World Academy of Science, Engineering and Technology
International Journal of Materials and Metallurgical Engineering
Vol:12, No:05, 2018

Mechanical, Thermal and Biodegradable Properties of Bioplast-Spruce Green Wood Polymer Composites

Authors : A. Atli, K. Candelier, J. Alteyrac

Abstract : Environmental and sustainability concerns push the industries to manufacture alternative materials having less environmental impact. The Wood Plastic Composites (WPCs) produced by blending the biopolymers and natural fillers permit not only to tailor the desired properties of materials but also are the solution to meet the environmental and sustainability requirements. This work presents the elaboration and characterization of the fully green WPCs prepared by blending a biopolymer, BIOPLAST® GS 2189 and spruce sawdust used as filler with different amounts. Since both components are bio-based, the resulting material is entirely environmentally friendly. The mechanical, thermal, structural properties of these WPCs were characterized by different analytical methods like tensile, flexural and impact tests, Thermogravimetric Analysis (TGA), Differential Scanning Calorimetry (DSC) and X-ray Diffraction (XRD). Their water absorption properties and resistance to the termite and fungal attacks were determined in relation with different wood filler content. The tensile and flexural moduli of WPCs increased with increasing amount of wood fillers into the biopolymer, but WPCs became more brittle compared to the neat polymer. Incorporation of spruce sawdust modified the thermal properties of polymer: The degradation, cold crystallization, and melting temperatures shifted to higher temperatures when spruce sawdust was added into polymer. The termite, fungal and water absorption resistance of WPCs decreased with increasing wood amount in WPCs, but remained in durability class 1 (durable) concerning fungal resistance and quoted 1 (attempted attack) in visual rating regarding to the termites resistance except that the WPC with the highest wood content (30 wt%) rated 2 (slight attack) indicating a long term durability. All the results showed the possibility to elaborate the easy injectable composite materials with adjustable properties by incorporation of BIOPLAST® GS 2189 and spruce sawdust. Therefore, lightweight WPCs allow both to recycle wood industry byproducts and to produce a full ecologic material.

Keywords : biodegradability, color measurements, durability, mechanical properties, melt flow index, MFI, structural properties, thermal properties, wood-plastic composites, WPCs
Conference Title : ICPC 2018 : International Conference on Polymers and Composites
Conference Location : Paris, France
Conference Dates : May 17-18, 2018