شبكة المعلومات الجامعية

التوثيق الإلكتروني والميكروفيلم

بسم الله الرحمن الرحيم

HANAA ALY

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جامعة عين شمس

التوثيق الإلكتروني والميكروفيلم

قسم

نقسم بالله العظيم أن المادة التي تم توثيقها وتسجيلها
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HANAA ALY

The dosimetric properties of Borosilicate glass doped with Rare earth oxides

Thesis Submitted to Faculty of Science-Ain Shams University in partial fulfillment for Degree of
MSc in Physics

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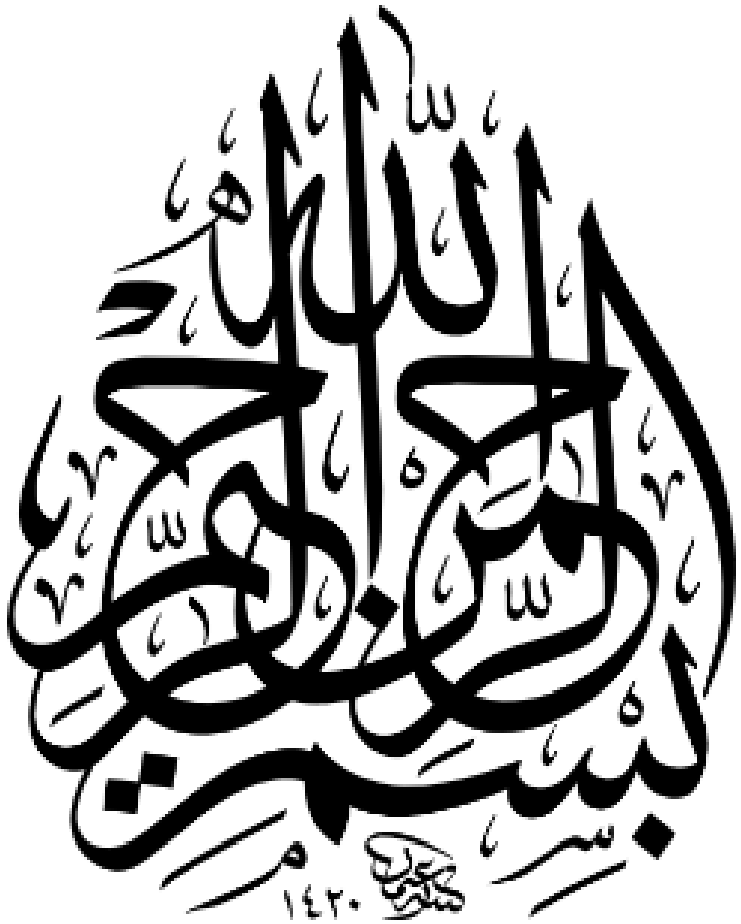
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Abstract

In this thesis, the thermoluminescence emission and the TL dosimetric characteristics of Sm-doped lithium borosilicate glasses are experimentally reported and analyzed to present a new preferable glass composite for radiation dosimetry applications.

This thesis includes five chapters, as follows:

we will explain a detailed presentation of the thermoluminescence phenomenon, and the difference between it and other luminescence behaviors. We will also discuss the most important applications that depend mainly on this phenomenon, such as TL Dating of Archaeological and Geological Samples, in addition to using this phenomenon in the fields of radiometric measurements which is defined by thermoluminescence dosimetry (TLD). We will also present information about the dosimetric properties of materials through which it is possible to determine whether any material can be used in these applications. At the end of the chapter, we will briefly mention some of the most important commercial materials used for this purpose and the efforts of researchers in developing their properties. Finally, we will discuss the goal and the main axis of this study.

we will present some of the most important theoretical models used to analyze TL- phenomenon. In addition to the methods for calculating kinetic parameters that have a great role in determining the dosimetric properties of TL materials. Finally, introducing the principle of X-Ray Diffraction (XRD) that will be relied upon in determining the non-crystal structure of the proposed glass material.

we will explain in detail how the glass samples of the proposed glass material were prepared and what tools and techniques are used for this purpose. A brief description of (X-ray diffractometer). Finally, the complete system for the measurements of TL signals will be presented in detail as well as the main parameters that control the TL signal output.

Thermoluminescence (TL) characteristics of the prepared system were investigated. The investigated thermoluminescence (TL) characteristics of the prepared system revealed that the highest TL response was obtained for this glass composite at 0.05 mole % Sm_2O_3. In this study, the 0.05 mole % Sm_2O_3 doped lithium borosilicate glass composite has been subjected to detailed dosimetric investigation in terms of its annealing condition, dose-response, and minimum detectable dose. The reproducibility of the response, thermal and optical fading were also studied. Thermoluminescence glow curves of gamma irradiated Samarium Doped Lithium borosilicate glass was investigated. The number of overlapping peaks is determined using the Repeated Initial Rise (RIR) method. the glow curves were deconvoluted into four overlapping peaks based on the results of RIR method. trapping parameters such as activation energy E, frequency factor (s), and kinetic order(b) for each peak is determined. The results indicated that, the Lithium borosilicate glass doped with Samarium has four electron trap levels with the average activation energies of 0.753,1.013,1.128, and 1.33 eV respectively. A new procedure for studying and analyzing the glow curve fading was introduced using CGCD program. The obtained results explain some observed properties such as, thermal fading and light sensitivity for the proposed glass material.

The investigated TL characteristics of this glass composite have indicated that this prepared glass has linear dose-response over a wide dose range of 2Gy-2kGy, as well as relatively low fading rate of 33% in one

month, reasonable reproducibility of about 4 % difference in the consecutive measurements and low detection limit of about 31 mGy. These attributes render the composite under investigation promising for the utilization in radiation detection.

Key Words:

Lithium borosilicate glass - Thermoluminescence - Samarium – Glow Curve