GROWTH OF ORIENTED $La_{0.7}Sr_{0.3}MnO_3$ MANGANITE NANOTUBES IN ALUMINA TEMPLATES

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We report the growth of oriented $La_{0.7}Sr_{0.3}MnO_3$ manganite nanowires within the pores of anodic alumina templates by chemical solution processes. The alumina membranes, with porous diameter varying from 20 to 200 nm, were wet with a sol. The sol was prepared with a stoichometric ratio of lanthanum, strontium and manganese nitrates in the required amount of water mixed with ethylene glycol in order to form linear chain polymer cation complexes. We obtained sols with variable viscosity.

The manganite phase was obtained after the corresponding heat treatment between 600 and 900ºC. We keep the nominal composition of the manganite. Scanning electron microscopy (SEM) with EDS microanalysis and transmission electron microscopy (TEM) allowed to characterize the morphology and microstructure of these nanostructures. By changing the diameter of the porous alumina, the solution viscosity and the heating treatment, leads to nanotube or to nanowire formation. The nanostructures are ferromagnetic at room temperature and exhibit a Curie Temperature T_C above 330K.

Moreover, these nanostructures can be chemically etched by high concentrated NaOH in order to remove the alumina. This opens the possibility to prepare $YBa_2Cu_3O_7$/nanorod composites by chemical methods, to increase the critical current density at high film thickness due to enhanced vortex pinning.

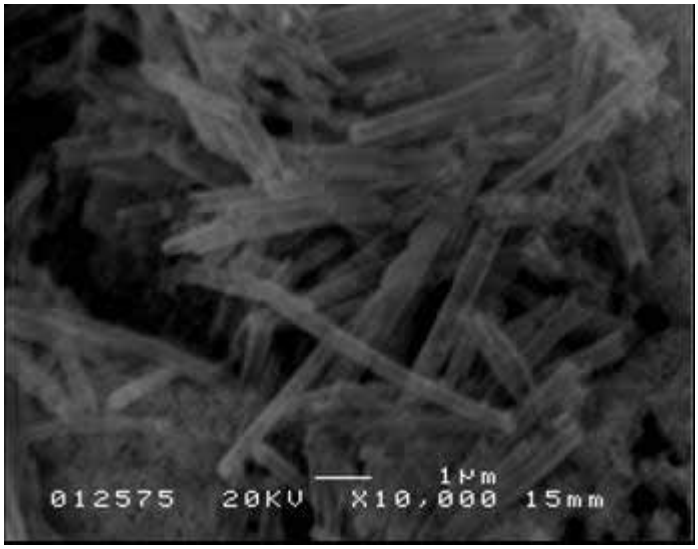

Figure 1: SEM micrograph of $La_{0.7}Sr_{0.3}MnO_3$ nanotubes obtained after removing the Alumina template by chemical etching.

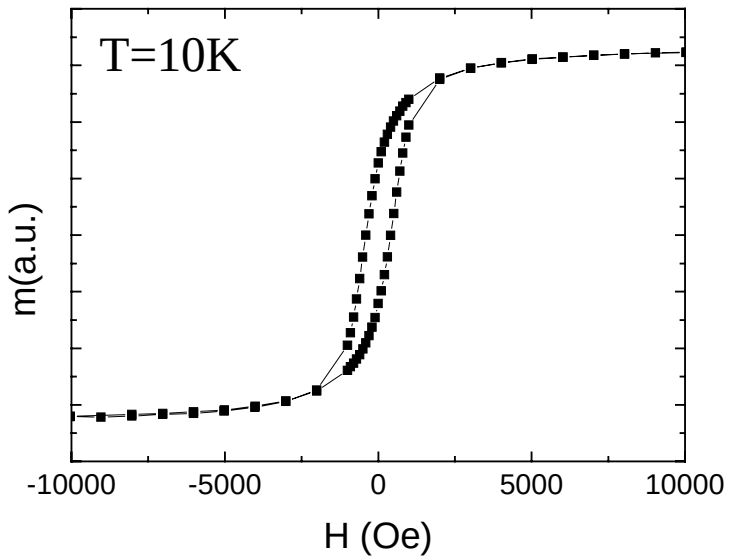

Figure 2: Magnetic hysteresis loop at 10K of 200 nm $La_{0.7}Sr_{0.3}MnO_3$ nanotubes.