Centro de Investigación en Materiales Avanzados, S.C.

ZnO Nanofibers Easily Synthesized by Electrospinning. A New Formula.

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Introduction.

ZnO is known as a wide band gap (3.37 eV) semiconductor and for its special properties like piezoelectricity and photoconductivity, photoluminescence [1], among others, which can result in innovative solutions in high technology. However, the reduction of ZnO size to nanometric scale such as nanotubes, nanoparticles, nanofibers, nanowires, etc., the possibilities of technological applications increase . Particularly ZnO nanofibers, due to its electric and optic properties, allow to develop solar cells, nano sensors, opto-electronic devices.

The electrospinning technique (Fig. 1) allows to produce easily high quality polymer composite and metal oxide nanofibers [2].

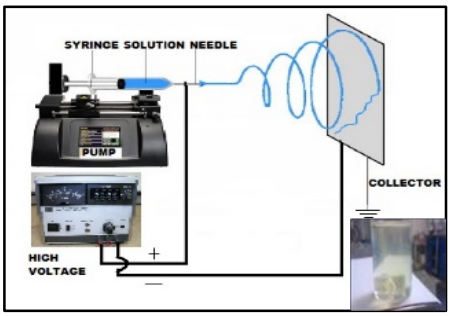

Fig. 1. Schematic drawing of the electrospinning setup and the resultant solution was delivered into a metallic needle.

Experimental.

The synthesis was realized by an electrospinning equipment Nabond Unit_Standard, using a resultant solution containing zinc acetate (Zn (CH3COO)2·2H2O) (0.5M), 1.9968 g of polyvinyl-pyrrolidone (PVP), absolute ethanol (70%) and water (30%).

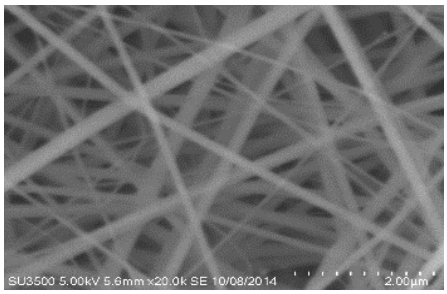

Fig. 2. Nanofibers obtained directly from electrospinning equipment.

The material produced was heated in air in a furnace at 600 °C for 6 hours to remove the polymer layer and to get the reaction to generate the ZnO structure.

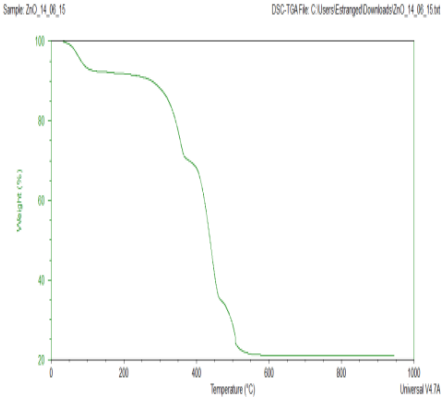

Fig. 3. TGA curve of the material synthesized.

Results.

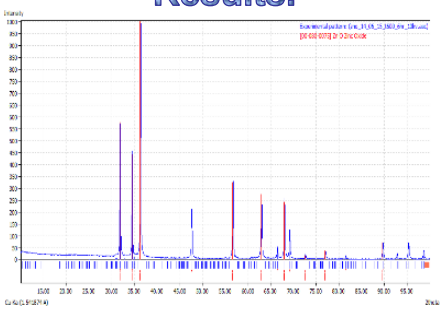

Fig. 4. XRD of the material after the calcination at 600°C, showing the characteristic peaks of ZnO.

The Calcined material were observed in HRTEM (Fig. 5) showing nanofibers with an average diameter of 100 nm.

Conclusions.

The method described here allows obtaining ZnO nanofibers around 100 nm diameter and 500 nm large.

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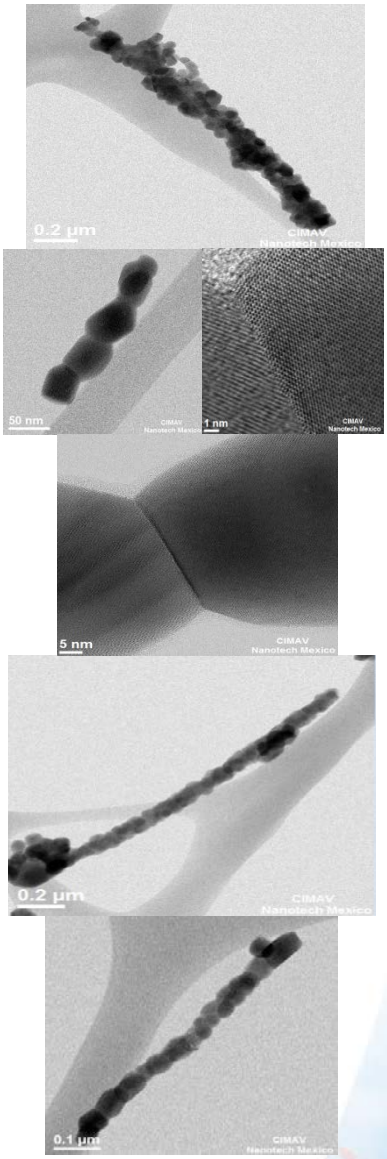

Fig. 5. ZnO nanofibers micrographs obtained directly from HRTEM ,

References.

[1] B. Sen, M. Stroscio and M. Dutta, Journal of Electronic Materials, **40** (2011), p.2015.

[2] J. Sundaramurthy, et. Al., Biofuel Research Journal 2, **2** (2014) p. 44

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