



University of Zabol

Graduate school

Faculty of Natural resources

Department of Wood and Paper Science and Technology

**The Thesis Submitted for the Degree of Master of Science
(In the Wood Composite Products)**

**The effect of nanographene on physical, mechanical and thermal
properties wood biocomposite- polylactic acid**

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Abstract

Green nanocomposites based on polylactic acid (PLA) and Wood Flour with different loadings of graphene nanoparticles (GNPs) were produced. The mechanical strength, dimensional stability, and viscoelastic behavior of nanocomposites were characterized by static mechanical analysis (flexural and tensile), water uptake and thickness swelling, and dynamic mechanical analysis (DMTA) tests. Thermal properties of samples were studied by thermogravimetric analysis (TGA) and differential scanning calorimetry (DSC). Dispersion of GNPs in the specimens was studied by X-ray diffractometry (XRD) and field emission scanning electron microscopy (FE-SEM). Results indicated that the incorporation of GNPs into the fabricated samples, improved the mechanical properties of the composites. The water absorption and thickness swelling of the composites decreased with increasing GNPs content. In general, the specimens filled with GNPs showed the highest values of storage and loss modulus compared with the other ones, due to highest interaction taking place at the matrix–filler interface. Morphological images and X-ray diffractometry show that the GNPs were homogeneously and well-dispersed in the composites. Based on the findings obtained from the present study, it can be said that the optimum content of GNPs for the fabricated WPC samples is 2%.

Keywords: Nano graphene, polylactic acid, biocomposite, wood plastic