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Dosimetric Properties of MgB4O7:Ce and MgB4O7:Ce, Li for Thermoluminescence Dosimetry Applications

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Thermoluminescent dosimetry is known as a well-established technique for monitoring radiation dose in medical practices. Some most used thermoluminescent dosimeters (TLDs) are: LiF:Mg,Ti (TLD-100), CaF:Mn, CaSO4:Dy, Li2B4O7, and aluminophosphate glasses. Recent studies have demonstrated that borates can be very useful for TL dosimetry because their compounds may be more sensitive to radiation than the commercial dosimeters as TLD-100. Furthermore, compounds with boron-10 allow the detection of thermal neutrons (E <0.25 eV). They also have other good dosimetric properties, such as linear dose response over a large absorbed dose range, effective atomic number close to the human tissue, and a simple TL emission curve with a single peak. However, there is not much discussion about preparation routes for dosimeters based on borates and on and the structure of their compounds. Among these, we examined thermoluminescence properties of magnesium tetraborate doped with cerium (MgB4O7:Ce) and co-doped with lithium (MgB4O7:Ce,Li). Some important TL properties were investigated such as: dose response for gamma and beta, fading and kinetic parameters of TL curves. To study TL response, the material was investigated in pellet format (3mm of diameter) that were irradiated with sources of beta particles (90Sr/90Y) and gamma rays (60Co) with different absorbed doses. The TL responses were measured using an TL/OSL reader (TL/OSL reader Riso). The results showed that the materials have great potential for TLD dosimetry, presenting low fading of TL signal (< 3% in one month) and prevalence of first-order TL peak. The dose response curves also show that saturation occurs at higher doses (up to 1000 Gy) and the kinetic parameter shows TL curve follow kinetic of first order.

Country/Organization invited to participate

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