ABSTRACT

The biocomposite films consisting of native tropical starches i.e. sago, rice and tapioca and treated native fibers i.e. bamboo, kenaf, roselle and Napier grass were prepared by a solution casting method using Polyvinyl Alcohol (PVA) as the polymer matrix. Two groups of films were obtained by blending PVA with different starches and different starches and fibers, respectively. Bleaching and mercerization were carried out on the fibers to improve their mechanical strength and adhesion to the matrix. The different sets of biocomposite films produced were studied for intermolecular interactions by using Fourier Transform Infrared Spectroscopy (FTIR) and X-Ray Diffraction Method (XRD) and for physical structural characterization by Scanning Electron Microscopy (SEM). Morphological investigation revealed that the crystallinity of the biocomposites decreased with the addition of the different starches and fibers. Thermal characterizations of the biocomposites were done using Thermogravimetric Analysis (TGA), Dynamic Mechanical Thermal Analysis (DMTA) and Differential Scanning Calorimetry (DSC). From the thermal analysis results, the biocomposites showed an enhanced thermal stability against thermal attack compared to its pure counterparts. DMA showed an increase of the storage modulus in the glass transition region with increasing fiber content suggesting increased rigidity with the addition of fibers. Tensile tests showed that the PVA/starch composites present slightly better tensile strength than PVA/starch/fibers composites. The non-uniformity of the fibers incorporated into the blend was responsible for the poor strength of the PVA/starch/fibers biocomposites. The weight loss analysis of the biodegradation test method revealed that the PVA/starch composites has better biodegradability when compared to the PVA/starch/fibers composites and is supported by the SEM images of the buried specimens. The addition of fibers into the blended composites slowed down the biodegradation rate.