

## Synthesis and characterization of ZnO nanostructures by the temperature controlled non-catalytic growth process on steel alloy substrate

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A variety of ZnO nanostructures such as nanowires, nanonails, comb-like nanostructures, hierarchical nanostructures etc have been grown without the use of any metal catalyst or additives on the steel alloy substrate via thermal evaporation of metallic zinc powder in a single reactor chamber. It was observed that temperature, distance of the substrate from Zn source as well as the oxygen concentration can affect the general morphology of the deposited structures and specific structures can be obtained at specific temperature zone under appropriate oxygen concentration. HRTEM and SAED patterns revealed that the deposited nanostructures are single crystalline and grew along the [0001] direction. Appearance of sharp, strong and dominant optical-phonon E2 mode and suppressed E1 (LO) mode in Raman spectra, for all the cases, indicated that the grown ZnO nanostructures have good crystal quality with the hexagonal wurtzite phase. A strong and sharp UV emission in the room-temperature photoluminescence spectra confirmed the excellent optical properties for the deposited ZnO nanostructures.