EFFECT OF BIRCH FALSE HEARTWOOD ON THE PHYSICAL AND MECHANICAL PROPERTIES OF WOOD-PLASTIC COMPOSITES

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False heartwood is a phenomenon where penetration of oxygen discolors the wood. It is an undesirable defect which influences the applications of the wood. The properties and formation of false heartwood have been investigated but false heartwood as a filler material in composites has not been previously used. The adhesion between polymers and wood fibers is weak because polymers are hydrophobic and wood fibers are hydrophilic. The aim of this research was to investigate the false heartwood fraction size and chemical modification effect on the physical and mechanical properties of wood-plastic composites. The effect of chemical treatment with NaOH and 3-aminopropyltriethoxyslane (APTES) was investigated to see if the modification will provide better interfacial adhesion. Wood-plastic composite boards were produced from three different false heartwood fraction sizes of 0.4 mm, 1 mm and 2 mm. The composites were chemically modified and compounded using a twin-screw compounder and the test specimens were produced via hot pressing and CNC milling. The composites physical properties were investigated using Fourier transform infrared spectroscopy (FTIR), differential scanning calorimetry (DSC) and density measurement by immersion. The mechanical properties were investigated using three-point bend test, tensile test and Charpy impact test. The effect of fraction size and chemical modification was compared. Results show that wood fibers increase the stiffness and rigidity when comparing to PP. The different fraction size of false heartwood does shows substantial differences in results. The FTIR test showed that chemical modification of APTES had occurred with peaks at 1028 cm-1 and 1104 cm-1 present. The peaks of the material were identical, only the absorption was somewhat different. DSC showed that fraction size and chemical modification do not alter the melting temperature or glass transition temperature of the material. The density of the material reduced with increasing fiber size and with chemical modification using NaOH and APTES.

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