

ELASTOMERIC BLEND AS ELECTRODE MATERIAL FOR POLYMERIC LITHIUM BATTERIES

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Organic conducting polymers are promising materials for several applications due to their interesting properties (electrical and ionic conductivity, electroactivity, electrochromism, etc) associated to high environmental stability. Among their potential uses, there are: batteries, electrochromic displays and photo-diodes. These polymers also have good characteristics for using as electrode materials in electrochemical capacitors due to their fast kinetics of charge/discharge, high charge density and significantly lower cost than metallic oxides.

In this work, we describe a lithium batteries based on poly (epichlorohydrin-co- ethylene oxide) P(EPI-co-EO)+PoAnis-TSA blends films as cathode material and blend of poly (dimethylsiloxane- co-ethylene oxide) P(DMS-co-EO) and P(EPI-co-EO) with 6 % m/m LiClO₄ as polymeric electrolyte

Electrical conductivity of the blend films was measured by AC (electrochemical impedance spectroscopy) using blocking electrode of stainless still and DC measurements (Coleman Method). DC conductivity was performed by the Coleman method, using a Keithley 617 programmable electrometer and a four-probe sensor with gold contacts.

Electrical conductivity response of the blend films as a function of the PoAnis weight fraction in the mixture was practically equal in the AC and DC measurements. Figure 1 presents AC and DC conductivity values for Epichlomer-C+PoAnis-TSA blends as a function of the conducting polymer concentration. The addition of PoAnis-TSA to the rubber increases its conductivity by several orders of magnitude. Besides, since the solid electrolyte is based on the same elastomer, the resistance between the electrode|electrolyte interfaces may be minimized, increasing the charge transfer processes through them.

The cyclic voltammogram of of the Epichlomer-C+PoAnis-TSA | P(DMS-co-EO)/P(EPI-co-EO)/6 % m/m LiClO₄ | Li system showed broad peaks, this behavior is due to epiclomer presence cause an increase of the resistance (Figure 2). However, cyclic voltammogram showed very stable after ten cycles. With increase poanis concentration was observed a decrease in total impedance of the system (Figure 3).

The charge /discharge process of the Epichlomer-C+PoAnis-TSA | P(DMS-co-EO)/P(EPI-co-EO)/6 % m/m LiClO₄ | Li system (Figure 4) demonstrated a sufficiently promising behavior for a completely polymeric battery.

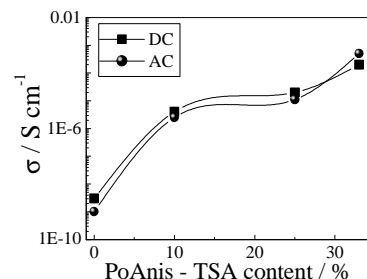


Fig. 1 Changes of electrical conductivity of Epichlomer-C+PoAnis-TSA blends as a function of PoAnis-TSA

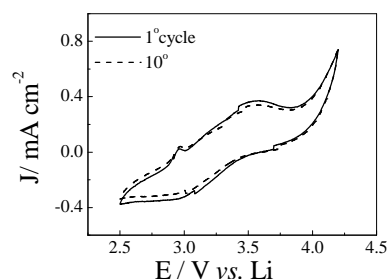


Fig. 2 – Cyclic voltammogram of Epichlomer-C+PoAnis-TSA blends film in P(DMS-co-EO)/P(EPI-co-EO) with 6 % m/m LiClO₄; at 5mV.s⁻¹.

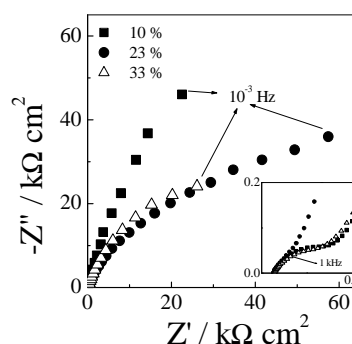


Fig. 3 – Nyquist diagram of the Epichlomer-C+PoAnis-TSA blends film at OCP. Amplitude 0.01 V and frequency range from 10⁻² to 10⁵ Hz.

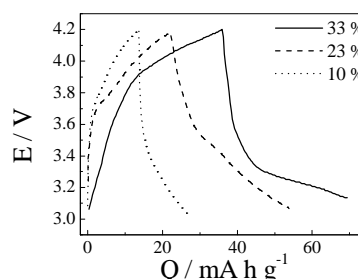


Fig. 4 – Specific charge/discharge curves of the Epichlomer-C+PoAnis-TSA blends film in P(DMS-co-EO)/P(EPI-co-EO)/6 % m/m LiClO₄ J = 10 μA.cm⁻².