CONTENTS

PREFACE i

Chapter 1 – BRIEF REVIEW OF THE EARLIER WORK ON SULPHIDE AND PHTHALOCYANINE THIN FILMS

1.1 Introduction 1
1.2 Metallic Sulphides 5
1.3 Organic Semiconductors 6
1.4 Molecular Structure 8
   A. Organic semiconductors 8
   B. Metallic sulphides 10
1.5 Earlier Studies on Multilayer Thin Films 13
References 14

Chapter 2 – APPARATUS AND EXPERIMENTAL TECHNIQUES USED IN THE PRESENT STUDY

2.1 Introduction 18
2.2 Methods of Preparation of Thin Films 19
2.3 Chemical Bath Deposition Technique 19
2.4 Thermal Evaporation Technique 20
2.5 Effect of Residual Gases 22
2.6 Effect of Vapour Beam Intensity 23
2.7 Effect of Substrate Surface 23
2.8 Effect of Evaporation Rate 23
2.9 Contamination from Vapour Source 24
2.10 Production of Vacuum 25
2.11 Oil Sealed Rotary Pump 26
2.12 Diffusion Pump 27
2.13 Vacuum Coating Unit 30
2.14 Preparation of Films 36
2.15 Substrate Cleaning 37
2.16 Thickness Measurement 37
2.17 Tolansky’s Multiple Beam Fizeau Fringe Method 39
2.18 Sample Annealing 40
2.19 Conductivity Cell 44
2.20 Keithley Programmable Electrometer 617 46
2.21 UV- Visible Spectrophotometer 49
2.22 X-ray Diffractometer 53
References 55
Chapter 3 – PREPARATION OF SINGLE AND MULTILAYER THIN FILMS OF CdS, ZnS, MnS and CuPc

3.1 Introduction 58
3.2 CdS Single Films by CBD Technique 60
3.3 ZnS Single Films by CBD Technique 62
3.4 MnS Single Films by CBD Technique 63
3.5 ZnS- MnS Multilayer Films by CBD Technique 63
3.6 CuPc Single Films by Vacuum Deposition Technique 64
3.7 CuPc Multilayer Films by Vacuum Deposition Technique 65
References 66

Chapter 4 – ELECTRICAL CONDUCTIVITY STUDIES IN SINGLE AND MULTILAYER THIN FILMS OF CdS, ZnS, MnS and CuPc

4.1 Introduction 70
4.2 Theory 71
4.3 Experiment 73
4.4 Results and Discussion 75
  4.4.1 CuPc films 75
  4.4.2 CdS films 78
  4.4.3 Multilayer CdS-CuPc films 80
  4.4.4 ZnS films 82
  4.4.5 Multilayer ZnS-CuPc films 84
  4.4.6 MnS films 86
  4.4.7 Multilayer MnS-CuPc films 88
  4.4.8 Multilayer ZnS-MnS films 90
4.5 Conclusion 92
References 93

Chapter 5 – OPTICAL ABSORPTION STUDIES IN SINGLE AND MULTILAYER THIN FILMS OF CdS, ZnS, MnS and CuPc

5.1 Introduction 95
5.2 Theory 96
5.3 Experiment 100
5.4 Results and Discussion 101
  5.4.1 CuPc films 120
  5.4.2 CdS films 121
  5.4.3 Multilayer CdS-CuPc films 122
  5.4.4 ZnS films 123
  5.4.5 Multilayer ZnS-CuPc films 124
  5.4.6 MnS films 125
  5.4.7 Multilayer MnS-CuPc films 126
  5.4.8 Multilayer ZnS-MnS films 127
5.5 Conclusion 128
References 129