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# Dielectric relaxation studies of ultrathin film of sulfonated polystyrene

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**Abstract** – Very recently some papers have shown that thin films of ionomers can be applied in OLEDs to improve the efficiency of charge injection. Despite the observed technological progress, the mechanism related to this relatively high injection is not well understood. In this work we carried out thermal stimulated depolarization (TSDC) measurements to study charge storage and carrier transport in thin films of sulfonated polystyrene having lithium or potassium as counter-ions. TSDC curves were analyzed taking into account the kinetics of trapping-detrapping or polar orientation related to the sample structure.

Ionomers are polymers that contain a small amount of bonded ionic groups. These ionic groups added to its structure change the physical, mechanical and rheological properties. Recently, thin layer of ionomer have been applied in OLEDs to improve the efficiency of the charge injection [1]. Despite this success, this improvement involves charge storage and charge transport mechanism phenomena which are not fully understood. We used sulfonated polystyrene (SPS) with lithium or potassium as cation counter-ions. The ultrathin film SPS was produced by spincoating technique and the film thickness was at about 50 nm. To clarify some of these effects, we used the thermally stimulated current depolarization (TSDC) technique on Al/SPS/Al structures. This technique consists in measuring the current of depolarization in samples previously polarized. The sample was heated with a constant rate and the current is measured in function of the temperature. The results showed two peaks with different dependence of the temperature polarization and on the field polarization. The TSDC peaks were studied by considering first order kinetics for storage and charge transport. From the fittings obtained applying the kinetic-models to the experimental results we obtained important parameters, such as, activation energies and the concentration of electrical active species. One peak was attributed to charge injection and the other was caused by dipolar relaxation.

**References**

[1] C.A. Olivati, A.J.F. Carvalho, D.T. Balogh, H. Von Seggern, R.M. Faria, Journal of Non-Crystalline Solids 352 (2006) 1686-1690.