Growth and characterization of Bi_2O_3 nanowires

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Abstract : 1-D nanostructured materials have much more attention because of their outstanding properties and wide applicability in device fabrication. Bismuth oxide(Bi_2O_3) is an important p-type semiconductor with main crystallographic polymorphs denoted by α-, β-, γ-, and δ -Bi_2O_3[1]. Due to its unique optical and electrical properties, Bi_2O_3 has been extensively investigated for various applications in gas sensors, photovoltaic cells, fuel cells, supercapacitors[2-4]. In this study, Bi_2O_3 NWs were grown by two step annealing process: in the first step, after annealing at 270℃ for 10h in a vaccum(3×10^{-6} torr), we can obtain the bismuth nanowires. In the second step, after annealing at 300℃ for 2h in O_2 ambient, we successfully fabicated Bi_2O_3 nanowires.

Key Words : Bismuth thin film, Bismuth oxide nanowires, optical properties

1. Introduction

Bismuth oxide (Bi_2O_3) is an interesting material, very important in modern solid state technology and fascinating to scientists, owing to its unique structures and physical properties like the large energy bandgap, high refractive index, dielectric permittivity and high oxygen-ion conductivity, as well as marked photoconductivity and photoluminescence[1] .Due to its unique optical and electrical properties, Bi_2O_3 make it suitable for a large range of applications, such as sensors, optical coatings, photovoltaic cells and microwave integrated circuits. They are also widely used in fuel cells, as catalysts for the soft oxidation of hydrocarbons and as electrochromic materials.

2. Results and discussion

Bi_2O_3 NWs were grown by two step annealing process: in the first step, after annealing at 270℃ for 10h in a vaccum(3×10^{-6} torr), we can obtain the bismuth nano wires. In the second step, after annealing at 300℃ for 2h in O_2 ambient, we successfully fabicated Bi_2O_3 nanowires. Structural properties of bismuth oxide nanowires analyzed by XRD and TEM.

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