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ANALYTICAL STUDY OF THERMOLUMINESCENCE GLOW CURVES FOR LUMINESCENT DOSIMETRIC MATERIAL

A Thesis Submitted in partial fulfillment of the requirements for the degree of

Master of Science in physics

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Summary

Summary

This study is divided into two parts: the first one is to analytically study the analysis of the data obtained from thermoluminescent materials (glow curves), and the second part is to investigate the thermoluminescence (TL) dosimetric properties of phosphate glass samples doped with different concentrations of Lanthanum (La).

There exist many methods to analyze TL glow curves. However, the Computerized Glow Curve Deconvolution (CGCD) method is the most popular used. Despite its success, this method has some theoretical, mathematical, and computational problems. These problems pose a limit and precautions to the usage of CGCD in the field of thermoluminescence dosimetry (TLD). Thus, the first part of this study attempts to discuss and suggest new solutions to the computational problem. Some TL theoretical models and the kinetic parameters evaluation methods are also presented.

Within the framework of the one trap-one recombination (OTOR) level model, the exact equations that describe the intensity of a single TL glow peak of different order kinetics are considered. A reformulation of the expressions of the intensities of TL glow peaks in terms of the peak intensity I_M, peak position T_M, and the activation energy E, for each order of kinetics is achieved. A MATLAB code was developed. This code utilizes the new obtained TL deconvolution equations, to computationally deconvolute the TL glow curves. The code can also use the original equations of the OTOR model with free parameters frequency factor s, E, initial concentration of trapped electrons n_0, and heating rate β. The code was tested by analyzing the reference glow curves of the GLOCANIN program. The obtained results