PREPARATION AND CHARACTERIZATION OF NANOPHOSPHOR

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EXECUTIVE SUMMARY OF THE PROJECT

Semiconducting nano-materials have been the key drivers for the swelling interest in nano-science and technology. Nanoparticles attracted considerable attention in recent years because of their special properties, such as quantum size effects and unusual luminescence phenomenon. The size dependent optical properties have many potential applications in the areas of solar energy conversion, light emitting devices, chemical/biological sensors, photo catalysis and optoelectronic devices. To obtain high quality nano phosphors, it is essential to understand the role of both the temperature and the concentration of doping.

The present study aimed at the synthesis and characterization of white emitting Manganese (Mn) doped Zinc Sulphide (ZnS)nanophosphors. The spectroscopic properties and the crystal structure of Mn doped ZnS nanoparticles are studied here to provide a better understanding on how the luminescence emission and the crystalline composition are influenced by the synthesis temperature. The syntheses of the samples were carried out by the simple wet chemical precipitation method. The influence of synthesis temperature on structure and optical properties were studied at constant Manganese concentration. The nanoparticles were structurally characterized by X-Ray Diffraction (XRD) and Scanning Electron Microscopy (SEM). The XRD studies show the phase singularity of Mn doped ZnS particles having zinc-blende (cubic) structure at all temperatures. The band gap of the doped samples are red shifted with temperature. Electron Paramagnetic Resonance (EPR) spectra exhibited resonance signals, characteristic of $Mn^{2+.}$ Incorporation of Mn in the ZnS nanoparticles was confirmed by Inductively Coupled Plasma- Atomic Emission Spectroscopic studies (ICP-AES). The samples show an efficient emission of yellow–orange light centered at 590 nm which is characteristic of Mn^{2+} along with a blue emission at 435 nm due to sulfur vacancy. The overall emission is white at all temperatures with CIE co-ordinates in close agreement with achromatic white.