

Optical absorption, electronic paramagnetic resonance and luminescence spectroscopic characterization of olivine

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The objective of the work is to study the properties of thermoluminescence (TL), electronic paramagnetic resonance (EPR), and optical absorption (OA) for characterization of natural Brazilian silicate “olivine”. Many TL and EPR signal changes are created when the lattice crystal submitted on nuclear irradiations. The olivine measures were carried out on natural sample and after γ and beta irradiation for energy level transition of electron and following the thermodynamic effect to estimate TL, EPR signals. The nuclear applications is necessary to increase or to better the signal. The silicate minerals can be also to have much sensibility when exposed to high radiation and some them can be used for radiation dosimeter. Our study of Olivine crystal will be investigated if it can be use as dosimeter. The members of the Olivine Group are crystallized with orthorhombic symmetry. The structure consists of independent SiO_4 tetrahedral linked by divalent atoms in six-fold coordination. The sample is from Teofilo Otoni’s region on the Minas Gerais State (Brazil) with green colored crystal and its dimensions are 2 cm x 3 cm x 5 cm. The EPR spectrum of natural olivine sample is composed of: (1) An intensive signal around 1000 Gauss with $g \approx 6.3$; (2) weak signals around 1500, 1900 and 2200 Gauss; (3) Mn^{2+} hyperfine lines; (4) about seven lines in the magnetic field range from 3753 to 4160 Gauss. The Optical Absorption spectra taken using several slabs have shown besides UV-band, two bands at 420 and 630 nm in the visible spectrum and a relatively intense band around 1100 nm due to Fe^{2+} . The green colour of olivine sample is due to 420 and 630 nm wavelength absorption band. The thermoluminescent curves present three different peaks around 145, 260 and 360 °C. Deconvolution methods applied on the samples indicated that each TL peak on 149, 266 and 369 °C have E-values of 0.55, 1.55 and 2.25 eV respectably.