



## Synthesis, Structural and Morphological Analysis of SILAR Synthesized CdSe Thin Films

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### ABSTRACT

Present investigation describes synthesis of CdSe thin films on stainless steel (SS) substrate from an aqueous medium. In order to prepare the best photoactive material, various synthesis parameters such as cationic precursor concentration, pH of cationic precursor solution, numbers of deposition cycles have been optimized using photoelectrochemical (PEC) procedure. The deposited films found reddish brown in color. These films were further characterized by various characterization techniques. Structure studies conducted by means of XRD and Raman spectroscopy techniques. Morphological study carried out using field emission scanning electron microscopy. The elemental composition of CdSe is certified using energy dispersive X-ray spectroscopy technique. CdSe thin films found photoactive in nature.

**Keywords:** Cadmium selenide, Photoelectrochemical, Structural analysis, Morphology, SILAR

Received 12.03.2022

Revised 21.03.2022

Accepted 26.04.2022

### INTRODUCTION

The task of material synthesis in thin film form has turned out as a point of interest, because of several applications of thin film. Right from micro-electronic devices like laptop, mobile, solar cells, sensors, polarizes, anticorrosive surfaces, self-cleaning surfaces up to medical and space applications, not a single field has left untouched by thin films [1]. Numerous methods and techniques have been invented and used by the researchers, for synthesis of material in thin film form. Chemical bath deposition (CBD) is one of the attractive, cheap and simple methods [2]. The process of thin film synthesis via CBD method progresses, subsequent to exceeding of ionic product to the solubility product, consequent to precipitate formation. This precipitate formation process is necessary up to some extent for deposition of material, but it causes needless wastage of material, which cannot be prohibited. With the intention to avoid this wastage, CBD method is transformed as modified-CBD (M-CBD). M- CBD method is also called as successive ionic layer adsorption and reaction (SILAR), which is based on a fundamental surface phenomenon known as adsorption. In SILAR method, various synthesis parameters as pH, concentration, reaction and rinsing time etc. influence growth phenomenon of thin film [3, 4]. Numerous chalcogenide thin films have been synthesized by researchers via SILAR method [5]. Because of simplicity in deposition procedure and paramount benefits, SILAR method is selected, for thin film synthesis purpose.

The potency of proficient solar cell is photoelectrode material, so proper selection of it is a vital thing. The primary requisite while choosing photoelectrode material is energy band gap value, which must likely to be positioned in the vicinity of visible spectrum maxima to make use of the solar spectrum expertly. From this perspective, II-VI binary semiconductors have been a centre point for the reasons that direct band gap, sharp absorption edges and superior absorption coefficient [6]. Cadmium selenide (band gap energy =1.7 eV) is one of the II-VI group semiconductors which has captivated interest of many researchers as a consequence of its fascinating properties and numerous applications [7-9]. Literature survey underlines, synthesis of CdSe thin films using SILAR method [10-13]. On the other hand no report is observed in the literature on synthesis and photoelectrochemical (PEC) studies of CdSe thin films on stainless steel substrate. In the present investigation, synthesis and characterization of CdSe thin films on SS substrate using SILAR method have been discussed.