PRODUCING A FAVORABLE IONIC MOBILITY BASED ON CMC/CARRAGEENAN DERIVATIVE HYBRID SOLID BIO-POLYMER ELECTROLYTES SYSTEM

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Abstract.
The increasing interest in green energy storage materials for electrochemical devices with the development of bio-polymer materials as electrolytes candidate has attracted great attention recently. It can offer a number of high-value opportunities, provided that lower costs can be obtained besides environmental friendly. In the present work, hybrid solid bio-polymer electrolytes (HSBEs) system were successfully prepared via solution casting approached comprises of CMC and blend with kappa carrageenan. The HSBEs system was characterized for structural and the conduction properties using FTIR, XRD and EIS technique. FTIR shown that the complexation has occurred between CMC and kappa carrageenan via -OH based on the coordination site and hydrogen ions for both polymers. The ionic conductivity is found to achieve the optimum value at ~10^{-7} S/cm for hybrid system with the ratio of CMC: KC is 80:20 and later was further increased to ~10^{-4} S/cm when NH_4NO_3 was added with 30 wt. %. The enhancement of ionic conductivity for HSBEs system was due to the increase in amorphous state between CMC/KC and addition of NH_4NO_3 as revealed by XRD analysis. From IR-deconvolution approach, it shows that the increasing of protonation (H^+) from [N-H_4^+] [NO_3^-] towards coordinating site of hybrid CMC/KC system, lead to the increment in ionic mobility of ions and reflected the activation energy for transportation of ions. Based on the results, it shows that the CMC/KC HSBEs system is a promising candidate for proton conduction which has potential to be applied as an electrolytes system for application in electrochemical devices.

Keywords: Hybrid polymer; ionic conductivity; proton conduction; amorphous