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POSTER PRESENTATIONS

Thin Film Polyaniline/Silver Nanowires Nanocomposites for Optoelectronic Applications

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The broad application of optoelectronic devices has influenced intense R&D to follow in its wake. As one of the building block materials in these devices, transparent electrodes (TE) represent an area of growing interest, owing to the fact that it is possible to drastically improve the performance of optoelectronic devices by improving properties of TE [1], such as transsmiting light, transffering and collecting charge carriers and providing a distributed electrical field. So far the most succesfully applied TE is indium tin oxide (ITO) with it's high transmitance and low sheet resistance [2]. Altough ITO has many favourable properties, there are certain drawbacks that limit it's application, such as demanding processing methods, brittleness, high price and inability to transmitt in the UV part of the spectra [3]. Mainly due to its high brittleness and the increasing width of application, researchers have proposed suitable replacements.

Silver nanowires (AgNW) having high transmittance, low sheet resistance, excellent flexibility, simple processing methods coupled with the option of wet chemical synthesis have been analysed as a suitable candidate [4]. However, liabilites such as low adhesion, low chemical stability and high surface roughness still have to be addressed. The aim of this work was to overcome these setbacks by developing polymer/AgNW nanocomposites [5], where the polymer matrix should maintain the essential TE properties all the while improving mechanical properties, stability, adhesion and surface roughness.

In this work TE thin films based on the nanocomposite of AgNW and polymer polyaniline (PANI) were processed via spincoating during which various wt% of polymer dispersions were coated on a layer of AgNWs, after which the nanocomposite was doped with orto-phosphorous acid to transform the polymer from its non-conductive emeraldine base (EB) to its conductive state – emeraldine salt (ES). PANI/AgNWs nanocomposites have shown promising optoelectronic properties, where the best ratio of optical transparency and sheet resistance was obtainted with the composition of AgNW suspension 1:1 and PANI 0.5 wt%. The values of 84.6% and 35 Ω/□ achieved for transparency and sheet resistance respectfully, could be considered adequate for TE performance.

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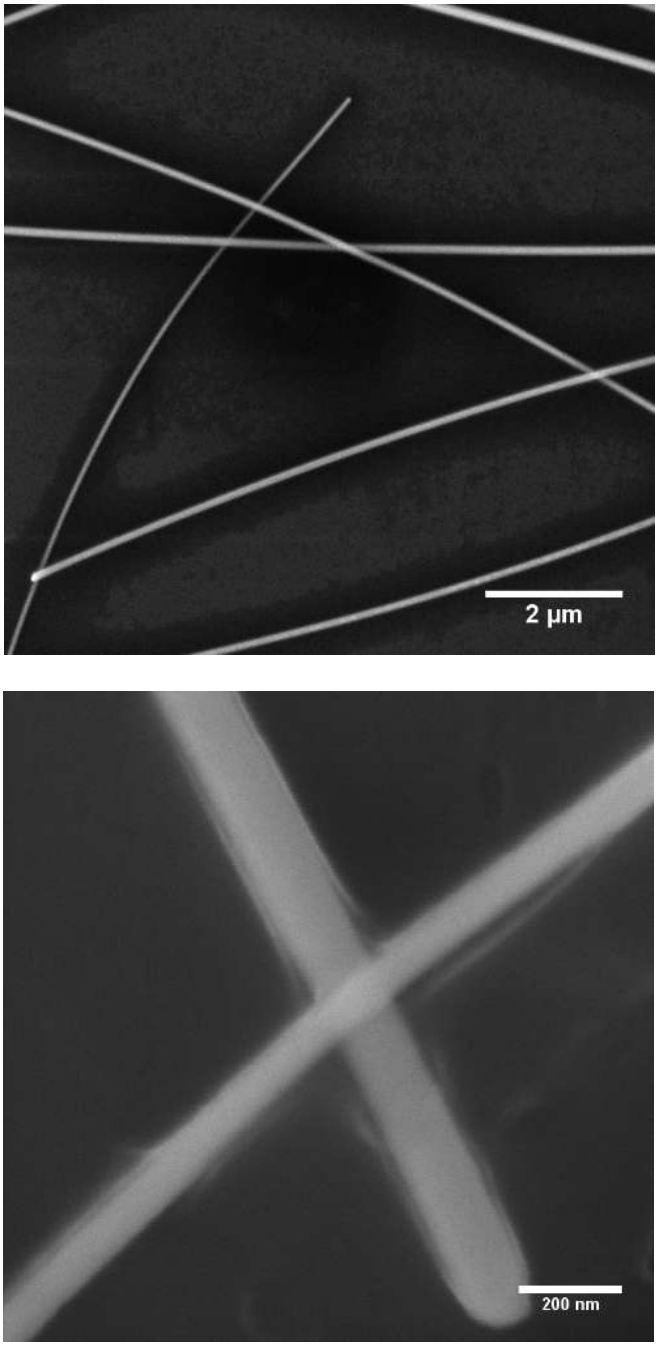

Figure 1. Morphology of the PANI/AgNW nanocomposite structures; top) the polymer fills the empty space between the nanowires, bottom) the polymer coats the nanowires.

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