Growth and analysis of Copper oxide nanowire

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Abstract : 1-D nanostructured materials have much more attention because of their outstanding properties and wide applicability in device fabrication. Copper oxide(CuO) has been realized as a p-type metal oxide semiconductor with narrow band gap of 1.2 -1.5eV. Copper oxide nanostructures can be synthesized by various growth method such as oxidation reaction , thermal evaporation thermal decomposition, sol-gel. and Mostly CuO nanowire prepared on the Cu substrate such as Copper foil, grid, plate. In this study, CuO NWs were grown by thermal oxidation (at various temperatures in air (1 atm)) of Cu metal deposited on CuO (20nm)/SiO_2 (250nm)/Si. A 20nm-thick CuO layer was used as an adhesion layer between Cu metal and SiO_2

Key Words : copper oxide nanowires, thin film, adhesion layer, compressive stress

1. Introduction

Copper oxides have been widely used in many areas such as in heterogeneous catalysts [1], anode electrodes for batteries. [2]

2. Experiment

In this study, CuO NWs were grown by thermal oxidation (at various temperatures in air (1 atm)) of Cu metal deposited on CuO (20nm)/SiO_2 (250nm)/Si. A 20nm-thick CuO layer was used as an adhesion layer between Cu metal and SiO_2.

3. Results and Discussion

CuO nanowires formed on the copper films of a thickness of 1000 nm at 400 ℃ for 4h in air. Here, copper oxide films are formed due to annealing of the copper films at 400 ℃ for 2h in air which are used as adhesion layers. (Fig 1 and 2)

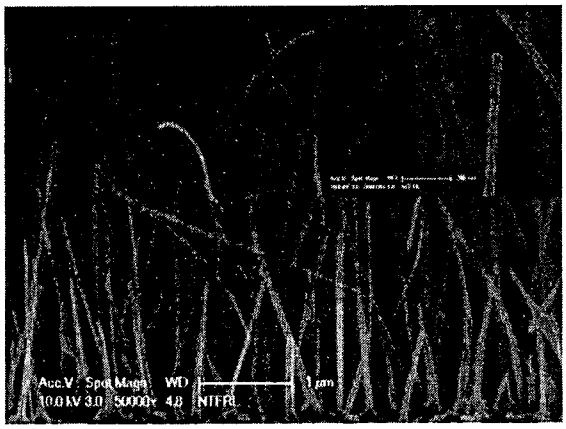

Figure 1. SEM images of CuO NWs at 400 ℃ for 4h in air.

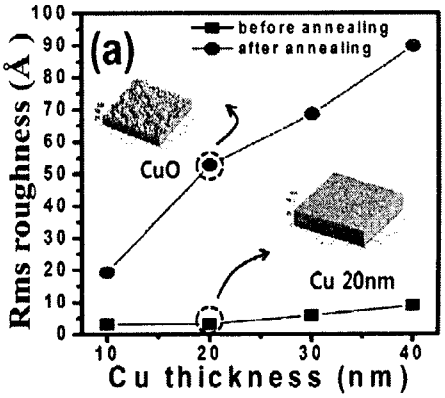

Figure 2. AFM images and Rms roughness of Cu and CuO thin film by thermal annealing

4. Conclusions

CuO nanowires with high aspect ratio were synthesized at 400 ℃ for 4h in air. And 20nm-thick CuO layer can be prevent the thin film cracking. or copper thin film surface is not tarnished after the annealing.

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