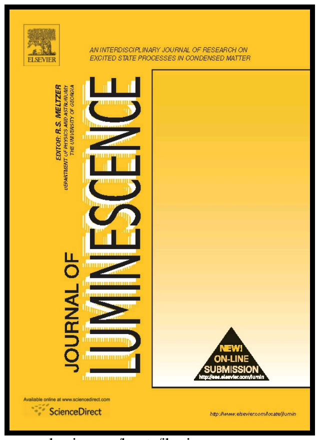

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Optically stimulated luminescence of the $20Li_2CO_3 – (X)K_2CO_3 – (80 - X)B_2O_3$ glass system

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Abstract

The main goal of this work was to analyze the OSL signal for a borate glass containing lithium carbonate and potassium carbonate as glass modifiers. This type of glass present desirable characteristics for dosimetry and has been intensively analyzed for TL. Five glass formulations were produced and analyzed regarding their OSL signal when exposed to a beta emitter source. The typical decay pattern for continuous wave stimulation (CW-OSL) was demonstrated for all compositions. Depending on the chosen parameter to plot the dose-response curve, the sensitivity range changed. If the initial OSL intensity was chosen, the composition named as L15KB presented the most intense signal. However, if the total area below the curve was considered, L10KB was the most sensitive. A comparison of the OSL decay for the two quoted compositions, after the application of a pre-heating process of 200 ^{o}C/10 s, showed a slightly change in the decay pattern comparing to the case without pre-heating. Pre-heating treatments also showed the relation between the shallow traps and the fast component of the OSL decay for L15KB. For all compositions, an increase in the dose implied in an increase on the emitted signal, and no signal of saturation was verified for the tested dose range (0.1 Gy to 7 Gy).

Keywords: borate glass; OSL; thermal treatment.

1. Introduction

Designing glass for radiation detection has been quoted as one of the tendencies in the optical studies of glass science [1]. Optical fiber sensors can be located in radiation hazardous areas for remote monitoring and reach difficult-to-access locations. In the last years, different glass compositions were evaluated for use in luminescent dosimetry [2,3]. In general, these assessments were focused on thermoluminescence (TL) analysis of high doses of radiation (order of grays to few kilograys). Besides TL, optically stimulated luminescence (OSL) has gained attention as a dosimetric technique due to some advantages over TL. Both TL and OSL techniques are based on the emission of light by a semiconductor or insulator, after being irradiated and received a stimulus to induce the recombination of the trapped charge carriers (electrons and holes). The recombination is induced by a controlled heating process for TL whereas for OSL it is induced by an optical stimulation [4,5].