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A novel method to synthesize ZnSe/CdSe core/shell quantum dot nanoparticles: A green approach

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Quantum Dots of semiconducting nanoparticles of CdSe and ZnSe are extensively focused in the recent research due to their tunable band gap and high emission efficiency which can be useful in the field of Photo Voltaic Cell, Light Emitting Diodes and Bio-labeling [1,2]. Besides the individual application, it is also observed that the core/shell structure of the combined quantum dots is more efficient in terms of emission efficiency due to the variation in band gap of the two materials. The present scenario of research does not give much access to the green synthesis of such kind of quantum dots and therefore we are hereby reporting an efficient and green synthesis of the ZnSe/CdSe nanoparticles. In this synthesis, we have first synthesized ZnSe and CdSe nanoparticles separately, using Sodium Borohydride as the reducing reagent and then added CdSe over ZnSe nanoparticles by stirring for 10 min at room temperature in the parent solvent Methanol.

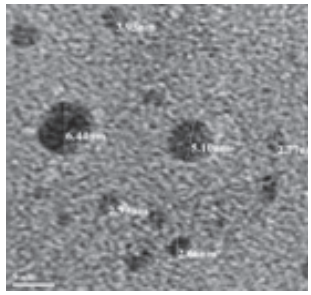

Figure 1: TEM image revealing particle size

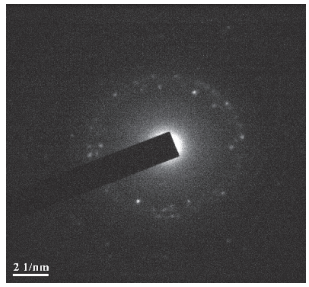

Figure 2: SAD pattern showing polycrystallinity

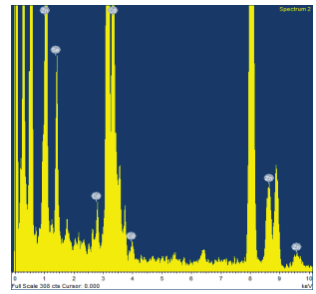

Figure 3: EDAX analysis

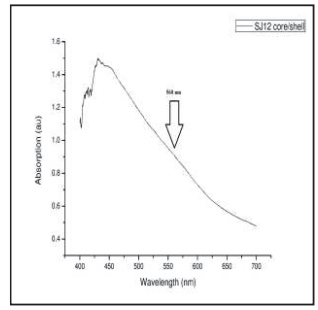

Figure 4: Absorption spectra

The High Resolution Transmission Electron Microscope (HR-TEM) results of the sample reveals the generation of nanoparticles of the range of 2-5 nm having high polycrystallinity shown in Figure 1 & 2. Energy Dispersive X-ray Spectroscopy analysis also confirms the presence of Cadmium, Zinc and Selenium elements throughout the sample in Figure 3. The UV-Visible spectrophotometer reveals an edge at 560nm in Figure 4. The prepared sample is seen to be highly stable over a period of three months without using any capping/stabilizing reagent.

References

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