P(EPI-EO)/P(DMS-EO) BLEND AS A POLYMERIC ELECTROLYTE

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An alternative to substitute the liquid electrolyte in electrochemical devices is the solid polymer electrolyte (SPE). In devices where high pressure is applied, the amorphous polymer electrolytes are not always suitable, because it is generally susceptible to creep even at low applied pressure. Therefore, for electrochemical application where mechanical stability is also important, copolymer of PEO [] and PEO blended with macromolecules or inorganic supports are used as solid polymer electrolyte. In the following, we report our investigation about the system based on blends of poly (dimetilsiloxano- co-ethylene oxide), P(DMS-EO) and poly(epichlorohydrin-co- ethylene oxide) P(EPI-EO) with different concentrations of $LiClO_4$ salt. The chemometric project was used for optimization of ionic conductivity and mechanical properties. The blends were prepared by mixing the polymers, P(DMS-EO) and P(EPI-EO) (1:10 wt. ratio), and 2.0, 6.0 and 10.0 % wt. of the $LiClO_4$, in THF. The solutions were dried in vacuum for 48 h.

In Figures 1(a) and (b) we compare the DSC curves of pure copolymers and blends P(DMS-EO)/ P(EPI-EO) (1:10 wt. ratio) without salt, and blends with different salt concentration, respectively. In the case of P(DMS-EO) we can see a crystalline phase with endothermic peak at -7.2 ^oC probably related to the melting of dimethylsiloxane [2]. The P(EPI-EO) and blend show characteristics of amorphous materials.

With the increase of salt concentration it was observed an increase of Tg values (Figure 1b) indicating a decrease in the segmental motion of the polymeric chain.

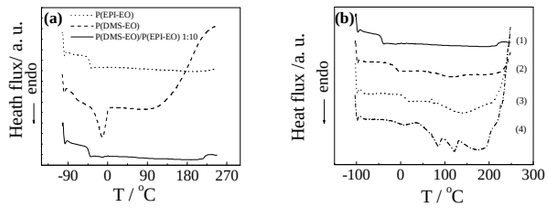

Figure 1. *DSC curves for pure copolymers and blends P(DMS-EO)/ P(EPI-EO) without salt (a), and blends with salt concentration, (1) 0.0, (2) 2.0, (3) 6.0, (4) 10.0 wt. % $LiClO_4$ (b).*

The conductivity was determined by *ac* impedance analysis. Figure 2 exemplifies the impedance plots of blend with different salt concentration.

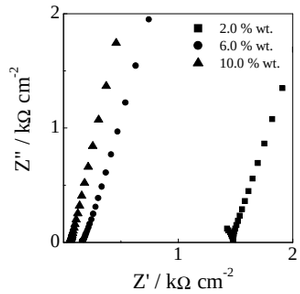

Figure 2. *a. c. impedance spectrum of SS/blend/SS system, at room temperature.*

The bulk resistance was obtained from the impedance spectra at the point where the arc intercepts the real part in the low frequency region. With the increase of salt concentration the semi-circle tends to disappear and shift to lower resistance value, increasing the ionic conductivity.

Figure 3 shows the ionic conductivity variation of salt - polymer complex as a function of temperature (Arrhenius plots). The curvature of the Arrhenius plots, showed at higher temperatures for all salt concentrations investigated, indicates that the conductivity can be described by the Vogel-Tamman-Fulcher equation [3].

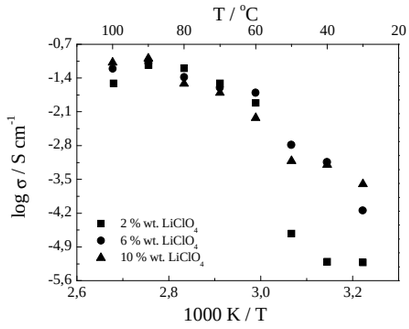

Figure 3. *Arrhenius plot: variation of the ionic conductivity as a function of salt concentration and temperature.*

Figure 4 presents UV-VIS absorption spectrum for the blends, where no significative absorption in visible region was observed for all salt concentration investigated. It is an important result for electrochromic application.

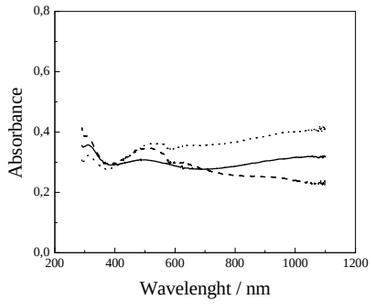

Figure 4. *Absorbance spectrum of ITO/ blend system, at different salt concentration, (full line) 2.0, (dash line) C = 6.0, and (dot line) 10.0 % wt. $LiClO_4$.*

In conclusion, this group of results indicates that the blends constituted by P(DMS-EO)/ P(EPI-EO) can be use as solid state polymeric electrolyte. This work continues to investigate others proportions between the polymers, according to chemometric project.

Acknowledgements

The authors thank FAPESP (proc. 98/14756-8; 99/03330–2 and 99/05257-0).

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[3] B. Scrosati, Polymer Electrolytes Reviews-1, J.R. Mac Callun, C.A. Vincent (Eds.), New York, 1987.