

Factors affecting spinnability of oil palm mesocarp fiber cellulose solution for the production of microfiber

ABSTRACT

Cellulose microfiber (MF) formation by electrospinning is affected by several factors. In this paper, fabrication of MF from oil palm mesocarp fiber (OPMF), a biomass residue abundantly available at the palm oil mill, was conducted by electrospinning. The effect of OPMF-cellulose solution properties on the spinnability of the solution was determined. Extracted cellulose from OPMF was dissolved in four different formulations of ionic liquids: (i) ([EMIM]Cl), (ii) ([EMIM]Cl):DMF, (iii) ([EMIM]Cl):([C10MIM][Cl]), and (iv) ([EMIM]Cl):([C10MIM][Cl]):DMF at cellulose concentrations of 1% to 9% (w/v). Scanning electron microscopy (SEM) analysis showed that MF formed had diameter sizes ranging from 200 to 500 nm. MF was formed only at 6% (w/v) cellulose concentration, when DMF was mixed in the solution. The results showed that cellulose concentration and viscosity played major roles in the spinnability of cellulose solution, in which too high viscosity of the cellulose solution caused failure of the electrospinning process and eventually affected the formation of MF. The characteristics of MF obtained herein suggest the potential of OPMF cellulose as a starting material for the production of MF.

Keyword: Oil palm mesocarp fibers; Microfibrillated cellulose; Spinnability; Electrospinning; Ionic liquids