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Nanofibers Pure And Doped With a Transition Metal: $BaTiO_3$ and $LiNbO_3$

M.C. Maldonado-Orozco[1], R. Narro-García[1], C. Nava-Dino[1], J.P Flores-De los Ríos[1], M.T. Ochoa-Lara[2] and F. Espinosa-Magaña[2].

[1.] Facultad de Ingeniería de la Universidad Autónoma de Chihuahua, Nuevo Campus s/n, Chihuahua, México.
[2.] Centro de Investigación de Materiales Avanzados, S.C., Laboratorio Nacional de Nanotecnología, Chihuahua, México.

Nowadays one dimensional nanomaterials such as nanofibers, have been synthesized by various processes, e.g. solution method, sol-gel, laser ablation, chemical vapor deposition (CVD), hydrothermal method and mechanochemical activation. In this work, structures ABO_3 such as $BaTiO_3$ and $LiNbO_3$ nanofibers were doped with Mn like transition metal and synthesized by electrospinning method, a detailed description of the procedure can be found in the literature [1][2]; this technique has been recognized as an efficient method to make polymeric nanofibers [3], who it is a straightforward way to synthesize nanostructures.

The potentials applications of these materials are focused in one of the extensively studied ferroelectric material with wide range of applications in non-volatile ferroelectric random access memories, as transducers, sensors and actuators, etc [4].

The presence of a pure phase and patterns from $BaTiO_3$ doped is confirmed by XRD analysis, Fig 1. In the other hand, the presence of a pure phase and patterns from $LiNbO_3$ doped is confirmed in Fig 2. The metal transition is used to dope the composite taking care the $BaTiO_3$ and $LiNbO_3$ stoichiometry. Such as Fig 1. and Fig 2. show the "x" value, that in both cases corresponds to 2.5, 5 and 10%. In $BaTiO_3$ doped to the 10% change it from tetragonal to hexagonal structure.

Fig 3. and Fig 4. show a SEM micrograph of as-spun fibers, $BaTiO_3$ and $LiNbO_3$ respectively. Cylindrical and randomly oriented $BaTiO_3$ fibers with diameter about 57-453 nm were obtained, compared with diameter about 57-146 nm obtained by $LiNbO_3$.

TEM micrographs, Fig 5. and Fig 6, show a isolated and calcined $BaTi_{0.95}Mn_{0.05}O_3$ and $LiNb_{0.95}Mn_{0.05}O_3$ nanofibers respectively, both in the same Mn concentration. In Fig 5, it can be observed fibers with few µm in length and an irregular morphology. Fig. 6 shows TEM micrograph, different surface morphology is evident.

References:

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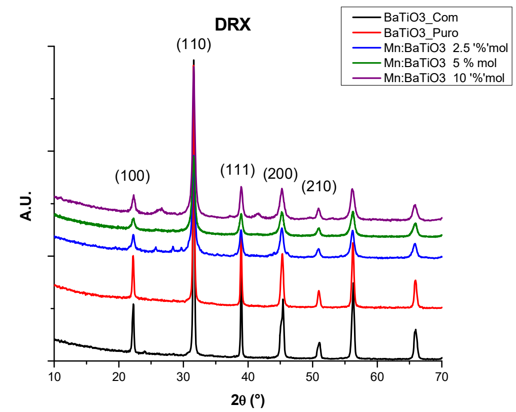

