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Studies of the electric and morphologic properties of POMA/PMMA blends deposited by spin coating technique

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Abstract – The POMA was synthesized by oxidative polymerization of the monomer o-metoxyaniline. The POMA/PMMA blends were produced by dissolving both polymers in $CHCl_3$ and depositing on glass substrate by spin coating. The films containing large amount of POMA behave as a pure polymer conductor, considering both their electrical and morphological properties.

Poly (o-metoxyaniline) (POMA) is a conductive polymer and was synthesized as described in the literature [1]. The blends were produced dissolving the POMA and poly(methyl metacrylate) (PMMA), which is an insulating polymer, in 10 mL of chloroform in the proportions of 25, 50 and 75 % (wt/wt). Then, a stock of blend solutions with polymers bulks was obtained. All solutions remained under agitation for 3 hours and were deposited on glass substrates (1.0 x 2.5cm^2) covered with tin oxide doped with fluorine (FTO) (Flexitec - Curitiba, Brazil), with planar resistivity in the order of 30 Ω cm.

The thickness of the films deposited by spin coating was measured by profilometry (Veeco – Dektak 150 Instruments). The polymeric blends presented thickness of ~100 nm, while the film of polymer bulks has thickness of ~80 nm to POMA and ~120 nm to PMMA.

Electrical measurements were taken at room temperature, with a Keithley 2400 programmable semiconductor measuring system. The sample with pure POMA and POMA/PMMA blends with higher concentration (50 and 75% wt/wt) of POMA showed smaller resistance than the other samples (Figure 1).

The morphology of the films was measured by an atomic force microscope (AFM) (Veeco Innova Instruments), in the contact mode (1024X1024 pixels). The PMMA showed a less rough surface than the POMA. The films produced by polymeric blends showed the appearance of roughness on the polymer surface, due to increased concentration of POMA in the formation of films (Figure 2).

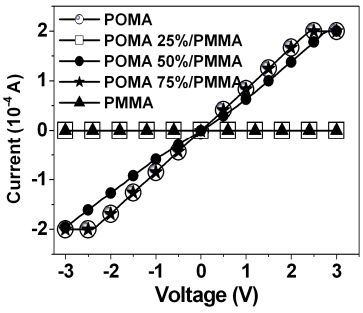

Figure 1: I x V curves of POMA, POMA/PMMA and PMMA.

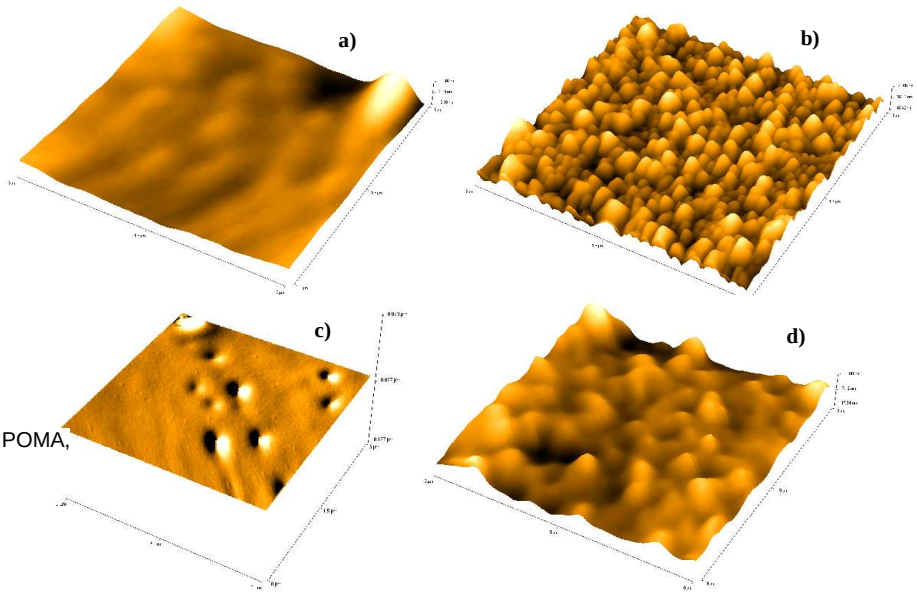

Figure 2: Image AFM of (a) PMMA, (b) POMA, (c) blend of POMA 25%/PMMA and (d) blend of POMA 50%/PMMA.

[1] R F Bianchi, R. K. Onmori, R. M. Faria Journal of Polymer Science. Part B, Polymer Physics. 43 (2005) 74.