Photoluminescence and luminescence time decay of MgB_4O_7:Ce,Li

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Magnesium tetraborate doped with cerium and codoped with lithium (MgB_4O_7:Ce,Li) has been widely used in luminescent dosimetry with the thermoluminescent (TL) technique and recently as an optically stimulated luminescence (OSL) dosimeter, due to its high sensitivity to ionizing radiation[1,2]. Recent studies have shown that among all the rare earths used as dopants for this host matrix, the Cerium (Ce^{3+}) produces the most intense TL and OSL emissions and recently the incorporation of lithium as codopant enhanced the sensitivity of the composite. As the MgB_4O_7:Ce,Li is a relative new OSL/ TL dosimeter, there is not much discussion so far about the process that gives raise to the luminescent emissions from these components.The present work aims to evaluate the luminescent properties of MgB_4O_7:Ce,Li. The material was obtained through a solid state synthesis, and the photoluminescence (PL) emission and the excitation spectra were studied with excitation in the vacuum ultraviolet spectral region, using synchrotron radiation; in the Toroidal Grating Monochomator (TGM) at the LNLS and with visible (VIS) excitation source using a CryLas GmbH 488 nm CW. The optical centers time decay of the centers was measured using an electrooptic modulator to pulse the CW laser. The excitation spectra were recorded at 373 nm, and they showed two prominent peaks around 275 and 319 nm; the emission curve measured at constant excitation in 315 nm showed a prominent peak around 370 nm. The luminescence spectra under excitations from 4.5 eV up to 9.1 eV, presented a broad emission around 3 eV (413 nm); the broadness of these emissions changed as the excitation energy increased. Further results will be presented and discussed.

Keywords: Magnesium tetraborate, photoluminescence, dosimetry, lifetime, cerium.

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