

EFFECTS OF SILVER NANOPARTICLES DOPING ON THE TL EMISSION OF MAGNESIUM BORATE GLASSES

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Introduction: Magnesium borate is known for its excellent luminescent characteristics and can be excited by different types of radiation [1-3]. From the point of view of personal dosimetry, Magnesium borate is attractive, because has an effective atomic number (Z_{eff}) of 8.5, very close to that of the skin. In order to increase the luminescent emission efficiency, the sample was doped with silver nanoparticles (NPs).

Material and method: Samples of silver-doped magnesium borate glasses were obtained by the fusion method. TL and OSL measurements were performed using the RISØ TL/OSL reader, model DA-20.

For OSL measurements the sample was optically stimulated using blue light source. All the irradiations was performed with a beta beam from the $^{90}\text{Sr}/^{90}\text{Y}$ source incorporated into the RISØ.

Results: TL glow curves obtained after irradiation with doses between 1 to 5 Gy exhibit an intense and well defined TL peak with the maximum intensity on 175 °C, shown in Figure 1. Other wise, the undoped sample shows a glow curve with a peak at around 105 °C and more attenuated than doped sample. In TL dose-response curve, a linear increasing was observed within this dose interval (Figure 2).

The sample also supplied OSL response and the dose-response curve have a linear behavior from 0.8 to 1.6 Gy, shown in Figure 3.

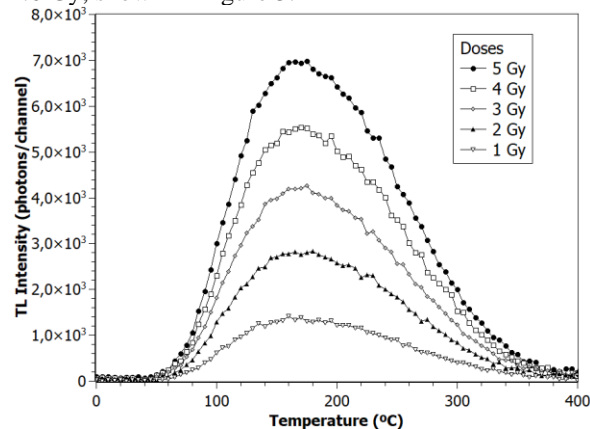


Figure 1: TL glow curves of magnesium borate glass samples doped with Ag, obtained with a linear heating rate of 5 °C s⁻¹.

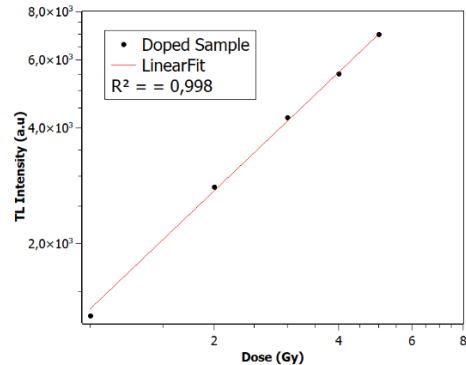


Figure 2: TL dose-response curve of magnesium borate glass doped with Ag.

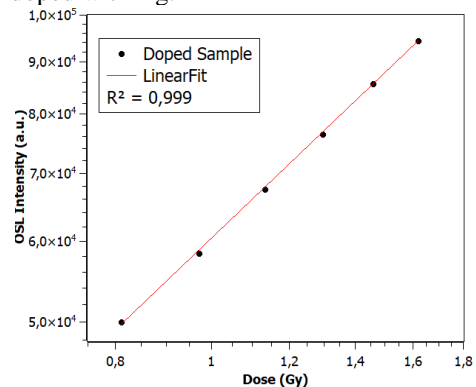


Figure 3: OSL dose-response curve of doped sample.

Conclusions: The magnesium borate glass doped with silver nanoparticles, produced in the present work seems promising as a TL and OSL dosimeter due to the high sensitivity and good linearity.

References:

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