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# Absorption and Electroluminscence Studies of CdSe/PVA nanocomposite

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**Abstract:** ***In this paper, synthesis of nanocomposite thin film CdSe/PVA has been prepared by chemical method and studied its absorption spectra and electroluminescence. Absorption spectra of the CdSe/PVA nanocomposite was studied, it is observed that there is uniform absorption range from 800nm to 400nm. Electroluminescence studies seen that emission starts at a threshold voltage and then increases rapidly with increasing voltage. The particle size of the CdSe nanocrystal also calculated and the radius of the given sample was found to be 2.16nm***.

**Keywords:** nanocomposite, absorption spectra, electroluminescence

## 1. Introduction

During past decade semiconductor nanoparticles was one of the most rapid developing field in research of physical science. Due to the infinite application, nanoparticles are studied widely. Nanocomposites polymer have attracted much attention recently due to their unique size dependent chemical and physical properties [1]. nanostructure CdSe semiconductor is important in group II-VI. It has wide bandgap,and blue shift absorption spectra. CdSe/PVA nanocomposite polymer showing electroluminescence which are used in many applications as light emitting diode, television display, display board etc [2 3]. Present studies have been undertaken to synthesize CdSe nanocrystals embedded in PVA and investigated their absorption spectra and electroluminescence.

## 2. Experimental and Sample Preparation

For Preparation of CdSe/PVA sample,1.24gm of Na2So3 and 39.48mg of Se is mixed with 10 ml of DMF to get Na2SeO3 and 0.05mol of selenium powder is mixed in 100ml of Na2SO3 DMF solution for a long 3 hours., then the solution of Sodium selenosulphate (Na2SeSO3) is filter and stored in dark. 3gm of PVA is dissolved in 50ml DMF and stirred at 90 degree till viscous transparent solution is formed.After that CdCl2 solution is mixed with 10ml of DMF to get 0.10m solution. In a 50 ml flask 20 ml the PVA solution is mixed with 1ml of CdCl2 and stirred constantly, added 2M of NaOH solution dropwise in the above solution until we get clear solution, PH value of the above solution is maintain about 10by adding acetic acid and the solution ofNa2SeSO3 is mixed in the solution ans stirred for 3 hours at room temperature to obtained the transparent solution. The above solution cast on the slide and lept it in oven and finally we get a nanocomposite polymer flim of CdSe.

### 2.1 Absorption spectra of the CdSe/PVA nanocomposite thin flim

Absorption spectra of the sample was taken successfully byUV/VIS Perkin Elember lambda-12 Spectrometer (ranging 200nm to 800nm).Fig 1 show tha typical absorption spectrum of tha sample prepared. It is observed that there is uniform absorption range of 800nm to 400nm, then there is gradually increase and different peaks are obtained, but due to bad filter selection we consider only the range from 800nm to 300nm.

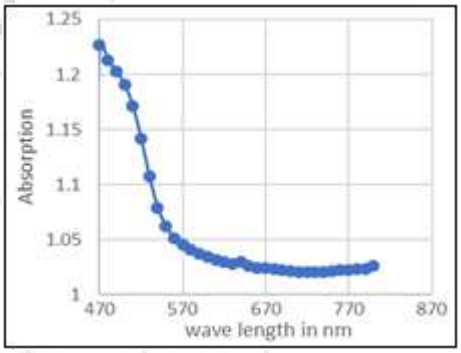


**Figure 1:** Absorption Spectra of the CdSe/PVA nanocomposite thin flim

### 2.2 Estimation of particle size of the CdSe nanocrystal

The estamitation of particle size of the CdSe nanocrystal is calculated from Effective mass approximation method.

$$r^2 = \frac{h^2}{8(Eg' - Eg)}\left(\frac{1}{m_e^*} + \frac{1}{m_h^*}\right)$$

$E_g$ = Band gap of CdSe – PVA Nanocomposite

$E_g$ = 1.74eV = 1.74 x 1.6 x $10^{-19}$ Joule

$E_{g'}$ = Band gap of bulk CdSe
$E_{g'}$ =1240/550= 2.254 eV = 2.254 x 1.6 x $10^{-19}$ Joule.
h = 6.6 x $10^{-34}$ J Sec.
$m_e^*$ = 0.7 x 9.1 x $10^{-31}$ Kg.
$M_h^*$ = 0.2 x 9.1 x $10^{-31}$ Kg.
Now,

$$r^2 = \frac{h^2}{8(Eg' - Eg)}\left(\frac{1}{m_e^*} + \frac{1}{m_h^*}\right)$$

r = 2.16 nm.
The radius of the given sample was found to be 2.16nm.

