

Sol-gel synthesis of Cu-doped p-CdS nanoparticles and their analysis as p-CdS/n-ZnO thin film photodiode

Objective

To synthesize Copper (Cu) doped p-CdS nanoparticles via a sol-gel method and to characterize them through XRD, EDS, SEM, UV-Vis, and PL spectrometry. Afterward, to implement the manufactured nanoparticles for fabrication of a Glass/ITO/n-ZnO/p-CdS/Al thin film photodiode and to study its IV characteristics.

Sample Preparation

Cu-doped CdS nanoparticles were prepared at 300 K by dropping simultaneously aqueous solutions of cadmium sulfate, copper sulfate, and sodium sulfide into 200 ml of distilled water containing a solution of EDTA, which was vigorously stirred using a magnetic stirrer. The precipitates were separated from the reaction mixture using a centrifuge and were dried in the desiccator at room temperature.

Data acquisition

There was used an SEM to study the surface morphology of the p-CdS nanoparticles, with a detector of secondary electrons, a WD of 10 mm, a voltage of 10 kV, and magnifications of 10.00 KX and 20.00 KX.

Conclusion

The synthesized Cu-doped CdS nanoparticles are useful p-type material and an efficient replacement to high cost and low sensitive p-type material for opto-device fabrications.

Representative figures & Results

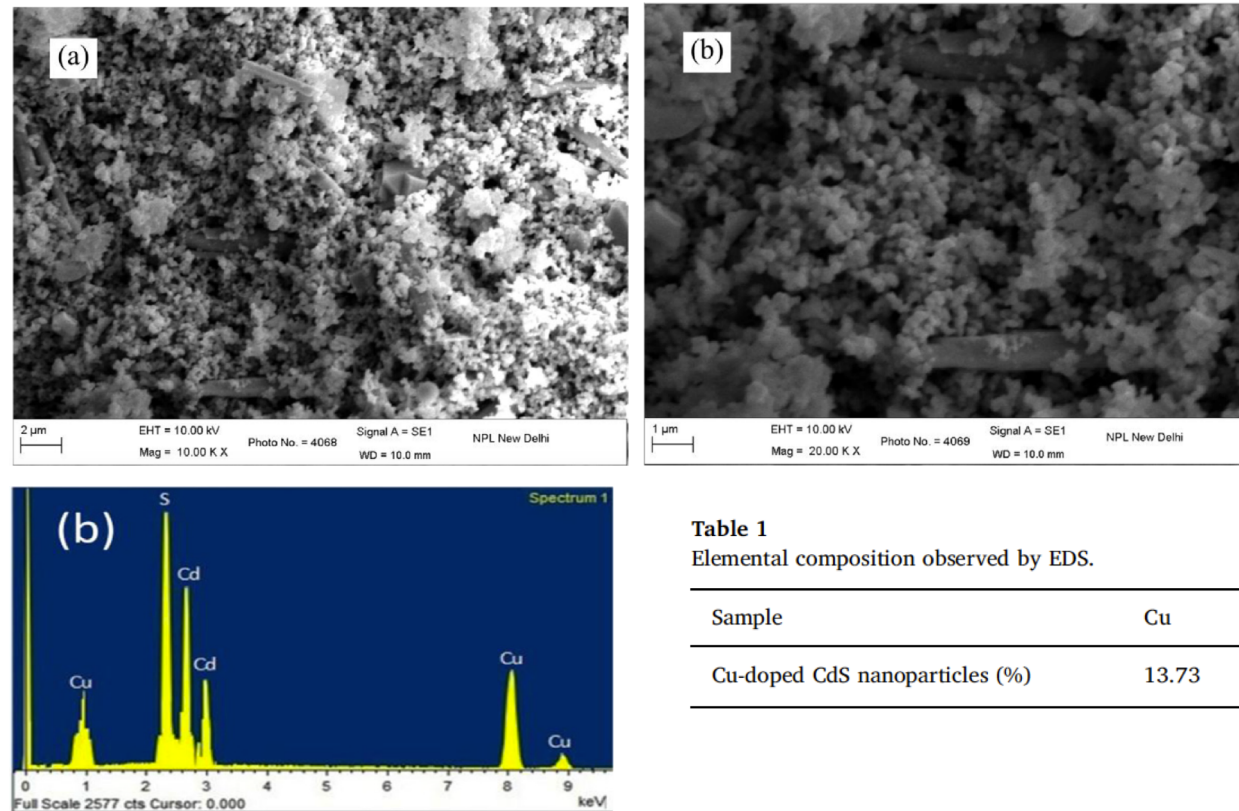


Fig. 3. (a) SEM of p-CdS nanoparticles with Mag=10 K X. (b) SEM of p-CdS nanoparticles with Mag=20 K X.

Table 1

Elemental composition observed by EDS.

Sample	Cu	Cd	S
Cu-doped CdS nanoparticles (%)	13.73	40.71	45.56

Fig. 2. b) EDS compositional intensity, of as-synthesized Cu-doped CdS nanoparticles.

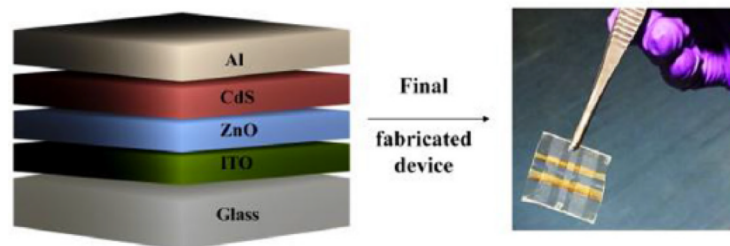


Fig. 1. Schematic diagram showing the fabricated Glass/ITO/n-ZnO/p-CdS/Al thin film photodiode.