In this report, dielectric properties and ion transport parameters in chitosan (CS) based solid polymer electrolyte (SPE) were examined. In this study, various amount of barium nitrate Ba(NO$_3$)$_2$ was dissolved in CS host polymer to synthesize solid polymer electrolytes (SPEs). The dielectric constant and dielectric loss increased with increasing Ba(NO$_3$)$_2$. On the basis of Trukhan model, the ion transport parameters, such as mobility ($\mu$), diffusion coefficient ($D$), and charge carrier number density ($n$) were calculated successfully. Due to higher concentration of salt, enlargement of dielectric loss along with a rise in dielectric constant was perceived. Electrode polarization allowed an extensive dispersion of dielectric constant spectra that transpired at low frequency region. The interesting observation is the loss tangent peaks shifted to higher frequency region and the intensity decreased with an increase in temperature. The increase of $\mu$ and $D$ are related to shifting of tanδ to high frequency sides with increasing temperature. The decrease of $n$ is correlated with decrease of tanδ peak with temperature. The mechanism of ion transport was investigated in the polymer via the tanδ spectra. The ion transport parameters are found to be 9×10$^{-8}$ cm$^2$/s, 0.8×10$^{17}$/cm$^3$, and 3×10$^{-6}$ cm$^2$/Vs for $D$, $n$, and $\mu$, respectively at ambient temperature. All these parameters have shown increasing as temperature increased. The electric modulus parameters were studied in an attempt to understand the relaxation dynamics and to clarify the relaxation process and ion dynamics relationship.
Keywords: Natural polymer; impedance study; dielectric properties; electric modulus study; ion transport parameters; Trukhan model

FULL TEXT

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