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SYNTHESIS AND STRUCTURAL CHARACTERIZATION OF SILICA DOPED ZINC OXIDE NANORODS FOR PHOTOLUMINESCENCE APPLICATIONS

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ABSTRACT

ZnO is considered to be a promising material for the nanoscale based device applications due to its wide direct band gap of 3.37 eV, Wurtzite crystal structure and high exciton binding energy of 60 meV. ZnO nanostructures have useful applications in the development of optoelectronic devices, piezoelectric transducers, dye-sensitized solar cells, gas sensors, and in medical field. In this paper ZnO nanorods are synthesized by using template free gel pyrolysis method in which a Zinc salt is precursor is trapped in a homogenized gel network and by controlling the gel structure and pyrolysis rate Zinc salt precursor can be calcinated into Zinc Oxide nanorods which are then doped with Silica. The synthesized nanorods are characterized using SEM, EDX, XRD, UV-Vis spectroscopy, FTIR and Photoluminescence Spectroscopy. ZnO nanorods obtained are 60-100nm in diameter and 500-1600 nm in length. Silica doped nanorods are equal in diameter to ZnO nanorods and are 400-800 nm in length. XRD studies show that the prepared samples are nanocrystalline in nature with hexagonal wurtzite phase and highly oriented along (101) direction. Silica doped ZnO nanorods showed improved band gap compared to ZnO nanorods. The Photoluminescence Characterization showed that Silica doped ZnO nanorods have exhibited very less UV emission and improved Blue-Green Emission which seems to be promising for LED lights and drug delivery with very low UV emission.

KEYWORDS: Silica Doped ZnO Nanorods, Gel Pyrolysis, Band Gap, Photoluminescence