## 3. Electroluminscence Studies

For electroluminscence studies, Electroluminscence(EL) cell

was prepared and connected to ac electroluminscence power supply. The EL cell is place at the slit of photo multiplier tube (PMT),which is connected to high voltage power supply and to pico-ammeter,which can recorf the output of the PMT.The EL set up shown in fig 2.

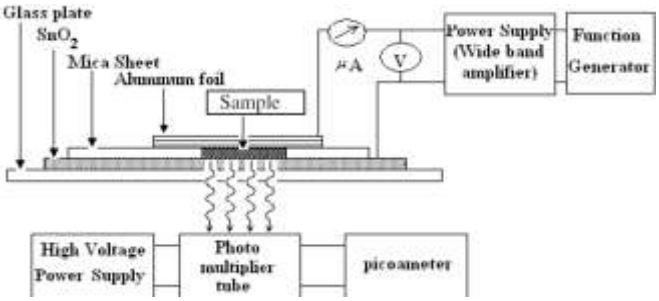


**Figure 2:** Electroluminescence set up.

### 3.1 Voltage brightness characteristics

The voltage dependence of EL brightness of CdSe nanofilm was studied for different frequency of the applied electric field. From fig 3. It is clear that the brightness increase with given frequency. It can be seen from the graph that at particular frequency emission start at threshold voltage and then increase rapidly with increase voltage.

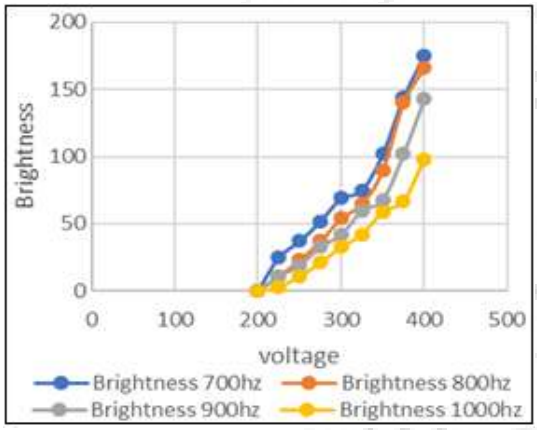


**Figure 3:** Voltage Brightness characteristics

### 3.2 Voltage current characteristics

In fig 4,the voltage voltage current characteristics of CdSe/PVA nanocomposite was shown, it seen that there is linear relation between current and this result indicate the ohmic contact.

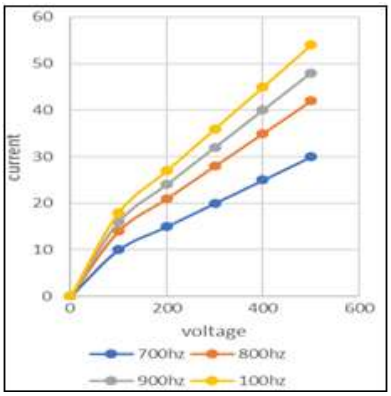


**Figure 4:** Voltage current characteristics

## 4. Conclusion

We prepared CdSe/PVA nanocomposite thin flim successfully by chemical method and studied its absorption spectra and electroluminescence. The absorption spectra of CdSe nanocomposite flim shows that the absorption edge is blue shifted as compared to bulk. From the shifting in absorption spectra increase in effective band gap can be estimated which is related to size of the paticle.

From the effective mass approximation the energy gap of nanocrystal CdSe is 2.254eV which is larger than bulk CdSe(1.74eV) and the particle size of the nano CdSe is in the order of 2.16nm.

EL show the relation between voltage and brightness. The brightness is increased with the applied voltage at 1KHz,900KHz,800KHz and 700KHz.It is that EL starts at certain threshold voltage and increase rapidly with voltage.

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