

Fused Aromatic Disubstituted Azomethine as Organic Additives in NH₄SCN doped CMC based Electrolyte Film

Abstract

The remarkable progress of organic dye based on donor- π -acceptor concepts has been extensively studied to enhance carrier mobility, electrical performance and can perform function at an optimum level in advanced electrochemical energy devices. In this study, new organic additive for solid polymer electrolyte (SPE) has been successfully synthesized by incorporating fused aromatic azomethine (-CH=N-) dye in carboxy methylcellulose (CMC) with ammonium thiocyanate (NH₄SCN) based electrolyte. Assessment of the synthesized additive has been physico-chemically characterized via Fourier transform infrared (FT-IR), UV-visible (UV-vis), 1D Nuclear Magnetic Resonance (NMR) and thermogravimetric (TGA) analysis. Besides, DFT calculation revealed that the value of HOMO-LUMO gap exhibits semiconductor properties with the activation energy of 3.135 eV. The investigation of their capability as organic additive SPE has been discovered by incorporating CMC-NH₄Cl via solution-casting technique. The structural analysis was conducted to study the effect of the atomic structure in correlation towards ionic and conductivity of newly develop SPE. The ionic conductivity of SPEs system has been measured using Impedance Spectroscopy with various weight percentage (wt%) of additive. The highest conductivity of SPEs at 303K was approximately $\sim 10^{-3}$ Scm⁻¹ at 0.6 wt%. As a result, the incorporation of fused aromatic azomethine into the SPE has a great potential to be used for electrochemical device application.