxyl groups (-OH) and unsaturated double bonds (C=C) like castor oil (CO), can be used as alternative polyol with near to similar properties. In this study, polyurethanes based on castor oil and organoclay (COPUs-Cloisite 30B) nanocomposites are synthesized by mixing polypropylene glycol polyol (PPG) and dehydrated castor oil (15%); enforced with organoclay in different weight %. The physico-chemical behaviours were evaluated by Fourier Transform Infrared Spectroscopy (FTIR), Fourier Scanning Electron Microscopy (FESEM), Scanning Electron Microscopy (SEM) and X-ray diffraction (XRD). Thermal stability was found improved up to ~ 30 °C in the sample with 5 wt % of C30B. Tensile properties depicted an improvement of ~ 240% in tensile strength and decrease of ~30% in elongation with 5wt% organoclay, respectively. Barrier properties were (nitrogen permeability machine) found very impressive with an increase of 50% with 5 wt% sample. Improved physico-chemical properties of COPUs-C30B signify the usage of COPUs-C30B in the industrial and commercial applications i.e. coatings, adhesives and automotive applications.

KEYWORDS: *Renewable Polyols; Polypropylene glycol polyol; Castor oil; Cloisite 30B; Physico-chemical behaviours*

1. INTRODUCTION

Polyurethanes (PUs) have been extensively applications due to excellent physical and chemical properties are high mechanical, flexible and thermal (Stefan O, 2013; Yusoh K et al, 2010; Akintayo1 C.O et al, 2013) and chemical resistance polymers. PUs can be tailored to meet diversified demands of many applications such as rigid insulations, coatings, footwear adhesives (Nihal S.; Emel O, 2007), fibers, thermoplastic elastomers, foams as well as medical devices (Judit E. et al, 2010; Bela P. J et al, 2008; Jose M.H et al, 2009). A huge demand of renewable resources for