
Table of Contents

Preface.....	vii
Author.....	ix
Chapter 1 Introduction	1
Chapter 2 Luminescent Properties Generated in Phosphor Particles.....	7
2.1 Excitation Mechanisms of Luminescence Centers	7
2.2 Transition Probability of Luminescent Centers	11
2.3 Short Range, Rather than Long Range, Perfection for Phosphors	14
2.4 Number of Luminescence Centers Involved in the Measurement of Luminescence Intensities.....	18
2.5 Optimal Particle Sizes for Practical Phosphors	24
2.6 Stability of Luminescence Centers in Phosphor Particles	29
2.7 Voltage Dependence Curve of CL Intensities.....	30
2.8 Energy Conversion Efficiencies of CL Phosphors.....	37
Chapter 3 Improved Luminance from the Phosphor Screen in Display Devices.....	41
3.1 Improvements in the Screen Luminance of Color CRTs.....	41
3.2 Correlation between Screen Luminance and Spot Luminance.....	43
3.3 Image Luminance on Screens Perceived by the Human Eye	45
3.4 Lifetime of CL Phosphor Screens in CRTs	46
3.4.1 Coloration of Phosphor Screens by Residual Gases	46
3.4.2 Decrease in CL Intensity during Operation	50
3.4.3 The Lifetime of Oxide Cathodes	51
3.4.4 The Lifetime of PL Devices	52
3.5 Flat CL Displays.....	52
3.5.1 Vacuum Fluorescent Display (VFD)	53
3.5.2 Horizontal Address Vertical Deflection (HAVD)	56
3.5.3 Modulation Deflection Screen (MDS)	57
3.5.4 Field Emission Display (FED).....	58

Chapter 4 Improving the Image Quality of Phosphor Screens in CL Displays	63
4.1 Threshold Resolution Power of the Human Eye	63
4.2 Survey of the Origin of Flickers.....	64
4.3 Powdered Screens Rather than Thin-Film Screens	67
4.4 Electric Properties of Bulk of CL Phosphor Particles in Screens	69
4.5 Optical Properties of Bulk Phosphor Particles	76
Chapter 5 The Screening of Phosphor Powders on Faceplates	81
5.1 The Ideal Phosphor Screen	82
5.2 Practical Problems in Drying the Unwedged Phosphor Screen.....	84
5.3 Optimal Thickness of Phosphor Screens in CL Devices	85
5.4 Particle Size for High Resolution of Monochrome CL Images.....	87
5.5 Photolithography on Ideal Phosphor Screens	90
5.6 Practical Phosphor Screens	94
5.6.1 Color Phosphor Screens in Current Screening Facilities.....	94
5.6.2 Monochrome Phosphor Screens	101
Chapter 6 The Production of Phosphor Powders.....	103
6.1 Required Purity of Raw Materials for Phosphor Production	105
6.2 Source of Oxygen Contamination.....	105
6.3 Eradication of Oxygen from Heating Mixture	106
6.4 Identification of Flux Material for Growth of ZnS Particles	111
6.5 Growth of ZnS Particles in a Crucible	113
6.5.1 Sealing Conditions of Crucibles	115
6.5.2 Sealing of Pores by Melted Materials.....	116
6.5.3 Control of Pore Size in the Heating Mixture	118
6.5.4 Growth of Plate Particles	119
6.5.5 The Size and Shape of Crucibles	119
6.6 Heating Program of Furnace for ZnS Phosphor Production	120
6.7 Removal of By-Products from Produced ZnS Phosphor Powders ...	122
6.8 Production of Practical ZnS Phosphor Powders	126
6.8.1 The ZnS:Ag:Cl Blue Phosphor	126
6.8.2 ZnS:Ag:Al Blue Phosphor.....	128
6.8.3 The ZnS:Cu:Al Green Phosphor	130
6.9 Production of Y ₂ O ₂ S Phosphor Powders	130
Chapter 7 The Design of Screenable Phosphor Powders for Cathodoluminescent Devices	139
Chapter 8 Conclusion	143
References	147
Index	151