Incorporation of Sb in ZnO Nanostructures through Hydrothermal Process: Effects on Morphology and Optical Band Gap

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In the last years there has been an increasing interest to synthesize doped nanostructures through low-cost chemical routes. We incorporated antimony in ZnO nanostructures through a low temperature hydrothermal method. While in as-synthesized nanostructures, Sb remains in Sb₂O₃ phase, on thermal annealing at 500°C, it dissociates into ZnO in metallic state mainly by substituting Zn from the crystal lattice of Sb drastically modifies the morphology of the ZnO nanostructures. Effect of Sb doping concentration on the morphology and optical band gap of the nanostructures are studied.

While un-doped samples present needle-like nanostructures, the antimony doping, depending on the concentration, promoted the formation of rod-like or spherical nanostructures. The optical band gap of the ZnO nanostructures is quite increased for lightly doped samples, but it decreases in heavy doping.

Figure 1. Typical SEM micrographs of a) undoped, b) 0.5% Sb doped, c) 1.0% Sb doped, and d) 2% Sb doped ZnO nanostructures after thermal annealing.

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