

Growth and optical properties of non-catalytically grown ZnO nanostructures by simple thermal evaporation process

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ZnO nanostructures with variety of morphologies and sizes, such as urchin-like structures composed of small-head nanonails, vertically aligned nanonails and nanocones, comb-like nanostructures, hierarchical nanostructures, and etc, have been synthesized via the simple thermal evaporation process onto the steel alloy substrate without the use of any metal catalyst or additives. It was observed from the detailed morphological and structural studies that substrate temperature, distances between source material and substrates, concentration of zinc vapors, zinc partial pressure, concentrations of reactant gases, and choices of substrates have serious impact on the morphologies and structural properties of as-grown products. Therefore, within certain reaction parameters, specific morphologies can be obtained. Detailed structural observations confirmed that the as-grown products are single-crystalline with the wurtzite hexagonal phase and grown along the [0001] directions. Raman-scattering and room-temperature PL studies revealed that the as-grown products have good crystallinity with the excellent optical properties.