

CHARACTERIZATION OF A GEL POLYMER ELECTROLYTE AND PERFORMANCE ASSESSMENT IN SUPER CAPACITOR USING ELECTROCHEMICAL IMPEDANCE SPECTROSCOPY

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Abstract

Request for power sources is getting increased day by day with the rising usage of electronic equipment. To satisfy the demand for power sources in a low cost, safely manner, gel polymer electrolytes (GPEs) have been used for various applications such as rechargeable batteries and super capacitors. This study is based on preparation, characterization and evaluation of its performance in a super capacitor using Electrochemical Impedance Spectroscopy (EIS). GPE was prepared using the solvent casting technique. It was consisted with polyvinylidene fluoride-hexafluoropropylene (PVdF-HFP), ethylene carbonate (EC), diethyl carbonate (DEC), and zinc trifluoromethane sulfonate ($Zn(CF_3SO_3)_2 - ZnTF$). The electrode was prepared using activated charcoal powder (AC), natural graphite (NG, Bogala) and polyvinylidene fluoride (PVdF). An super capacitor was fabricated using the gel polymer electrolyte (GPE) and the electrode. Conductivity of the GPE at various temperatures was sought first. Then, the single electrode specific capacitance of the super capacitor was determined. Conductivity variation of GPE with temperature followed Arrhenius behavior showing a room temperature conductivity of $3.08 \times 10^{-3} \text{ Scm}^{-1}$. The single electrode specific capacitance value of 14.65 Fg^{-1} was obtained by the EIS test using a Nyquist plot.

Keywords: Gel Polymer Electrolyte, super capacitor, conductivity, electrochemical impedance spectroscopy,