EFFECT OF THE O$_2$ FLOW ON THE MORPHOLOGY OF In$_2$O$_3$ NANOSTRUCTURES GROWN THROUGH VLS PROCESS

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Indium oxide (In$_2$O$_3$) has gained attention due to its high optical transparency, good electrical conductivity [1] and high chemical stability [2]. In$_2$O$_3$ nanostructures have been widely studied due to their very attractive properties, which make them suitable for applications in gas sensors [1], catalysts [3], transparent field effect transistors [2], and so on. In$_2$O$_3$ nanostructures have been synthesized in different morphologies, such as wires [4], belts [5], rods [6], cubes [6], and particles [1,6]. Morphology of nanostructures rules their physical and chemical properties. As controlling the morphology of nanostructures is very important for their applications in optoelectronic devices, understanding and controlling the growth process become a key factor for applying In$_2$O$_3$ nanostructures in device fabrication. Although there are some reports [7,8] dealing the growth mechanism of In$_2$O$_3$ nanostructures, the effect of growth parameters such as deposition temperature, O$_2$ flow rate/partial pressure, system pressure, carrier gas flow rate, and used catalyst, have not been clarified adequately.

In this work, In$_2$O$_3$ nanostructures were synthesized by VLS process. O$_2$ flow in the reaction system has been varied to observe its effect on the nanostructures morphology. Different Ar:O$_2$ flow ratios have been set in the reaction system (100:X v/v, with X=10,6, and 3), keeping Ar flow fixed at 60 sccm. Besides, In$_2$O$_3$ nanostructures have been grown under steady O$_2$ atmosphere without any flow. The obtained products have been analyzed by SEM, EDS to observe the nanostructures morphology and elemental composition as function of O$_2$ supply. Raman spectroscopy has been employed to analyze the structural properties of the fabricated nanostructures.

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