

CONTENTS

	Page
Acknowledgement	i
Abstract	ii
CHAPTER ONE INTRODUCTION	1
CHAPTER TWO BACKGROUND THEORY AND LITERATURE	
REVIEW	
2.1. Introduction	3
2.2. Optical properties of thin films	4
2.2.1. Optical properties of semiconducting films	4
2.2.2. Dispersion relations	12
2.3. Optical absorption of polycrystalline and amorphous films	14
2.3.1. Polycrystalline films	14
2.3.2. Amorphous films	16
2.4. Linear optical properties of quantum structures	17
2.5. D.C. electronic transport mechanisms in amorphous semiconducting thin films	22

	Page
2.6. Photoconductivity in semiconducting thin films	24
2.6.1. Recombination processes	25
2.6.2. Recombination kinetics involving a distribution of gap states	27
2.7. Review of CdTe thin films	29
2.7.1. Structure	29
2.7.2. Optical properties	32
2.7.3. Electrical properties	37
 CHAPTER THREE PREPARATION AND STRUCTURE OF E-BEAM	
SPUTTERED CdTe THIN FILMS	
3.1. Introduction	44
3.2. Experimental technique	44
3.2.1. Sample preparation and metallization	44
3.2.2. X-Ray diffraction	51
3.2.3. SEM, TEM and EDAX	54
3.3. Results	55
3.3.1. Thin film preparation	55
3.3.2. X-Ray diffraction	55
3.3.3. SEM, TEM and EDAX	62
3.4. Discussion	74

CHAPTER FOUR OPTICAL PROPERTIES OF CdTe THIN FILMS

4.1. Introduction	83
4.2. Experimental technique	83
4.2.1. Transmission spectroscopy	83
4.2.2. Tolansky fringe shift for determination of thickness	85
4.2.3. Brewster's method for refractive index determination	86
4.3. Results	88
4.3.1. Thickness and refractive index (at 632.8 nm)	88
4.3.2. Thickness and dispersion of n from transmission spectrum	92
4.3.3. Single oscillator model	106
4.3.4. Quantum size effects	108
4.4. Discussion	115

**CHAPTER FIVE ELECTRICAL AND ELECTRO-OPTICAL
PROPERTIES OF CdTe THIN FILMS**

5.1. Introduction	123
5.2. Experimental technique	123
5.2.1. Dark conductivity measurement	123
5.2.2. Photoconductivity measurement	126

	Page
5.3. Results	128
5.3.1. Activation energy	128
5.3.2. Photoconductivity	134
5.4. Discussion	148

CHAPTER SIX CONCLUSION AND SUGGESTIONS FOR FURTHER WORK

6.1. Conclusion	151
6.2. Suggestions for further work	153

APPENDICES

Appendix A	155
Appendix B	156