Figure 1. XRD pattern $BaTi_{1-x}Mn_xO_3$

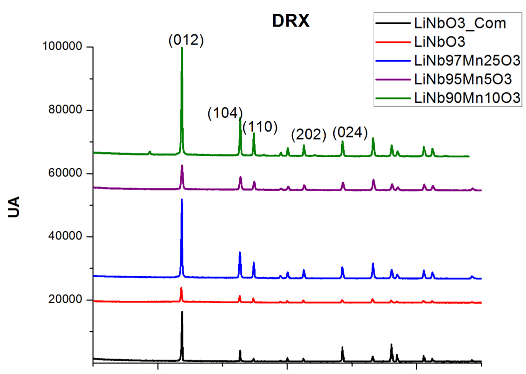

Figure 2. XRD pattern $LiNb_{1-x}Mn_xO_3$

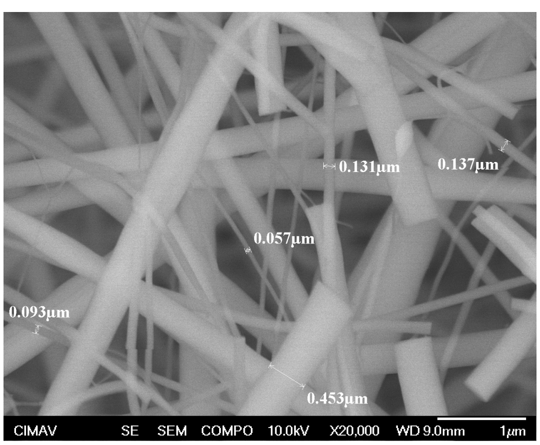

Figure 3. SEM images of as-spun $Ba(C_2H_3O_2)_2$:$Ti[OCH(CH_3)_2]_4$:PVP:CH_3COOH:H_2O:C_2H_5OH composite.

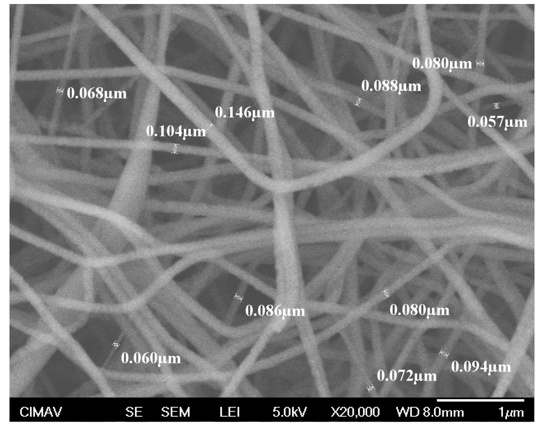

Figure 4. SEM images of as-spun HLiO:$Nb(OCH_2CH_3)_5$:PVP:CH_3COOH:C_2H_5OH. composite.

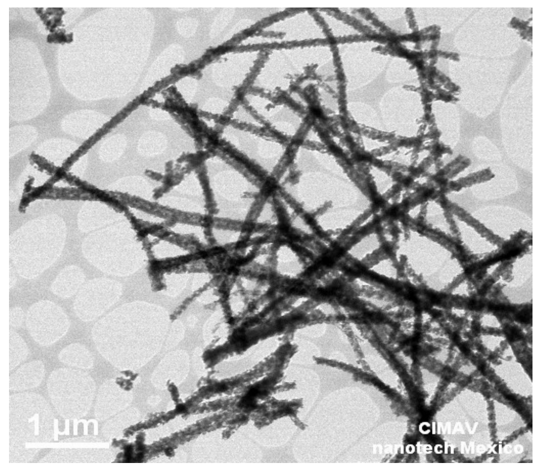

Figure 5. TEM image of $BaTi_{0.95}Mn_{0.05}O_3$ nanofibers.

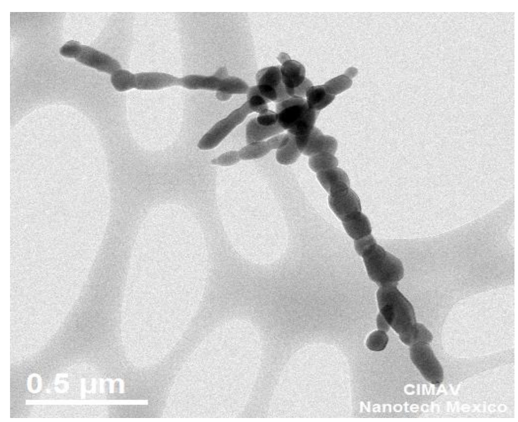

Figure 6. TEM image of $LiNb_{0.95}Mn_{0.05}O_3$ nanofibers.

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