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Recent Research at the Intersection of Science & Technology

Editors:

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CONTENT

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CHAPTER
9

A GREEN SYNTHETIC APPROACH FOR THE DOPED ZnO NANOPARTICLES FOR OPTOELECTRONIC APPLICATION

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Theoretical Background

Green synthetic approach for ZnO

Nanostructures of metal and semiconductors hybrids have gained significant interest in recent years due to their potential applications in the emerging fields of nanotechnology (Sun *et al.*, 2009). Size, shape, surface area, inertness and conductivity are few parameters of selecting these materials. Among many materials, Zinc oxide (ZnO) nanostructures have proven to be a suitable candidate for various applications due to its superior characteristics; which include wideband gap (3.37 eV), large excitation binding energy (60 meV) and high electron mobility (about 115–155 cm2/V/S) (Das, *et al.*, 2017). ZnO is a unique and versatile material that exhibits both semiconducting and piezoelectric properties also having high interfacial area, which allows more electron–hole formation in presence of UV light, essential criteria for optoelectronic devices (Singh, 2010). Other favorable aspects of ZnO include its non-toxicity, biocompatibility, low cost, easy synthesis with varying morphology (nanorods, nanoflowers), andlow power threshold (Xia *et al.*, 2016). Together, these properties makes ZnO an ideal candidate for a variety of applications in solar cells, gas sensors, photo catalytic, antibacterial, electrical and optical devices (Rekha *et al.*, 2010). Recent studies show ZnO nanostructure has potentialas antibacterial agents in lotions, mouthwashes, ointments, and microbial efficacy against growth. Moreover, there have been significant efforts underway for the development of UV photodetectors, UV lasers, and switches using ZnO nanostructures (Maiti *et al.*, 2015). The green synthesis of nanoparticles is a good substitute for physical and chemical methods. Various synthetic parameters use for the ZnO materials itself is a versatile application. The synthetic methods comprises of sol-gel combustion, chemical vapor deposition, sonochemical, hydrothermal, wet polymerization, solvothermal, thermal decomposition, microwave assisted, precipitation, micro-emulsion, lyophilization and laser ablation (Kaviyarasu *et al.*, 2016a, 2016b). The green synthetic method, employing biological plant extracts is one of the more extensively acknowledged routine due to its several advantages.