

Temperature controlled catalyst-free synthesis of UV-emitting ZnO nanostructures by thermal evaporation

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A variety of ZnO nanostructures i.e. needle-like nanowires, nanorods and uniform nanowires originated from nanosheets have been achieved on silicon substrate by the thermal evaporation of high purity metallic zinc powder in the presence of oxygen without the use of any catalyst or additives. It was observed that a particular type of ZnO nanostructure can be obtained in a specific temperature zone and morphology can be well controlled simply by adjusting the substrate temperature. Detailed structural analysis reveals that the formed ZnO nanostructures are single-crystalline with wurtzite hexagonal phase and grow along the [0001] direction in preference. Raman scattering and room temperature photoluminescence (PL) spectra confirm the good crystallinity with hexagonal wurtzite phase and excellent optical properties, respectively for all the deposited ZnO nanostructures.