Synthesis of luminescent particles of Al_2O_3:Yb/Tm co-doped with yttrium by Spray Pyrolysis

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Materials with up-conversion properties are very interesting because of the ability to emit high-energy photons upon excitation with low-energy radiation, usually, in the NIR region, becoming the focus of interest for applications such as lighting and color displays [1], improvement of solar cells [2], waveguides [3], and etc. Among several oxides used as host matrix, alumina are interesting due to their good mechanical properties, chemical stability and a high optical transparency from the ultraviolet to the infrared [4]. In this context, alumina doping of yttrium offers advantages and has been studied mainly in relation to the crystalline phase yttrium aluminum garnet (YAG, $Y_3Al_5O_{12}$), and when that host is doped with rare earth ions it is one of the main materials with application in solid-state laser and it can be used too on fiber-optic telecommunication systems [5]. The aim of this work was to obtain alumina with the different concentration of Y^{3+} concentration by spray pyrolysis in order to obtain a matrix with lower phonon energy and consequently better the up-conversion efficiency**.** Luminescent particles of Al_2O_3:Yb/Tm codoped with Yttrium were synthesized by the spray pyrolysis technique, and the cubic phase of YAG was obtained by a thermal treatment (TT) at 1100°C/6 hours. However, the thermal analysis (DSC) has showed different phase transitions at temperature lower than 1000°C, so the thermal treatment can generate several crystalline phases and it allows to obtain different chemical environments for the rare earth on the host lattice. The TT particles has showed efficient upconversion energy process under excitation at 980 nm, and additional studies will be carried out to understand the dependence of blue emission intensity ($^1G_4 \rightarrow {}^3H_6$) with the increase of Y^{3+} content, since, the rare earth ions replace, preferably, the Y^{3+} on the YAG structure.

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