Introduction

Thin film and thin film devices play an important role in the development of modern science. The thin film is a two dimensional form of solid material, whose one dimension, called the thickness, is much smaller than the other two dimensions. The thin film is formed by atom to atom or molecule to molecule condensation process. Their thicknesses are typically less than several microns. Historically Bunsen and Grove first obtained thin metal films in a vacuum system in 1852. The limit of thickness may very from a nanometer to a few micrometers depending upon the field of application [1]. At the initial stages, investigation on the thin films was made out of scientific curiosity, particularly for their significantly different properties from those of the same material in bulk form. However the acquired capability of controlling properties of the thin films in subsequent years, helps immensely the use of thin films in electronic optoelectronics and other devices and as a result the electronics industry has become the greatest beneficiary of thin film technology. On the other hand, the thin film technology contributes to the development of microelectronics, by reducing the sizes of semiconductor devices to two dimensions.

The range of thin film applications is very large and extends from micrometer dots in microelectronics to coatings of several square meters on windows glasses. Polycrystalline films of metals and oxides were the first films which found industrial applications, mainly in the field of optical devices and electronics. Polycrystalline semi conducting thin films have found widespread industrial applications. Thin film deposition technology is a major area of scientific research because of its wide range of applications from microelectronics to optics, space science to aircrafts, and superconductivity to photovoltaics. One of the most
important applications of thin films is in the photovoltaic devices and other solar cells \[2\]. Use of thin film in photovoltaic devices reduces material cost and also the fabrication of large area devices at a comparatively low cost becomes possible. The investigations on thin films have led to the development of new kind of active devices and passive components. Thin films have number of applications in various fields. Few of them are A.R. coating, interference filters, polarisers, narrow band filters, solar cells, photoconductors, IR detectors, waveguide coatings. Temperature control of satellites, photo thermal solar coatings such as black chrome, nickel, cobalt etc., magnetic films, superconducting films, anticroosive films, microelectronics devices, diamond films, reduction of fabrication through coating or surface modification i.e. epitaxy and heterostructure films, high temperature wear resistance films, hard coatings etc.\[3\]. Hence in addition to major contribution to verity of new and future scientifically based technology, the thin films studies have directly or indirectly caused advancement of many new areas of research in solid state physics and chemistry and will continue to play increasingly important roles in the study of a variety of problems of basic and technological importance.

During the last few decades metal chalcogenides thin films have become increasingly important in various fields of science and technology for their variety of applications. Because of physical properties of the semi conducting compounds belonging to the cadmium chalcogenides and their mixed compounds in thin film form can be used for various applications particular in optoelectronic devices such as solar cells and photo sensors. Cadmium sulphide is a very important compound semiconductor from II-VI group which has been studied for many years. II-VI compounds also have the advantage that they can be prepared in the form of high
quality polycrystalline films from inexpensive materials by several low-cost methods. Due to high transitivity and low resistivity cadmium sulphide is used as window layer for the fabrication of solar cell. It can also be used for the fabrication of photo detectors and piezoelectric transducers; CdS is a direct band gap material which has been prepared by various methods such as electro deposition, Vacuum deposition, sintering, sprays, pyrolysis, chemical deposition etc. because of the excellent properties of CdS and its usefulness in the various optoelectronic devices it is selected for this particular study.

Cadmium selenide is direct band gap material and good photoconductive material that makes it useful in the field of optoelectronics and low cost devices such as LED, solar cells, photo detectors, gas sensors, thin films transistors etc. various deposition techniques such as chemical bath deposition (CBD), electro deposition, molecular beam epitaxy (MBE), spry pyrolysis and successive ionic layer absorption and reaction method (SILAR) have been used for deposition of cadmium selenide thin films.

Cadmium sulphoselenide (CdSSe) is one of the interesting semi conducting alloys from the II-VI groups. It has received considerable attention in the field of filters, holography, optical, waveguide and temperature sensors \[^4\]. Though the CdS and CdSe are two very important wide gap semiconductors, because of their wide application in optoelectronics, however for some opto-electronics applications it is important to be able to tune the emission wavelength. The tenability can be achieved through composition modulation, for example, alloyed II-VI semiconductor ternary of CdS\(_{1-x}\) Se\(_x\), Zn\(_x\)Mg\(_{1-x}\)O, and Cd\(_{1-x}\)Mn\(_x\)S with continuously tuned band gap have been reported \[^5\]. Consequently, wavelength
tunable emission can be achieved from ternary compounds by simple adjustment of composition. The alloy of CdSSe should have more applications since its band gap can be tuned by means of the composition in between 2.44eV (for CdS) and 1.72eV (for CdSe) almost covering the entire visible range. However, for the efficient opto-electronics device application, material is usually between CdS in which very high sensitivity is possible but response time is high CdSSe in which a lower response time is possible at the cost of some loss in sensitivity [6]. Since band gap of CdS$_{1-x}$Se$_x$ thin films can be tuned by means of the changing composition of the elements, we focus our work to investigate the properties of CdS$_{1-x}$Se$_x$ as function of x.