Characterization of an amorphous materials hybrid polymer electrolyte based on a LiNO3- doped, CMC-PVA blend for application in an electrical double layer capacitor

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ABSTRACT

In the present work, hybrid polymer electrolytes consisting of a CMC-PVA blend doped with various amounts of $LiNO_3$ was produced using the casting technique. The structural and ionic conductivity of the prepared samples were studied by using Fourier transform infrared (FTIR) spectroscopy, x-ray diffraction (XRD), scanning electron microscopy (SEM) and electrical impedance spectroscopy (EIS) analyses. The optimum ionic conductivity at room temperature was achieved at 3.54×10^{-3} S cm^{-1} with the addition of 20 wt % of $LiNO_3$ which showed the lowest percentage of crystallinity. IR-deconvolution revealed that the ionic conductivity is dependent on the ionic mobility and diffusion coefficient. Linear sweep voltammetry was performed where the highest ionic conducting sample is electrochemically stable up to 1.43 V. The highest conducting sample was fabricated into an electrical double layer capacitor (EDLC) and was characterized by using cyclic voltammetry and galvanostatic charge-discharge (GCD) for their electrochemical stability performance. The GCD profile showed that the fabricated EDLC is stable to operate up to the 5000th cycles with the average specific capacitance of ~100 F/g.

KEYWORDS

Polymer electrolytes; CMC-PVA hybrid; $Li^{+;}$ Electrochemical devices

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