Electrical and Dielectric Properties of Copper Ion Conducting Solid Polymer Electrolytes Based on Chitosan: CBH Model for Ion Transport Mechanism

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Copper ion-conducting polymer electrolytes based on chitosan (CS) were prepared using solution-cast technique. The CS host polymer was complexed with different weight percent copper iodide (CuI) salt. Effect of frequency, temperature and copper ion concentration on the electrical and dielectric properties has been studied. The high value of dielectric constant at low frequency is an evidence for the presence of space charge polarization. The AC conductivity at higher frequency region obeys a Jonschers power law. Three regions were distinguished in the ac conductivity spectra of the solid polymer electrolyte films. The frequency exponent (S) was estimated for the high-frequency regions. Analysis of frequency exponent (S) at various temperatures suggested the correlated barrier hopping (CBH) model for ion transport mechanism at high temperatures. The results of the present work, reveals that to get deep insight about the conduction mechanism the frequency exponent (S) at different temperature must be studied. The estimated value of dc conductivity obtained from the plateau region of ac conductivity spectra seem to be close to those calculated from the bulk resistance. The electrical modulus analysis shows the non-Debye type conductivity relaxation.

Keywords: polymer electrolytes; dielectric properties; electrical conductivity; ionic transport mechanism; electric modulus

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