Solid Polymer Electrolytes Based on Chitosan: NH_4Tf Modified by Various Amounts of TiO_2 Filler and its Electrical and Dielectric Characteristics

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In the current work the role of titanium dioxide (TiO_2) filler on dielectric and conductivity properties of chitosan (CS) based solid polymer electrolytes (SPEs) were investigated at various temperatures. To prepare CS based SPEs fixed amount of ammonium triflate ($\text{NH}_4\text{CF}_3\text{SO}_3$) was dissolved in CS solution and then various amount of TiO_2 was added to CS: $\text{NH}_4\text{CF}_3\text{SO}_3$ solution. The films of composite electrolytes were obtained by solution cast technique. The results showed that dielectric properties of composite electrolytes have been improved up to 1 wt.% of TiO_2 and their values are found to be temperature dependent. The composite film incorporated with 1 wt.% of TiO_2 exhibits a smallest bulk resistance. The M'' parameter against frequency shows asymmetric single relaxation peak which reveal the non-Debye relaxation type. The ac conductivity spectra were used to obtain the DC conductivity values at ambient temperature. The temperature dependent DC conductivity was found to follow Arrhenius behaviour. The obtained value of activation energies from DC conductivity is found to be comparable to that calculated from relaxation time. The single value of activation energy obtained from the Arrhenius plot indicates one conduction mechanism involved in the present system.

Keywords: proton ion conducting; solid polymer electrolytes; electric modulus; activation energy; relaxation process

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