

Characterization of microcrystalline cellulose isolated from conocarpus fiber

ABSTRACT

Conocarpus fiber is an abundantly available and sustainable cellulosic biomass. With its richness in cellulose content, it is potentially used for manufacturing microcrystalline cellulose (MCC), a cellulose derivative product with versatile industrial applications. In this work, different samples of bleached fiber (CPBLH), alkali-treated fiber (CPAKL), and acid-treated fiber (CPMCC) were produced from Conocarpus through integrated chemical process of bleaching, alkaline cooking, and acid hydrolysis, respectively. Characterizations of samples were carried out with Scanning Electron Microscope (SEM), Energy Dispersive X-ray (EDX), Fourier Transform Infrared-Ray (FTIR), X-ray Diffraction (XRD), Thermogravimetric (TGA), and Differential Scanning Calorimetry (DSC). From morphology study, the bundle fiber feature of CPBLH disintegrated into micro-size fibrils of CPMCC, showing the amorphous compounds were substantially removed through chemical depolymerization. Meanwhile, the elemental analysis also proved that the traces of impurities such as cations and anions were successfully eliminated from CPMCC. The CPMCC also gave a considerably high yield of 27%, which endowed it with great sustainability in acting as alternative biomass for MCC production. Physicochemical analysis revealed the existence of crystalline cellulose domain in CPMCC had contributed it 75.7% crystallinity. In thermal analysis, CPMCC had stable decomposition behavior comparing to CPBLH and CPAKL fibers. Therefore, Conocarpus fiber could be a promising candidate for extracting MCC with excellent properties in the future.

Keyword: Microcrystalline cellulose; Conocarpus fiber; Morphology; Crystallinity; Thermal stability