



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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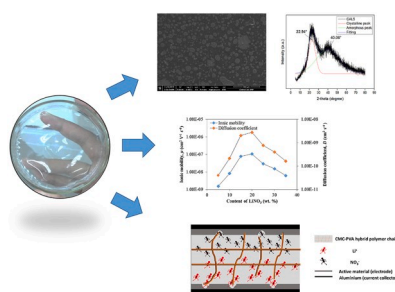
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HIGHLIGHTS

- Hybrid polymer electrolytes were prepared based CMC-PVA doped LiNO₃.
- Li⁺ which originate from LiNO₃ has improved the crystalline phase of CMC-PVA.
- The room temperature ionic conductivity achieved the maximum value at $\sim 10^{-3}$ S cm⁻¹.
- The fabricated EDLC exhibited favorable performance in electrochemical characteristics.

GRAPHICAL ABSTRACT



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ABSTRACT

In the present work, hybrid polymer electrolytes consisting of a CMC-PVA blend doped with various amounts of LiNO₃ 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 LiNO₃ 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.

1. Introduction

Electrochemical devices are known as devices with the capability to

store and release electrical energy when required. The demand for better performing electrochemical devices has led to greater interest among researchers towards the development of electrochemical devices such as

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