Investigation of luminescent properties of MgB_4O_7:Ce,Li for Optically Stimulated Luminescence technique

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Optically Stimulated Luminescence is a technique that has been widely used in several procedures, such as arqueological and geological dating of materials; nowadays it is well established in medical dosimetry and has already been used commercially for almost two decades. The main challenge for the OSL technique is that there has been a lack of materials for clinical dosimetry; Al_2O_3:C (aluminum oxide) and BeO (beryllium oxide) are the commercial available OSL dosimeters, even though these materials have some limitations, and thus there is a need for new OSL dosimeters. In the present work the objective is investigate the luminescent properties of MgB_4O_7:Ce,Li. Recently, this material has been suggested as OSL dosimeter for neutron detection by Yukihara *et al*. (2016) and some dosimetric properties has been described by Souza *et al*. (2017). Here we are complementing these studies, analyzing proprieties, such as the effect of codopant concentration in tetraborate matrix (concentration *quenching*), the OSL behavior of the curve when continuous-wave (CW) and linear modulated (LM) modes of operation are used, thermoluminescence emission spectrum, dose response curve, minimum detectable dose, step-annealing experiment, optical bleaching for reuse of the dosimeters and dose response curve. Luminescence measurements and irradiations were carried out using a Risø TL/OSL equipment. Some preliminaries results indicated that the optimal OSL $MgB_4O_7:Ce_{0.5\%},Li_{x\%}$ emission was exhibited by the powder with 0.5 wt% (weight) of lithium codopant. Then a decrease in the OSL intensity was observed, which can be attributed to the concentration quenching effect.The thermoluminescent emission spetrum indicated that the emisison luminescent emission from the samples are in the UV-Vis region (300-400 nm) and the LM-OSL curves relates the peak position with the photoionization cross-section of the trap.

Keywords: Magnesium tetraborate, radiation detectors, OSL dosimetry.

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References

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