

Synthesis and characterization of carboxymethyl cellulose from oil palm empty fruit bunch stalk fibres

ABSTRACT

The current extraction of carboxymethyl cellulose (CMC) from wood has created competition with wood industries. Interest in alternative sources is critical to ensure the sustainable production of CMC. Therefore, the extraction of CMC from oil palm empty fruit bunch (OPEFB) stalk fibres was evaluated. CMC extracted from OPEFB stalk fibres was characterized for chemical composition as well as by spectroscopic, microscopic, physicochemical, and rheological tests. Highest cellulose content was obtained from raw stalk fibres with the least amount of lignin and residual oil as compared to the empty fruit bunch (EFB) and spikelet. The XRD analysis revealed that the native cellulose was transformed into an amorphous phase, as evidenced from the characteristic peaks that had almost disappeared. Likewise, the FTIR analysis showed that major peaks in the lignin and hemicellulose were absent, which enabled the cellulose to be converted to CMC. Microscopy analysis showed notable changes in the fibres' morphology throughout the extraction process. In addition, X-ray diffraction (XRD), Fourier transform infrared (FTIR), scanning electron microscopy (SEM), physicochemical studies, and rheological tests on extracted CMC showed that there was a significant difference between each phase of the extraction process and this showed that OPEFB stalk fibre was feasible to produce CMC that was comparable to those of commercial CMC.

Keyword: Carboxymethyl cellulose (CMC); Oil palm empty fruit bunch (OPEFB); Stalk fibre