Thermoluminescence, Fluorescence and Electron Paramagnetic Resonance of natural alexandrite.

Alexia Oliveira Silva[1,2], Matheus Cavalcanti dos Santos Nunes[3,2], Elisabeth Mateus Yoshimura[2], Orlando Rodrigues Junior[4], Neilo Marcos Trindade[2]

[1]Instituto Federal de Educação, Ciência e Tecnologia de São Paulo (*Física*) , [2]Instituto de Física da Universidade de São Paulo (*Física Nuclear*) , [3]Universidade Estadual Paulista (*Pós-graduação em Ciências e Tecnologia de Materiais*) , [4]Instituto de Pesquisas Energéticas e Nucleares

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

Recent studies have proposed the investigation of alexandrite mineral (BeAl2O4:Cr3+) as a potential luminescent dosimeter. Despite this, in-depth studies of defects and luminescent centers in alexandrite were not investigated. It is proposed to characterize the thermoluminescence (TL) emission spectra, fluorescence (FL) and electron paramagnetic resonance (EPR) of alexandrite. TL dosimeters, when stimulated by thermal energy, emit light proportional to the dose of ionizing radiation previously absorbed. The emitted wavelength can be measured through thermoluminescence emission spectra. On the other hand, EPR and FL provides additional information about mineral structure, enabling the study of the effects of ionizing radiation on the sample. For TL, the samples were irradiatedwith X-rays and measured by Lumi22 homemade system. EPR measurements were carriedout using a Bruker EMXplus spectrometer operating in the X-band at room temperature, 2mW microwave power, 100 kHz modulation frequency and 0.25 mT modulation amplitude.The FL spectra were measured using the Duetta spectrofluorometer, with a 75 W xenon arclamp included. The data was collected by scanning excitation wavelengths in 360-480 nmand recording emission in the wavelength range of 670-740 nm. Preliminary results indicatethat the TL emission spectra presented two peaks, at ~80°C and ~175°C, with emissioncentered between 600 nm - 700 nm, related to Fe3+ and Cr3+, also detected by EPR. TheFL spectra showed two signals: an emission centered at 680 nm (Cr3+ in inversion center),and at 700 nm (Cr3+ in mirror symmetry). The results of all techniques used in this worksuggest that emissions are correlated to Cr3+ and Fe3+ ions.

Acknowledgements: A. O. Silva thanks to FAPESP (#2020/15626-6). M. C. S. Nunes thanks to FAPESP (#2021/12758-1). E. M. Yoshimura is grateful to FAPESP (#2018/05982-0). N. M. Trindade thanks FAPESP (#2018/05982-0; #2019/05915-3), CNPq (#409338/2021-4) and IFSP/IFSULDEMINAS.