A novel approaches an enhancement of ammonium salts-based cellulose derivative proton conductive polymer electrolytes for protonic battery applications

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Abstract. Since the introduction of solid polymer electrolytes in 1973, numerous polymers are particularly interesting especially bio-polymer have been investigate. The main interest in developing polymer electrolyte lies in the hope that such systems will avoid many of the problems encountered when using electrochemical devices with liquid constituents which costly along with expensive materials processing. In arrears to the fact given, the development of plasticized polymer electrolytes (PPEs) has been accomplished in this work by incorporating various composition of plasticizer with CMC-NH_4Br via solution casting method. The PPEs system formation has been analyzed through FTIR spectroscopy, X-RD, impedance and TNM method. The highest conducting CMC PPEs was achieved at ~10^{-4} Scm^{-1} with addition of 25 wt. % NH_4Br and was improved to ~10^{-3} S cm^{-1} when plasticized with 8 wt. % EC. It has been shown that the conducting element in this work are predominantly due to proton (H^+) which was confirmed via FTIR and TNM analysis. Proton conducting PPEs battery have been fabricated with the configuration of $Zn+ZnSO_4.7H_2O//MnO_2$ and produced a maximum open circuit potential (OCP) of 1.48 V at ambient temperature and showed good rechargeability. This work implies that the possible practical application of the present electrolytes as a new candidates in the fabrication of electrochemical devices.

Keywords: biopolymer materials; proton conductor (H^+); ionic conductivity, proton battery