

Isolation and characterization of microcrystalline cellulose extracted from banana fiber in poly(lactic acid) biocomposite produced from solvent casting technique

Abstract

The purpose of this project is to extract Microcrystalline Cellulose (MCC) from Banana fiber to produce Poly(Lactic Acid)/Microcrystalline Cellulose, (PLA/MCC) biocomposite film using a solvent casting technique. The initial phase is the production of MCC from Banana fiber by involving three steps; alkaline treatment, bleaching and acid hydrolysis. MCC produced from the different concentration of Nitric acid in the acid hydrolysis process, were used to analyze the morphological and crystalline properties using SEM and XRD respectively. MCC produced from the higher concentration of Nitric acid shows good morphological properties and higher % crystallinity. Then, MCC compounded into PLA with different filler loading to produce PLA/MCC biocomposite film using a different solvent which is Chloroform and Dichloromethane. Results show that lower MCC loading, induces good filler matrix interaction and this evidences by the improvement of the Tensile strength and Young's Modulus, as well as shows improvement in loss factor and storage modulus which studied from DMA. Moreover, the addition of MCC slightly improved the thermal stability of PLA. From using a different solvent to produce PLA/MCC biocomposite film, Dichloromethane solvent improves the tensile strength and Young's modulus of biocomposite film, while Chloroform reduces the tensile properties of biocomposite film.