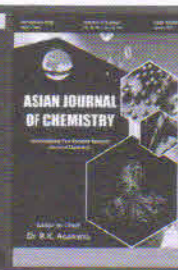


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## Synthesis of ZnSe Thin Films for Advanced Photodetector Applications: Impact of Deposition Time on Structural, Optical and Photoresponse Properties

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The present work investigates the simple and inexpensive chemical route for the fabrication of zinc selenide (ZnSe) nanocrystalline thin film for photosensing application. This study involved the systematic study of optical, structural, surface morphological characteristics as well as electron kinetics of the proposed ZnSe thin films with respect to the deposition time. The comprehensive analysis clearly revealed the formation of polycrystalline ZnSe thin film with enhancing the absorption of light in the visible region with respect to deposition time. Furthermore, the potential of the as-deposited ZnSe nanocrystalline thin film utilized for the photodetection in the visible region of the solar spectrum. The photodetection performance of the device was thoroughly analyzed through J-V characteristics, which clearly demonstrated that the performance of device is significantly influenced by the deposition time during chemical bath deposition. Optical analysis yielded similar results, with optical parameters such as optical conductivity and extinction coefficient exhibiting comparable trends. Remarkably, the device deposited for 3 h showed excellent photodetection performance, achieving detectivity and sensitivity value of  $4.72 \times 10^{11}$  Jones and 9.12, respectively.

**Keywords:** Zinc selenide, Chemical bath deposition, Thin films, Nanocrystalline, Photodetector.