Dosimetric Properties of $CaSO_4$:Eu with Addiction of Silver Nanoparticles

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Different materials detectors have been proposed in the literature for use in personal and environmental dosimetry. Thermoluminescent detectors are among the detectors most widely used to this purpose. The motivation of this work was to produce crystals of $CaSO_4$ doped with unusual elements such as europium (Eu) and silver (Ag), including in the form of nanoparticles, prepared by an adaptation of the method developed by Yamashita (1971). The interest in the production of these materials was to investigate other methods of producing thermoluminescent materials. In the new growth route, the crystals were produced from calcium carbonate ($CaCO_3$), by incorporating the dopants (Eu_2O_3 or Ag_2O) in a solution of sulfuric acid. Silver nanoparticles Ag(NP) were obtained through a synthesis route so-called polyol method, which is based on the reduction of Ag ions in a polyalcohol. Thermoluminescent (TL) characteristics as sensibility, linearity, reproducibility, energy dependence, minimum detectable dose, fading and kinetics order were evaluated. The composites showed TL emission glow curves with a single peak centered around 200°C. The new routes for the preparation of dosimeters have shown to be viable. The dosimeter based on calcium sulfate doped with europium and silver nanoparticles ($CaSO_4$:Eu,Ag(NP)) provides the most intense TL emission between the preparations studied, with high sensibility, low detection limit and an acceptable fading, being this TL linear, reproducible, and first order kinetics.