

## Single-Crystalline $\text{La}_{0.7}\text{Sr}_{0.3}\text{MnO}_3$ Nanowires Grown by Template Directed Chemical Solution Synthesis\*

*A. Carretero-Genevrier<sup>1</sup>, N. Mestres<sup>1</sup>, T. Puig<sup>1</sup>, A. Hassini<sup>1</sup>, A. Pomar<sup>1</sup>, J. Oro<sup>1</sup>, J. Gázquez<sup>1</sup>, F. Sandiumenge<sup>1</sup>, X. Obradors<sup>1</sup>, E. Ferain<sup>2</sup>*

<sup>1</sup> *Institut de Ciència de Materials de Barcelona ICMAB-CSIC, E-08193 Bellaterra, Catalonia, Spain*

<sup>2</sup> *Université Catholique de Louvain (UCL), B-1340 Louvain la Neuve; Belgium*

*Organization, Address, City, Country*

[Acarretero@icamb.es](mailto:Acarretero@icamb.es)

One dimensional (1D) nanostructures offer a means of tuning the strong interactions that exist between magnetic, electronic and crystal structures of manganites. The development of facile, mild and effective approaches for generating size controllable 1D manganite structures remains a significant challenge. In this report, we demonstrate that self standing single crystalline  $\text{La}_{0.7}\text{Sr}_{0.3}\text{MnO}_3$  (LSMO) nanowires several microns long with controllable morphology can be successfully synthesized by template assisted chemical solution deposition (CSD) using track-etched polymer membranes of varying pore size. Nanowires were synthesized using a sol-gel based polymer precursor route allowing a good control of the viscosity and stability of the precursor solution, which are crucial parameters for template aided synthesis. The pores of the membrane were filled with the precursor solution by capillarity and subsequently heated at high temperature for polymer elimination and phase formation. Extensive characterization has been performed using XRD, SEM and TEM microscopy and SQUID magnetometry. We prove that these nanowires exhibit a monoclinic crystallographic structure not known up to now for manganite that seems to modify its electronic and magnetic properties.

Moreover, we have nanostructured single crystalline substrates with vertically aligned magnetic LSMO nanopillars and nanopyramids combining CSD with supported track-etched polymer templates, this opens the possibility to study new phenomena and interactions in nanomagnet systems embedded into magnetic/non magnetic matrices.

\*This work has been financed by the EU (Hiperchem NMP4-CT2005-516858), MEC (NANOFUNCIONA, NAN2004-09133-CO3-01, NANOSELECT and FPI) and the CSIC (PIF project CANNAMUS).

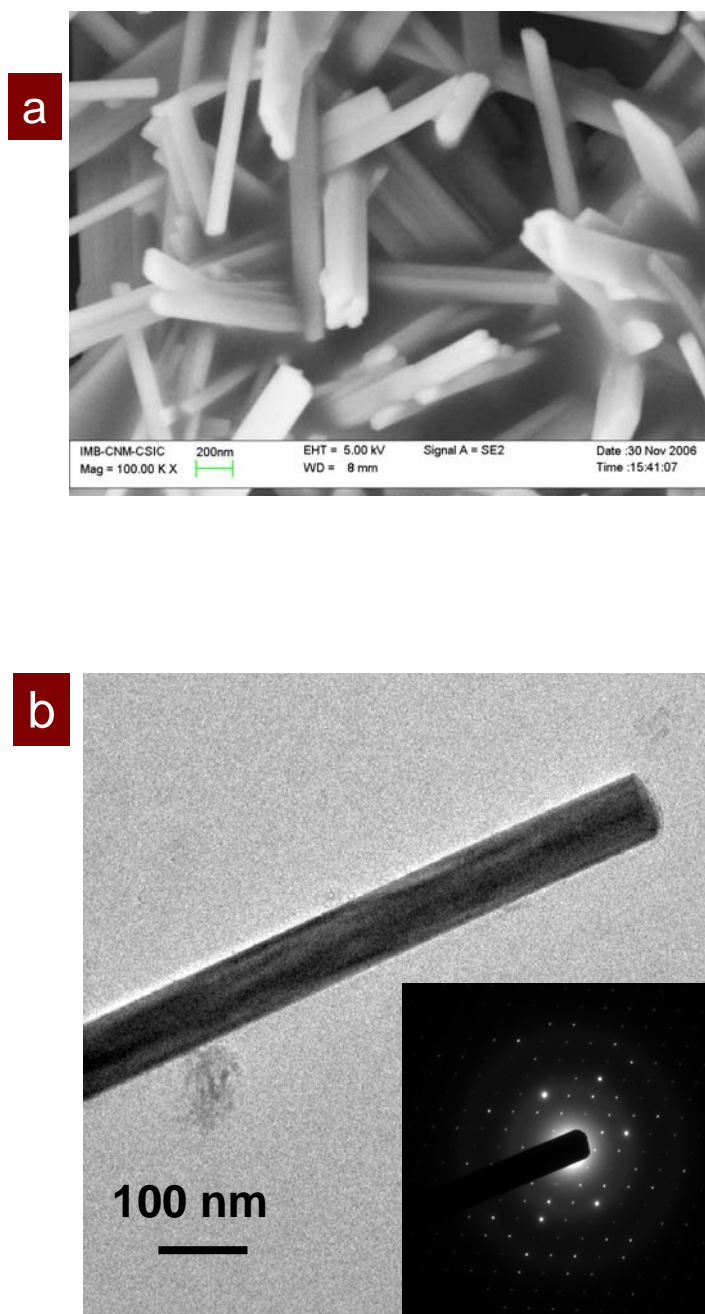


Figure 1: a) Typical field emission SEM image of LSMO nanowires prepared using polyimide membranes with 100 nm pore size, (b) Transmission electron microscopy (TEM) image of a single LSMO nanowire. The inset shows the corresponding SAED pattern indicating the single crystalline nature of the nanowires.