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Emerging Materials Congress 2019: Indium doping effects of CdSe nanocrystalline films for solar cell applications- N. J. Suthan Kissinger, Jubail University College

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Energy storage capacity, conversion efficiency with clean power to the environment makes PEC photovoltaic cell to seek out potential applications within the field of energy. Suitable bandgap and high stability make CdSe (Cadmium Selenide), a promising material for photovoltaic cell applications. Also, the performance of CdSe based devices is influenced by doping with suitable material. In our present work beam (EB) evaporation method was employed to deposit CdSe and Indium doped CdSe (with In concentration of 25, 50 and 75%) thin films at different substrate temperatures and therefore the films were optimized for the preparation of (Photo electrochemical) PEC solar cells. The EDX analysis shows the rise within the percentage of indium with the rise within the concentration of doping and therefore the X-ray analysis shows the shifting within the peak position which confirms the incorporation of indium. The grain sizes were found to be within the range of 20-24 nm and it's found to decrease with a rise in concentration. The calculated energy gap value decreased with increase in concentration. PEC photovoltaic cell is fabricated using CdSe: In films prepared by EB technique with a thickness of 400 nm and substrate temperature of 100°C. The I-V studies performed under the illumination of 100 mW/cm^2 and it's found that the 25% of indium in CdSe showed an efficiency of two .66% and fill factor of 0.41.

There is an incredible interest within the physical and chemicalproperties of nanocrystalline thin films on the idea of quantum confinement effects. Tuning of the band gap by changing the parti-cle size and consequent band edge luminescence over the entire visible range has been utilized in optoelectronic devices, biolabeling etc. Thin films of II–VI semiconductors are of considerable interest due to their excellent optical properties within the visible range. Metal selenide thin films offer a variety of optical band gap energies suitable for various optical and optoelectronic applications. CdSe may be a widely used semiconductor whose band gap (Eg= 1.7 eV) lies within the solar power spectrum. it's one among the prom-ising semiconducting materials that are studied for application in solar cells, thin film transistors, gamma-ray detectors, photodetection and optoelectronic applications. CdSe can exist in either zincblende (cubic) or wurtzite (hexagonal) modification in solid state.

Doped semiconductor nanoparticles are studied exten-sively due to their excellent luminescence properties. Dop-ing may be a widely used method to tailor the electrical and optical properties of semiconductors. Major attention has been given in recent years to the investigation of electrical and optical proper-ties of doped CdSe thin films so as to enhance the performance of the devices and also to find new applications. Various methods have been reported to organize In doped CdSe thin films.

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