

# HRTEM as a Tool to Characterize Nanomaterials

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Nanostructured materials are being investigated for use in all areas of knowledge, and preliminary results show that they can improve the properties in most of cases. So, a question that emerges is: - How to characterize these so small materials individually? It is in this context that the scanning electron microscopy (SEM) and transmission electron microscopy (TEM) and their related techniques (SAD, HRTEM, EDS, etc.) can help the nanoscience and the nanotechnology. In this work it will be presented FEG-SEM and TEM characterization of 2D, 1D and 0D nanostructures, but the main focus will be the characterization of tin oxide and tin-doped indium oxide (ITO) nanobelts grown from vapor phase. It is known that the properties of materials are strongly dependent of their size, shape, structure and chemical composition, and TEM techniques may be used for these characterizations in individual nanomaterials. For example, it is possible to know the preferential growth direction of 1D nanostructures, and the presence (or absence) of defects in these materials. At the moment, TEM techniques are more available for research groups, and another important use of TEM in materials science is the possibility to perform *in situ* experiments, and some examples of this application will be presented.

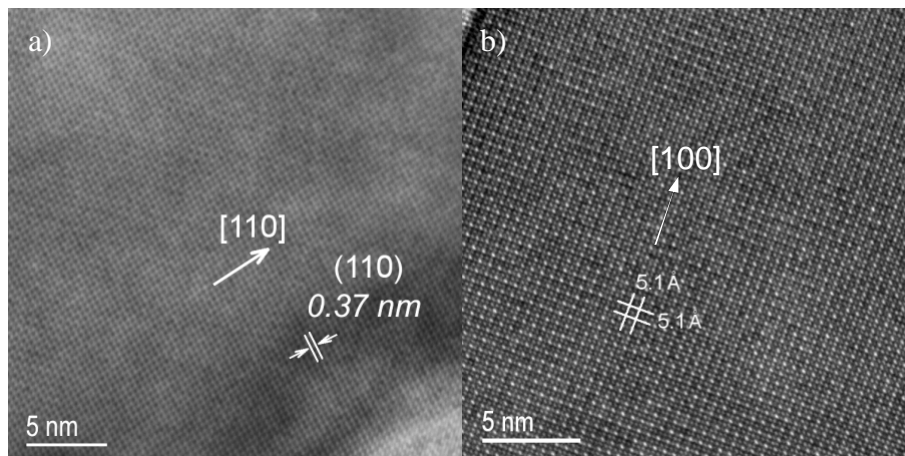


Figure 1: a) HRTEM image of a SnO nanobelt grown in the [110] direction of the orthorhombic structure of SnO, and b) HRTEM image of an ITO nanobelt grown in the [100] direction of the cubic structure of  $\text{In}_2\text{O}_3$ .

Key-words: Nanomaterials, HRTEM, Tin oxide, ITO.

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