Thermoluminescence properties of alexandrite under beta, ultraviolet and X-ray irradiation.

Alexia Oliveira Silva[1], Matheus Cavalcanti dos Santos Nunes[2], Elisabeth Mateus Yoshimura[3], Carina Ulsen[3], Melina Mara de Souza[4], Neilo Marcos Trindade[3,1]

[1]Federal Institute of São Paulo, [2]São Paulo State University, [3]University of São Paulo, [4]Federal Institute of Southern Minas Gerais

e-mail: alexia.o@aluno.ifsp.edu.br

Recent studies have proposed the investigation of alexandrite mineral ($BeAl_2O_4:Cr^{3+}$) as a potential natural dosimeter due its composition combines BeO and Al_2O_3, oxides used as commercial dosimeters [1]. Dosimetric materials are essential for the evaluation of personal and environmental irradiation doses in medical, spatial, and industrial activities [2]. Thermoluminescent dosimeters, when stimulated by a thermal energy, emit light with intensity proportional to the radiation dose absorbed by the material. Thermoluminescence (TL) analysis of alexandrite samples after beta, X-ray and ultraviolet irradiation are discussed in this study. For each measure, samples from the same batch, were previously irradiated with a beta source $^{90}Sr/^{90}Y$; or illuminated by ultraviolet lighting system Boitton lamp, model BOIT-LUB01, in UVC range with 6W of power; or X-ray source (Moxtek 50kV Cabled). TL measurements were performed with a Risø reader (model DA-20) and in a homemade system, LUMI22, developed by the Lumidosi group at Federal Institute of São Paulo. In addition, alexandrite was analyzed by X-ray Fluorescence (XRF) and X-ray Diffraction (XRD). Preliminary TL measurements were carried out using beta and UVC sources. Alexandrite shows five TL glow peaks, I (~355K), II (~405K), III (~445K), IV (~525K) and V (~585K). It is expected to develop an innovative and commercially accessible detector.

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