Mercerized natural Cellulose based-solid Polymer Electrolyte

Abstract

Cellulosic materials derived from three different types of local wood samples (sawmill woods sawdust, Acacia mangium and belian (Euxideroxilon zwagery) were extracted at atmospheric pressure using organosolv method. In an initial stage, the wood samples were delignified using peroxyacetic acid pulping to remove lignin. Then the pulp was bleached in 0.01 M solution of sodium hydroxide (NaOH) with addition of 4% hydrogen peroxide of absolute dry pulp (ODP). Conversion to alpha-cellulose or mercerized cellulose was achieved by soaking bleached cellulosic materials in 17.5% solution of NaOH for 15 minutes at 25oC. The mercerized cellulose was thoroughly washed with large amount of distilled water until pH of the filtrate reached to natural, then vacuum dried at 60oC. From Scanning electron microscope (SEM) all mercerized woods cellulose were differ in microfibril size with high irregularity observed in sawmill sawdust. Formation of cellulose II was confirmed with X-Ray Diffraction (XRD) and Fourier transform infrared spectroscopy (Ft-IR) analysis. Preparation of solid polymer electrolyte (SPE) membrane was obtained by dissolving dry mercerized cellulose in molten 1 butyl-3-methylimidazolium chloride ([bmim]Cl) in the presence of lithium perchlorate (LiClO4) to produce a transparent solid gel film. All SPE membranes exhibit conductivity in the range of 3.6 x 10-6 to 5.7 x 10-5 Scm-1 at room temperature. It was also observed that the conductivity of the SPE is affected by the size of cellulose microfibril and type of extraction. It was then further characterized with SEM, XRD, FTIR and TGA.