Wet chemical synthesis of CuO and NiO nanoarchitectures and nanometrological analysis

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Hydrothermal and solvothermal growth techniques have gained significant popularity since they are an inexpensive and relatively facile means to obtain a plethora of 3-dimensional nanostructures characterized by structural complexity, hierarchy and multiple functionalities. In particular these approaches have been very popular into creating nanoarchitectures of semiconducting monoxides with strong emphasis on nickel oxide (NiO) and cupric oxide (CuO) for a large spectrum of applications.

In this work, CuO and NiO nanostructures have been developed via a two-step sol-gel and hydrothermal technique onto silicon substrates. A two-fold study has been devised. On the one hand, the compatibility of the proposed method with microelectronic fabrication techniques is explored in order to facilitate routes for novel optoelectronic and sensing devices. On the other hand, it was seen that despite the apparent simplicity of the synthesis method, the created nanostructures are morphologically and hierarchically complex (Fig.1). For that reason, a symmetry-based approach has been employed to develop the appropriate methodology describing these non-conventional nanoarchitectures, to directly link their features to the synthesis parameters and to create in a predictable way customizable CuO and NiO nanostructures.

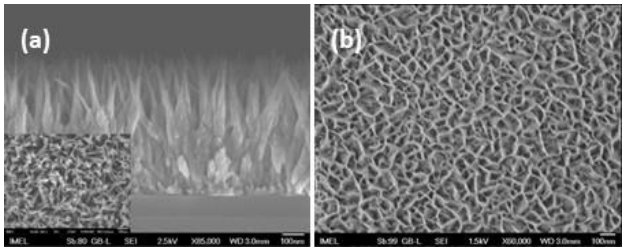

Fig. 1 SEM images of (a) CuO and (b) NiO nanostructures created via wet chemical synthesis on Si substrates (scale bars: 100nm).