

Ionic transport properties of protonic conducting solidm biopolymer electrolytes based on enhanced carboxymethyl cellulose - NH₄Br with glycerol

N. M. J. Rasali¹ & A. S. Samsudin¹

¹Advanced Materials Group, Faculty of Industrial Sciences & Technology, Universiti Malaysia Pahang, 26300 Gambang, Pahang, Malaysia

ABSTRACT

The present work investigates the ionic conductivity as well as its transport properties of carboxymethyl cellulose–NH₄Br plasticized with various weight percentage of glycerol for solid biopolymer electrolytes (SBEs) prepared by solution-casting technique. It was shown from the FTIR analysis that the complexation transpires at C=O and C–O–from COO[–] of CMC upon the addition of glycerol into the SBEs system. The highest room temperature ionic conductivity of ~10^{–3} S cm^{–1} was achieved at 6 wt.% of glycerol owing to the broadening in the amorphous state as demonstrated in the XRD analysis. The conductivity-temperature plots were found to be in good agreement with the conventional Arrhenius relationship. It was further shown that the conducting element is mainly due to the protonation of H⁺ where ionic mobility and diffusion coefficient was found to contribute towards the enhancement in the ionic conductivity of SBEs system.

Keywords : Solid biopolymer electrolytes; Ionic conductivity; Deconvolution method; Transport properties