**Effect of morphology and hydroxyl groups of different nanoparticles on the properties of PLA bionanocomposites**

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**ABSTRACT**

Polylactic acid (PLA) bionanocomposites using halloysite nanotubes (PLA-HNT) and sepiolite (PLA-SEP) were synthesized by *in-situ* polymerization technique following azeotropic distillation, with 3 wt. % and 5 wt. % of HNT and SEP respectively. This method was chosen in particular with a perspective to improve the interactions between PLA and the nanoparticles. The formation of PLA bionanocomposites was confirmed using fourier transform infrared spectroscopy, wide angle X-ray diffraction, 29Si and 27Al-nuclear magnetic resonance spectroscopy analysis. Then the effect of hydroxyl groups present in both the nanoparticles on the properties of the PLA bionanocomposites were studied and compared. In addition, the influence of tube and tunnel like morphologies of HNT and SEP, respectively, on the properties of bionanocomposites were investigated. Scanning electron microscopy analysis confirmed that there was no significant agglomeration of the nanoparticles in PLA. In the case of PLA-HNT bionanocomposites, transmission electron microscopy analysis gave ample proof to substantiate the intercalation of PLA chains into HNT. Studies on zeta potential of PLA bionanocomposites, as compared with PLA, confirmed the interactions between PLA and HNT and PLA and SEP. The hydrophilicity of bionanocomposites was investigated using water contact angle studies. From DSC analysis of bionanocomposites it was understood that HNT was found to act as nucleating agent while SEP didn’t had any effect in the crystallization temperature of PLA.

*Keywords: Halloysite nanotubes; In-situ polymerization; Sepiolite*