Influence of Seed Layer to Change the Size of Zinc Oxide Nanorods

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1. Introduction

Zinc oxide (ZnO) is one of the most common materials used in the field of electronics. It can be applied in the optoelectronics area due to the similar property with titanium dioxide which gives one of the highest photon to current efficiency. Vertically aligned ZnO nanorods was chosen due to its easiness of fabrication and reduced electron recombination for solar cell application [1].

2. Experimental

A 20 ml mixture of zinc acetate dihydrate with 2-methoxyethanol was chosen as the solution to grow the seed layer on top of the FTO substrates. The concentration of zinc acetate was determined as the variable at 0.025 M and 0.050 M. Ethanolamine was added to the solution to act as a stabilizer and then stirred and heated at 60°C. Spin coating method was used to grow a thin film of seed layer at 3000 rpm speed and then heated at 100°C for 10 min. This process was repeated for 3 times. A thermal annealing at 350°C was performed to the samples with attached seed for the duration of 1 h. The growing solution for the nanorods consisted of two separate solutions of zinc acetate dihydrate and hexamethylenetetramine (HMT) with each containing 0.03 M and 50 ml. Chemical bath deposition was chosen as the method to grow the nanorods at 85°C for 3 h. After that, the samples were dried at room temperature. A thermal annealing at 350°C was done for 1 h.

3. Results and Discussion

Scanning Electron Microscope (SEM) images of the seed layers and nanorods can be seen in Fig. 1. The solution concentration for the seed layer does not show noticeable difference in the morphology of seed layer. However, a comparison between the resultunt nanorods shows that nanorods with larger diameter are grown on the seed layer with higher solution concentration. The result could be explained by the more nucleation growth sites provided by higher slution concentration for the seed layer.

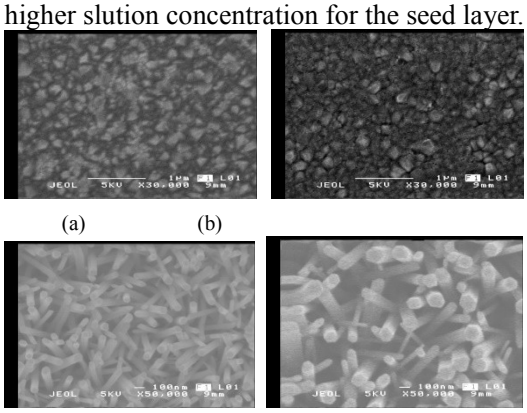

Fig. 1. SEM images of seed layers (a, b) and nanorods (c,d). The solution concentrations for seed layer are 0.025 M (a,c) and 0.050 M (b,d), respectively.

[1] Gonzalez-Valls, I., B. Ballesteros, and M. Lira-Cantu, Nano, 2015. p. 1550103