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EFFECT OF PHTHALIC ACID ON STRUCTURAL, MECHANICAL AND WATER RESISTANCE PROPERTIES OF BIODEGRADABLE CASSAVA STARCH/POLYVINYL ALCHOHOL THIN FILMS

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This work focuses on producing and evaluating *green* multifunctional film materials based on a mixed eco-friendly thermoplastic starch (TPS)/Polyvinyl alcohol (PVA) matrix compatibilized with phthalic acid as a solution for non-degradable petroleum-based plastic waste accumulation. Most researchers have utilized maleic acid, succinic acid, borax and acetic acid to compatibilize TPS/PVA thin films. In the present study, TPS/PVA blended films were prepared using a solution casting with 0, 1, 2 and 5 wt% of phthalic acid as the compatibilizing agent with respect to TPS share while maintaining TPS/PVA weight ratio of 40/60 and 60/40, respectively. Fourier Transform Infrared (FTIR) spectroscopy, Scanning Electron Microscopy (SEM), and Powder X-ray Diffraction (PXRD), dynamic mechanical analysis (DMA) and Thermogravimetric Analysis (TGA) were used to characterize the samples. The tensile, water absorption and biodegradability tests were carried out according to ASTM D-882-02, ASTM-D-570-98, and aerobic compost environment tests. TGA results implied an enhanced homogeneity and better thermal stability of compatibilized blends compared to their non-compatibilized blends. Besides, the FTIR spectrums demonstrated that new hydrogen bonds had been formed in the presence of phthalic acid, causing increased interactions between starch and PVA macromolecules. According to the biodegradation test, the blended films except neat PVA showed a significant degradation after 30 days. Both the tensile strength and water resistivity improved with the addition of phthalic acid. This study demonstrated that these films with enhanced mechanical properties and water sensitivity could replace non-degradable packaging films for low water content.

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