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Influence of RTA treatments on optical properties of ZnO nanorods synthesized by wet chemical method

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Zinc oxide is the most attractive material due to the large direct band gap (3.37 eV), excellent chemical and thermal stability, and large exciton binding energy (60 meV). Recently, ZnO nanorods were used as the high efficient antireflection coating layer of solar cells based on silicon (Si). In this reports, we studied the effects of rapid thermal annealing (RTA) treatment on optical properties of ZnO nanorods. For fabrication of ZnO nanorods, there are many methods such as hydrothermal method, sol-gel method, and metal organic chemical vapor deposition method. Among of them, we used the conventional wet chemical method which is simple and low temperature growth.

In order to synthesize the ZnO nanorods, the ZnO films were deposited on Si substrate by RF magnetron sputtering at room temperature and the samples were dipped to aqua solution containing the zinc nitrate and hexamethylentetramines (HMT). The synthesis process was achieved in keeping with temperature of 90-95 C° and under constant stirring.

The morphology of ZnO nanorods on glass and Si was characterized by scanning electron microscopy. For the analysis of antireflection performance, the reflectance and transmittance were measured by spectrophotometer. And for analyzing the effects of RTA treatment on ZnO nanorods, crystalline properties were investigated by X-ray diffraction measurements and optical properties was estimated by photoluminescence spectra.