

## CONTENTS

| CHAPTER | TITLE  | PAGE    |
|---------|--|---------|
| I       | INTRODUCTION   |         |
| 1.1     | Crystal Growth   | ... 2   |
| 1.2     | Luminescence   | ... 2   |
| 1.3     | Survey of Literature   | ... 4   |
| 1.4     | Scope of Present Work  | ... 8   |
|         | References   | .... 13 |
| II      | CRYSTAL GROWTH   |         |
| 2.1     | Introduction   | .... 16 |
| 2.2     | Methods of Single Crystal Growing  | .... 17 |
| 2.2.1   | Growth from Vapour Phase   | .... 17 |
| 2.2.2   | Growth from Melt   | .... 18 |
| 2.2.3   | Growth from Solution Technique   | .... 20 |
| 2.3     | Growth of SrSO <sub>4</sub> :Dy Single Crystals  | .... 25 |
| 2.3.1   | Purification of Celestine  | .... 26 |
| 2.3.2   | Preparation of Charge  | .... 26 |
| 2.3.3   | Experimental set-up  | .... 27 |
| 2.3.4   | Growth of Single Crystals  | .... 28 |
|         | Tables   | .... 29 |
|         | Figure Captions  | .... 30 |
|         | References   | .... 35 |
| III     | STRUCTURAL, ELECTRICAL AND OPTICAL PROPERTIES OF SrSO <sub>4</sub> :Dy SINGLE CRYSTALS |         |
| 3.1     | Introduction   | .... 40 |
|         | Experimental   |         |
| 3.2     | Structural   | .... 40 |
| 3.2.1   | Microstructure   | .... 40 |
| 3.2.2   | X-ray Diffraction  | .... 40 |

Content (contd.)

| CHAPTER | TITLE  | PAGE     |
|---------|--|----------|
| 3.3     | Electrical   | .... 41  |
| 3.3.1   | Resistivity Measurements                                       | .... 41  |
| 3.3.2   | Thermoelectric Power (TEP)                                     | .... 42  |
| 3.4     | Optical Absorption Measurements                                | .... 43  |
| 3.5     | Results and Discussion   | .... 44  |
| 3.5.1   | Specification of Single Crystal                                | .... 44  |
| 3.5.2   | X-ray Diffraction  | .... 45  |
| 3.5.3   | Electrical Conductivity  | .... 45  |
| 3.5.4   | Thermoelectric Power (TEP)                                     | .... 47  |
| 3.5.5   | Optical Absorption of SrSO <sub>4</sub> :Dy<br>Single Crystals | .... 48  |
|         | Tables   | .... 49  |
|         | Figure Captions  | .... 52  |
|         | References   | .... 63  |
| IV      | ELECTROLUMINESCENCE  |          |
| 4.1     | Introduction   | .... 66  |
| 4.2     | Mechanism of Electroluminescence                               | .... 69  |
| 4.3     | Experimental Set-up  | .... 69  |
| 4.3.1   | Electronic Excitation Source                                   | .... 70  |
| 4.3.2   | Electroluminescent Cell  | .... 70  |
| 4.3.3   | Brightness Measuring Unit                                      | .... 71  |
| 4.4     | Results and Discussion on Voltage                              | .... 73  |
| 4.4.1   | Brightness Dependence on Voltage                               | .... 73  |
| 4.4.2   | Bright-Dependence on Frequency                                 | .... 76  |
| 4.4.3   | Threshold Voltage Dependence<br>on Frequency                   | .... 78  |
| 4.4.4   | Effect on EL Brightness of Charge<br>Compensator               | .... 79  |
| 4.4.5   | Mechanism of EL in SrSO <sub>4</sub> :Dy<br>Single Crystals    | .... 80  |
|         | Figure Captions  | .... 83  |
|         | References   | .... 95  |
| V       | SUMMARY AND CONCLUSION   | .... 99  |
|         | BIOGRAPHICAL DATA  | .... 103 |