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Optimization of CdSe Quantum Dots Embedded in PVP Polymer Matrix for Solar Cell Applications

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Abstract—*Implementation of polymer nanocomposites (PNC's) in devices has developed immense attention now a day. PNC's are used in applications such as charge storage capacitor system [1], memory device application [2], polymer based solar cells and light emitting diodes [3]. PNC's enhance efficiency of solar cells by improving the optical, electrical and chemical properties of a material. In this research work CdSe/PVP nanocomposite (NC) material was synthesized using wet chemical synthesis technique. The X-ray diffraction (XRD) study results in the formation of crystalline structure of CdSe nanoparticles (NP's) and PVP NC. The particle size was determined by Debye shearer formula using X-ray spectra, which was observed to be less than 10 nm. CdSe/PVP NC shows a broad hump which may be due to the presence of PVP matrix. UV-VIS Spectroscopy is used to calculate energy band gap. A red shift in the absorption edge of CdSe/PVP NC is observed with respect to CdSe Np's,*

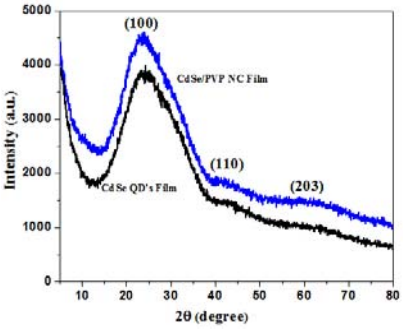

Fig. 1: X-ray diffraction spectra of CdSe NP's and CdSe/PVP NC's.

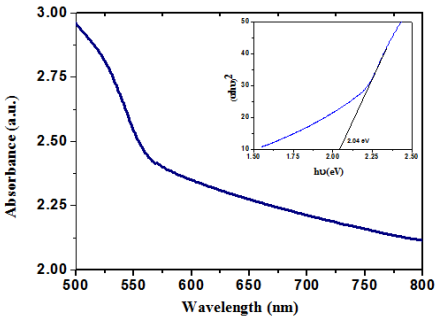

Fig. 2: UV-VIS absorption spectra inset $(\alpha h\nu)^2$ vs. hν of CdSe/PVP NC's

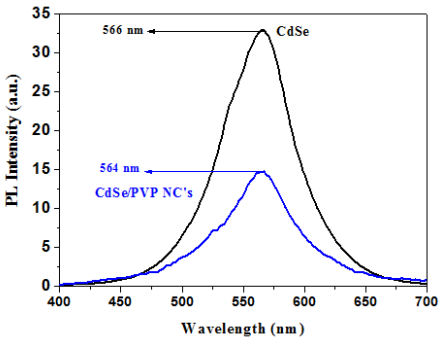

Fig. 3: Photoluminescence spectra of CdSe NP's and CdSe/PVP NC

The emission wavelength for CdSe NP's is 566 nm, at 360 nm as an excitation wavelength. For CdSe/PVP NC emission wavelength is obtained at 564 nm. Whereas the absorption wavelength is at 600 nm, which shows a stoke shift of 36 nm for CdSe/PVP NC's. The improved properties of NC as compared to NP's allow its use in solar cell application.

Keywords: *Nanoparticles, Nanocomposites, Solar cell.*

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