ABSTRACT

New glasses Li2CO3–K2CO3–H3BO3 (LKB) co-doped with CuO and MgO, or with TiO2 and MgO, were synthesized by the chemical quenching technique. The thermoluminescence (TL) responses of LKB:Cu,Mg and LKB:Ti,Mg irradiated with 6 MV photons or 6 MeV electrons were compared in the dose range 0.5–4.0 Gy. The standard commercial dosimeter LiF:Mg,Ti (TLD-100) was used to calibrate the TL reader and as a reference in comparison of the TL properties of the new materials. The dependence of the responses of the new materials on 60Co dose is linear in the range of 1–1000 Gy. The TL yields of both of the co-doped glasses and TLD-100 are greater for electron irradiation than for photon irradiation. The TL sensitivity of LKB:Ti,Mg is 1.3 times higher than the sensitivity of LKB:Cu,Mg and 12 times less than the sensitivity of TLD-100. The new TL dosimetric materials have low effective atomic numbers, good linearity of the dose responses, excellent signal reproducibility, and a simple glow curve structure. This combination of properties makes them suitable for radiation dosimetry.

Keyword: Thermoluminescence; Dosimetry; Lithium potassium borate; Copper; Titanium; Magnesium dopants