

## INDEX

<b>CONTENTS</b>	<b>i-iii</b>
<b>LIST OF FIGURES</b>	<b>iv-ix</b>
<b>LIST OF TABLES</b>	<b>x</b>
<b>LIST OF ABBREVIATIONS</b>	<b>xi</b>

## CONTENTS

<b>Titles/Subtitles</b>	<b>Page No.</b>
<b>Chapter-1</b>	<b>01-20</b>
<b>1.1 Motivation and Background</b>	<b>01</b>
<b>1.2 Luminescence</b>	<b>01</b>
<b>1.3 Defects in Quartz and its luminescence</b>	<b>03</b>
<b>1.4 Study of Defects in Quartz</b>	<b>04</b>
<b>1.5 Thermoluminescence (TL) and Optically Stimulated Luminescence (OSL)</b>	<b>05</b>
<b>1.5.1 Thermoluminescence (TL)</b>	<b>05</b>
<b>1.5.1.1 Literature review on TL of Quartz</b>	<b>07</b>
<b>1.5.1.2 110°C TL peak (pre-dose peak)</b>	<b>08</b>
<b>1.5.1.3 325°C TL peak (RBP)</b>	<b>08</b>
<b>1.5.1.4 375°C TL peak (SBP)</b>	<b>09</b>
<b>1.5.1.5 Other TL peaks</b>	<b>9</b>
<b>1.5.2 Optically Stimulated Luminescence (OSL)</b>	<b>10</b>
<b>1.5.2.1 Simplest Model: one trap/one center</b>	<b>13</b>
<b>1.5.2.2 Competing, deep trap</b>	<b>14</b>
<b>1.5.2.3 Competing shallow trap</b>	<b>14</b>
<b>1.5.2.4 Competing recombination center</b>	<b>15</b>
<b>1.5.2.5 Literature Survey of OSL of Quartz</b>	<b>17</b>
<b>1.6 Scope and Objective of the present work</b>	<b>18</b>
<b>References</b>	<b>19-20</b>
<b>CHAPTER-2 Quartz, Its Application and Sample Preparation</b>	<b>21-33</b>
<b>2.1 Introduction to Quartz</b>	<b>21</b>
<b>2.2 Crystal habit and structure</b>	<b>21</b>
<b>2.3 Types of Quartz on the basis of microstructure</b>	<b>22</b>
<b>2.4 Various use of Quartz</b>	<b>24</b>
<b>2.5 Quartz Defects</b>	<b>25</b>
<b>2.5.1 Oxygen Vacancies</b>	<b>26</b>
<b>2.5.2 Al Centers</b>	<b>27</b>
<b>2.6 A Need for Synthetic Quartz Crystals</b>	<b>27</b>
<b>2.7 Preparation of Synthetic Quartz (SQ)</b>	<b>28</b>
<b>2.8 Quality rating of synthetic quartz</b>	<b>30</b>
<b>References</b>	<b>32-33</b>
	<b>34-57</b>

<b>CHAPTER-3 Experimental Methods</b>	
3.1 Material	34
3.2 Instruments Used	34
3.3 Sample Preparation	34
3.4 Thermal Annealing Treatment	35
3.5 Thermoluminescence analysis	35
3.6 Analysis of Luminescence Optically	35
3.7 Analysis of Electron Spin Resonance	36
3.8 TL/OSL Reader (DA-20, DTU Nutech, Denmark)	37
3.8.1 The Risø TL/OSL Reader Model DA-20 consists of:	37
3.8.2 Electronics, detectors and controls	38
3.8.3 Irradiation sources	38
3.8.4 Infrared/Blue Light Optically Stimulated Luminescence (OSL) attachment	41
3.8.5 Software	42
3.8.6 Sample carousel	42
3.8.7 Light detection system	43
3.8.8 Photomultiplier tube	43
3.8.9 Detection filters	44
3.8.10 Luminescence stimulation system	45
3.9 Experimental Protocols used in the present work	49-56
References	57
<b>Chapter – 4 Result &amp; Discussion</b>	<b>58-118</b>
4.1 Introduction	58
4.2 Thermoluminescence (TL) study of synthetic quartz.	59
4.2.1 Effect of beta dose on TL glow curve of unannealed sample.	60
4.2.2 TL-Dose Response Curve (TL-DRC) of unannealed sample.	62
4.2.3 Effect of annealing temperature on TL glow curve of sample	64
4.2.4 Effect of cycle of physical treatment on TL glow curve of annealed sample	73
4.3 Optically Stimulated Luminescence (OSL) study of synthetic quartz	85
4.3.1 Effect of repetition of cyclic sequence of physical condition on OSL decay	87
4.3.2 OSL-Dose Response study under repetition of cyclic sequence of physical condition	94
4.3.3 Deconvolution study of OSL at 125°C under sequence of physical condition	97
4.3.4 Effect of thermal bleaching temperature and their cut-off duration on OSL decay	110
References	115-118
<b>CHAPTER 5 ESR STUDY</b>	<b>119-133</b>
5.1 Electron Spin Resonance	119
5.2 Electron spin	119

<b>5.3 Fundamental Principle of ESR</b>	<b>120</b>
<b>5.4 ESR Spectra and Parameter</b>	<b>121</b>
<b>5.5 Result and Discussion</b>	<b>125</b>
<b>References</b>	<b>133</b>
<b>CHAPTER 6 SUMMARY AND CONCLUSION</b>	<b>134-140</b>
<b>Appendix-1</b>	<b>141-146</b>