

Ultrasonic Assisted Growth of ZnO Nanorods at Low Temperature

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Abstract : This paper investigates the effect of ultrasonic treatment on ZnO nutrient solution prior to the growth of ZnO nanorods, where the seed layer is annealed at 50 and 100°C. The results show that the ZnO nanorods are successfully grown on the sample annealed at 50°C in the sonicated ZnO nutrient solution with a length and a diameter of approximately 8.025 µm and 92 nm, respectively. However, no ZnO nanorods structures are observed for the sample annealed at 50°C and grown in unsonicated ZnO nutrient solution. Meanwhile, the ZnO nanorods for the sample annealed at 100°C are successfully grown in both sonicated and unsonicated ZnO nutrient solutions. The length and diameter of the nanorods for the sample grown in the sonicated solution are 8.681 µm and 1.033 nm, whereas those for the sample grown in the unsonicated solution are 7.613 µm and 1.040 nm. This result shows that with ultrasonic treatment, the length of the ZnO nanorods increases by 14%, whereas their diameter is reduced by 0.7%, resulting in an increase of aspect ratio from 7:1 to 8:1. Electroconductivity and pH sensors are used to measure the conductivity and acidity level of the sonicated and unsonicated solutions, respectively. The result shows that the conductivity increases from 87 mS/cm to 10.4 mS/cm, whereas the solution pH decreases from 6.52 to 6.13 for the sonicated and unsonicated solutions, respectively. The increase in solution conductivity and acidity level elucidates the higher amount of zinc nutrient in the sonicated solution than in the unsonicated solution.

Keywords : ultrasonic treatment, low annealing temperature, ZnO nanostructure, nanorods

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