Thermoluminescent analysis of silver addition in $CaSO_4 : Tb$

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According to results of the literature, some unusual rare earth elements, such as terbium, have been shown to be promising as a dopant in $CaSO_4$ matrix. Silver has also been used in the co-dopant function. As there are no reports on the structural characterization of $CaSO_4 : Tb$ with the incorporation of silver, the aim of this work was to produce and characterize terbium doped $CaSO_4$ crystals, co-doped with silver oxide (Ag (Ox)) and silver nanoparticles (Ag (NP)). The main purpose is to use them as alternative TL dosimeters to those commercially available. The phosphors were produced by the slow evaporation route and characterized by X-ray diffraction (XRD), which confirmed the viability of the route, and by scanning electron microscopy (SEM). The silver nanoparticles were produced by the method of Lee and Meisel and characterized by ultraviolet-visible spectrophotometry (UV-Vis), SEM and XRD. The composites in the form of pellets were obtained from the addition of Teflon to the phosphors. The TL emissions of the new materials produced were investigated. It was observed that the addition of silver as a co-dopant in the $CaSO_4 : Tb$ matrix shifts its main TL peak to higher temperatures, and the presence of Ag (NP) increases the intensity of this peak. By means of the TL emission curves of the composites, some parameters associated with the charge transfer processes in these materials were determined. The lower detection limit of the composites was also evaluated. The crystals of $CaSO_4 : Tb, Ag(NP)$ presented higher sensitivity than $CaSO_4 : Tb, Ag(Ox)$. All samples have a luminescent signal reproducible and linear, with TL responses proportional to the absorbed doses.