

CONTENTS

<i>List of Figures</i>	xvii-xxi	
<i>List of Tables</i>	xxiii	
<i>List of Abbreviations</i>	xxv-xxvi	
<i>List of Symbols</i>	xxvii-xxviii	
<i>Preface</i>	xxix-xxx	
CHAPTER 1	Introduction and Scope of the Thesis	1-36
1.1	Semiconductor Physics	3
1.1.1	Electronic Structure and Energy Bands	3
1.1.2	Optical Properties and Excitons	5
1.2	Quantum Dots	7
1.2.1	Structure of Quantum Dots	8
1.2.2	Preparation of Quantum Dots	11
1.2.3	Electron Transfer in Quantum Dots	14
1.2.4	Optical Properties of Quantum Dots	18
1.3	Colloidal CdSe and ZnO Quantum Dots Characterization Techniques	19
1.3.1	Structural Characterization	20
1.3.2	Optical Characterization	22
1.3.3	Electrical Characterization	23
1.3.4	Photoresponse Characterization	25
1.4	Some State-of-the-art Works on Colloidal QDs Based Photodetectors	26
1.4.1	Review of Self-Powered Photodetectors	26
1.4.2	Review of Spectrum Selective Photodetectors	28
1.4.3	Review of Other Colloidal QDs Based Photodetectors	29
1.4.4	Other Application of Colloidal CdSe and ZnO Quantum Dots	30

1.4.5	Major Observation from the Literature Survey	31
1.5	Motivation and Problem Definition	32
1.6	Scopes of the Thesis	34
CHAPTER 2	Effect of Heat Treatment on the Colloidal ZnO QDs Based Charge Transport Layer on the Performance Characteristics of ZnO QDs/ CdSe QDs/MoO_x/Ag Thin Film Photodetectors	37-62
2.1.	Introduction	39
2.2	Experimental Details	40
2.2.1	Preparation of Colloidal ZnO QDs	41
2.2.2	Preparation of Colloidal CdSe QDs	42
2.2.3	Device Fabrication	44
2.3	Result and Discussion	44
2.3.1	Structural characterization of as-grown ZnO QD and CdSe QD	44
2.3.2	Device Characterization	46
2.3.3	Suitability of Annealed Colloidal ZnO QDs for Thin Film Transistors	57
2.4	Conclusion	61
CHAPTER 3	Effect of Heat Treatment on Electrical and Optical Characteristics of ZnO QDs/MoO_x/Ag Based Photodetectors	63-75
3.1.	Introduction	65
3.2	Experimental Details	66
3.2.1	Preparation of MoO _x Solution	67
3.2.2	Device Fabrication	67
3.3	Results and Discussion	68
3.3.1	Structural Characterization	68
3.3.2	Optical Characterization	69

3.3.3	Electrical Characterization	71
3.4	Conclusion	75
CHAPTER 4	Colloidal ZnO QDs and CdSe QDs Based Inorganic Self-Powered Photodetectors	77-95
4.1.	Introduction	79
4.2	Experimental Details	80
4.2.1	Device Fabrication	81
4.3	Result and Discussion	82
4.3.1	Optical Characterization	82
4.3.2	Electrical Characterization	86
4.4	Conclusion	94
CHAPTER 5	Colloidal CdSe QDs and PQT-12 Based Hybrid Self-Powered Photodetectors	97-110
5.1.	Introduction	99
5.2	Experimental Details	100
5.2.1	Device Fabrication	102
5.3	Result and Discussion	103
5.4	Conclusion	109
CHAPTER 6	Optical Cavity Based Metal (Pd, Au)/ CdSe QDs/ ZnO QDs/ ITO Self-Powered Spectrum Selective Photodetectors	111-131
6.1	Introduction	113
6.2	Experimental Details	114
6.3	Results and Discussion	115
6.3.1	Electrical Characteristics	116
6.3.2	Photoresponse Characteristics	119
6.3.3	Theoretical Analysis	125
6.4	Conclusion	130

CHAPTER 7	Conclusion and Future Scope	133-144
7.1	Introduction	135
7.2	Summary and Conclusion	136
7.3	Future Scope of Work	143
<i>Appendix</i>		145-147
<i>References</i>		149-161
<i>Author's Relevant Publications</i>		163-164
<i>Other Relevant Publications</i>		165-167