

## INDEX

## Page No

### CHAPTER-1: INTRODUCTION

|  |    |
|--|----|
| 1.1 Basic concept of luminescence and thermoluminescence (TL)  | 1  |
| 1.2 Phenomenological description of Optically Stimulated Luminescence (OSL) and its advantages over TL | 3  |
| 1.3 Theoretical concept of OSL   | 6  |
| 1.4 OSL - Model and its literature survey  | 7  |
| 1.5 Quartz and its importance  | 11 |
| 1.6 Thermoluminescence of quartz   | 13 |
| 1.7 OSL of quartz  | 16 |
| 1.8 Literature survey of OSL   | 18 |
| 1.9 Objective, the present work and results  | 20 |
| 1.10 Effect of different protocols on synthetic quartz   | 20 |
| References   | 23 |

### CHAPTER-2: QUARTZ AND ITS APPLICATIONS

|  |    |
|--|----|
| 2.1 Type of quartz                                   | 26 |
| 2.2 Structure  | 29 |
| 2.3 Defects  | 31 |
| 2.4 Method of preparation of synthetic quartz (S.Q.) | 35 |
| 2.5 Preparation of synthetic quartz at C.G.C.R.I.    | 36 |
| 2.6 Quality rating of synthetic quartz               | 39 |
| 2.7 World production: synthetic quartz crystals      | 39 |
| 2.8 Properties                                       | 41 |
| 2.9 Applications                                     | 42 |
| References   | 44 |

### CHAPTER-3: EXPERIMENTAL DETAILS

|                                  |    |
|----------------------------------|----|
| 3.1 Heating System               | 45 |
| 3.2 Optical Filters              | 46 |
| 3.3 RISO Automated TL/OSL System | 46 |
| 3.4 Sample Preparation           | 52 |
| 3.5 Thermal Annealing Treatment  | 52 |

|  |     |
|--|-----|
| References   | 53  |
| <b>CHAPTER-4: RESULTS AND DISCUSSION</b>   |     |
| 4.1 Thermoluminescence study of synthetic quartz at room temperature                             | 54  |
| 4.2 A selection of 470nm stimulation wavelength for the present OSL study                        | 67  |
| 4.3 OSL measured at room temperature   | 70  |
| 4.4 OSL measured at 160°C  | 86  |
| 4.5 OSL measured at 160°C after post irradiation heat treatment at 290°C for different durations | 92  |
| 4.6 Study of OSL under cyclical succession at 160°C measured                                     | 96  |
| References   | 100 |
| <b>CHAPTER-5: ELECTRON SPIN RESONANCE (ESR)</b>  |     |
| 5.1 Electron spin  | 104 |
| 5.2 Fundamental principle of ESR   | 105 |
| 5.3 ESR spectra and parameters   | 105 |
| 5.4 Results and Discussions  | 109 |
| References   | 113 |
| <b>CHAPTER-6: CONCLUSIONS</b>  | 114 |