

**Contents**  
**List of Figures**  
**List of Tables**

# CONTENTS

<b>CHAPTER I</b>	<b>Pages</b>
<b>General Introduction</b>	<b>1-33</b>
1.1 Solid Thin Films	2
1.2 Characteristics of solid thin films	3
1.3 Some physical attributes of II-VI solid thin films	4
1.4 Optoelectronic importance of solid thin films	6
1.5 The processes of film growth	7
1.6 Deposition of solid thin films	9
1.6.1 Different methods of deposition	9
1.6.2 Selection of the processes of deposition	10
1.6.3 Thermal Evaporation Technique	12
1.7 Metal-Semiconductor Junction	14
1.7.1 Work function of metal and semiconductor	14
1.7.2 Ohmic contact to a semiconductor	14
1.8 Photoconductivity of semiconductor thin films	15
1.9 Brief survey of previous work on CdSe thin films	19
1.10 Motivation of the present work	23
1.11 References	24
 <b>CHAPTER II</b>	
<b>Equipments used and Details of the Experimentals</b>	<b>34-67</b>
2.1 Introduction	35
2.2 Film fabrication	36
2.2.1 Sample material used for film deposition	36
2.2.2 Substrate material	36
2.2.3 Substrate cleaning	40
2.2.4 Mask preparation	41
2.2.5 Substrate heating	43

<b>2.2.6. Vacuum coating unit</b>	<b>43</b>
<b>2.2.7 Film and electrode deposition</b>	<b>45</b>
<b>2.2.8 Post deposition treatment</b>	<b>47</b>
<b>2.3 Thin film thickness</b>	<b>47</b>
<b>2.3.1 Control of film thickness</b>	<b>47</b>
<b>2.3.2 Measurements of film thickness</b>	<b>48</b>
<b>2.3.3 Multiple beam interferometry method of thickness measurement</b>	<b>48</b>
<b>2.3.4 Experimental assembly of thickness measurement</b>	<b>49</b>
<b>2.3.5 Working formula</b>	<b>51</b>
<b>2.4 Design of measurement setup</b>	<b>52</b>
<b>2.4.1 Sample holder</b>	<b>53</b>
<b>2.4.2 Sample heating</b>	<b>53</b>
<b>2.4.3 Glass Jacket</b>	<b>53</b>
<b>2.4.4 Measurement of current</b>	<b>55</b>
<b>2.4.5 Faraday cage</b>	<b>58</b>
<b>2.5 Optical Arrangements</b>	<b>58</b>
<b>2.5.1 Optical set up</b>	<b>58</b>
<b>2.5.2 Filter arrangements</b>	<b>59</b>
<b>2.5.3 Light intensity measurements</b>	<b>59</b>
<b>2.6 Measurement of Transmittance and Absorbance</b>	<b>59</b>
<b>2.7 Structural Analysis</b>	<b>61</b>
<b>2.7.1 X-ray diffraction analysis</b>	<b>61</b>
<b>2.7.2 Scanning electron microscope analysis</b>	<b>61</b>
<b>2.7.3 EDAX analysis</b>	<b>61</b>
<b>2.7.4 XRF analysis</b>	<b>67</b>
<b>2.8 References</b>	<b>67</b>

## **CHAPTER III**

<b>Structural Characterization of CdSe Thin Films</b>	<b>68-113</b>
<b>3.1 Introduction</b>	<b>69</b>
<b>3.2 Experimental</b>	<b>71</b>

<b>3.3 X-Ray Diffraction</b>	<b>72</b>
<b>3.4 Structural analysis</b>	<b>75</b>
<b>3.4.1 X-ray diffractogram of CdSe bulk sample</b>	<b>75</b>
<b>3.4.2 Analysis of diffractogram of CdSe thin films</b>	<b>78</b>
<b>3.5 Morphological study of CdSe thin films</b>	<b>102</b>
<b>3.5.1 SEM Analysis</b>	<b>102</b>
<b>3.5.2 EDAX Analysis</b>	<b>102</b>
<b>3.5.3 XRF analysis</b>	<b>102</b>
<b>3.6 Conclusions</b>	<b>110</b>
<b>3.7 References</b>	<b>110</b>

## **CHAPTER IV**

<b>Optoelectronic Properties of CdSe Thin Films</b>	<b>114-160</b>
<b>4.1 Introduction</b>	<b>115</b>
<b>4.2 Experimental Method</b>	<b>117</b>
<b>4.2.1 Preparation of thin films</b>	<b>117</b>
<b>4.2.2 Experimental procedure followed</b>	<b>118</b>
<b>4.3 Electrode contact</b>	<b>119</b>
<b>4.4 Characteristics plots of photocurrent</b>	<b>122</b>
<b>4.4.1 The effect of field : Poole Frenkel effect</b>	<b>126</b>
<b>4.5 Contribution of grain boundary defects</b>	<b>133</b>
<b>4.5.1 Photocurrent versus light intensity characteristics</b>	<b>134</b>
<b>4.6 Temperature dependence of conductivity</b>	<b>140</b>
<b>4.7 Correlative assessment</b>	<b>147</b>
<b>4.8 Conclusions</b>	<b>157</b>
<b>4.9 References</b>	<b>158</b>

## **CHAPTER V**

<b>Spectral Response, Rise &amp; Decay of Photocurrent and Optical Properties</b>	<b>161-205</b>
---	----------------

<b>5.1 Introduction</b>	<b>162</b>
<b>5.2 Experimental</b>	<b>163</b>
<b>5.3 Results and Discussions</b>	<b>164</b>
<b>5.3.1 Spectral Response</b>	<b>164</b>
<b>5.3.2 Spectral response characteristics in CdSe thin films</b>	<b>165</b>
<b>5.3.3 Photocurrent rise and decay characteristics</b>	<b>168</b>
<b>5.3.4 Trap depths analysis</b>	<b>176</b>
<b>5.3.5 Mobility activation in CdSe thin films</b>	<b>185</b>
<b>5.3.6 Study of optical properties</b>	<b>192</b>
<b>5.4 Conclusions</b>	<b>202</b>
<b>5.5 References</b>	<b>202</b>
<b>List of Publications and Presentations</b>	<b>206</b>
<b>Abstract</b>	<b>213-221</b>