

## **Fabrication of seed assisted CdS and properties**

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CdS is an imperative member of the II–VI group with comprehensive applications as gas sensors, photovoltaics, photodetectors and photochemistry, owing to its direct band gap, low work-function, high electronic mobility and excellent thermal and chemical stability. In this study, a novel method of fabricating chemical bath deposited CdS (CBD-CdS) by using electrodeposited CdS (ED-CdS) as a seed layer is reported. Thin layer of CdS was electrochemically deposited on fluorine doped tin oxide (FTO) glasses by three electrode cathodic electrodeposition in an aqueous solution of 0.05 mol dm<sup>-3</sup> cadmium chloride, 0.05 mol dm<sup>-3</sup> sodium thiosulfate at -600 mV against the Ag/AgCl electrode, at a bath temperature of 60 °C and a pH between 1-2. CBD process on ED-CdS was carried out using, 0.001 mol dm<sup>-3</sup> cadmium sulphate, 0.002 mol dm<sup>-3</sup> thiourea and 1.1 ml of ammonia solution and the deposition process was carried out at a bath temperature of 80 °C for one hour. Later, the fabricated films were air annealed at 200 °C for 1 hour. The crystallographic phase of the fabricated seed assisted CdS films (ED/CBD-CdS) was determined to be hexagonal by GIXRD analysis. The ED/CBD-CdS films were found to display better compactness, uniformity and an enhanced effective surface area compared to CBD-CdS. The fabricated films of ED/CBD-CdS show high photoelectrochemical efficiency than CBD-CdS thin films. Carrier concentration ( $6.62 \times 10^{17} \text{ cm}^{-3}$ ) and flat band potential (-907.60 mV Vs. Ag/AgCl) values calculated for ED/CBD-CdS systems using Mott-Schottky measurements were found to be significantly greater compared to CBD-CdS films. Furthermore, the band gap and its disorder estimated using UV-Vis spectroscopic measurements also revealed better optical properties for ED/CBD-CdS. Hence, seed assisted CdS can be concluded to show better electrical and optical properties compared to conventional CBD-CdS films.

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