

## CONTENTS

---

	<u>PAGE NO.</u>
<b><u>CHAPTER I</u></b>	
<b><u>INTRODUCTION</u></b>	
1.1	Solid State Luminescence 1
1.2	Historical Background 1
1.3	Definitions 4
	1.3.1 Luminescence 4
	1.3.2 Fluorescence and Phosphorescence 7
1.4	Phosphors and their classification 7
	1.4.1 Phosphors in pure form 8
	1.4.2 Impurity activated phosphors 8
1.5	Explanation of luminescence in terms of crystal structure 9
1.6	Mechanism of photoluminescence 10
	1.6.1 Excitation and emission 11
	1.6.2 Energy Transfer 13
	1.6.3 Energy storage 14
1.7	Mechanism of Electroluminescence 17
	1.7.1 Excitation 17
	1.7.2 Transfer of Energy 19
	1.7.3 Recombination 19
1.8	Kinetics of Luminescence 21
1.9	Review of previous work 22
1.10	Scope and object of present work 27
	Reference s 29
<b><u>CHAPTER II</u></b>	
<b><u>PREPARATION OF PHOSPHORS AND EXPERIMENTAL ASPECTS</u></b>	
2.1	Introduction 42
2.2	Elementaries in phosphor preparation 43
2.3	Preparation parameters of phosphors 44

	<u>PAGE NO</u>
2.4	Different methods of preparation of phosphors 47
	2.4.1 Details of method followed in present work 48
	2.4.2 Method of calculation of Mn and rare earth impurity percentage in host $\text{CaSO}_4$ 48
	2.4.3 Experimental procedure 50
	2.4.4 Sample preparation 51
	2.4.5. Prepared phosphors 53
2.5	Instrumentation and experimental aspects 53
	2.5.1 Instruments used for preparation of phosphors 53
	2.5.2 Phosphorescence decay measurements 54
	2.5.3 Thermoluminescence measurements 57
	2.5.4 Electroluminescence measurements 58
	2.5.5 Conductivity (Resistivity) measurements 60
2.6	X-ray Diffraction Study of prepared phosphors 62
	References 68
 <b><u>CHAPTER III</u></b>	
	<b><u>PHOTOLUMINESCENCE</u></b> 80
3.1	Introduction 80
3.2	Theoretical background 81
	3.2.1. Decay laws 81
	3.2.2 Effect of steady excitation of a phosphor on the filling of electron traps 84
	3.2.3 Phosphorescence decay for different trap distribution 87
	3.2.4 Retrapping of electrons during phosphorescence 89
3.3	<b><u>RESULTS AND DISCUSSION</u></b> 90
	3.3.1 Decay Curves 90
	3.3.2 Correlation Coefficient 91
	3.3.3 Decay Constant 91
	3.3.4 Variation of decay constant for different phosphors 92
	3.3.5 'Peeling Off' decay curves 92
	3.3.6 Effect of activator concentration on trap depths 93
	3.3.7 Distribution of traps 94
	3.3.8 Kinetics of luminescence 94

	<u>PAGENO.</u>	
3.4	Summary	95
	References	98
	<b><u>CHAPTER IV</u></b>	
	<b><u>THERMOLUMINESCENCE</u></b>	109
4.1	Introduction	109
4.2	Theory of glow curves	110
	4.2.1 TL glow curve parameters	110
	4.2.2 Randall and Wilkins Theory	111
	4.2.3 Garlick and Gibson theory (Second order Kinetics)	113
	4.2.4 General order kinetics	114
4.3	Method for determining trap depths	117
	4.3.1 Methods making use of shape of glow curves	117
	4.3.2 Methods making use of various heating rates	121
	4.3.3 Other Methods	122
4.4	Methods for determination of escape frequency factor	126
	4.4.1 Method due to Randall and Wilkins	126
	4.4.2 Method due to Garlick and Gibson	126
	4.4.3 Isothermal decay method	127
	4.4.4 Method due to Aramu and Maxia	127
	4.4.5 Method due to Curie	127
4.5	Determination of size of trap	128
4.6	Results and Discussion	128
	4.6.1 Results obtained when samples are excited by uv source for 15 minutes and by gamma source for 25 minutes	128
4.7	Summary	136
	References	146
	<b><u>CHAPTER V</u></b>	
	<b><u>ELECTROLUMINESCENCE</u></b>	168
5.1	Introduction	168
5.2	Theoretical background	168
	5.2.1 Relation between brightness and applied voltage	168
	5.2.2 Relation between brightness & frequency	172
	5.2.3 Brightness waves	174

	5.2.4 Efficiency of electroluminescence	175
5.3	Results and Discussion	176
	5.3.1 Dependence of brightness on voltage	176
	5.3.2 Brightness waves	177
	5.3.3 Dependence of EL brightness on frequency	178
	5.3.4 Effect of activators on electroluminescence behaviour	180
	5.3.5 Mechanism of electroluminescence	180
	5.3.6 Kinetics involved in the EL process	180
5.4	Summary	181
	References	184
<b><u>CHAPTER VI</u></b>		
<b><u>THERMALLY STIMULATED CONDUCTIVITY</u></b>		
6.1	Introduction	201
6.2	Experimental procedure	201
6.3	Results and Discussion	202
	6.3.1 Conductivity of Phosphor	202
	6.3.2 Bandgap energy	203
	References	205
<b><u>CHAPTER VII</u></b>		
<b><u>RESULTS AND GENERAL DISCUSSION</u></b>		
7.1	<b><u>PHOTOLUMINESCENCE STUDY</u></b>	207
	7.1.1 Nature of Decay	207
	7.1.2 Activation Energies from decay curves	207
	7.1.3 Trap distribution	208
7.2	Thermoluminescence Study	208
	7.2.1 TL glow curves	208
	7.2.2 Activation Energies from glow curves	209
	7.2.3 Escape frequency factor	210
	7.2.4 Size of traps	210
	7.2.5 Dose Dependence	210

7.3	Electroluminescence Study	211
	7.3.1 Dependence of brightness on voltage	211
	7.3.2 Dependence of EL brightness on frequency	211
	7.3.3 Effect of addition of activators on EL brightness	212
e/	7.3.4 Mechanism of Electroluminescence	212
	7.3.5 Brightness Waves	212
1/	7.3.6 Kinetics of Luminescence	213
7.4	Thermally stimulated conductivity	213
7.5	Comparative results	213

---