CRYSTAL GROWTH AND CHARACTERIZATION OF BaY_2F_8:TR (TR= Nd^{3+}; Pr^{3+}; Er^{3+}; Tb^{3+};Dy^{3+})

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Fluorides materials have shown a continuous development on research and technological uses as dosimeters, x-ray monochromators and mainly as optical devices, such as optical windows and laser hosts. The BaY_2F_8 compound has recently been the subject of several studies, especially regarding the spectroscopy of rare earth (RE) doped crystals for determination of their potential for new compact diode pumped laser systems. Although numerous reports in the literature deal with the laser properties of RE-doped BaY_2F_8 crystals, only a few of them study their preparation in details. Synthesis and growth process of single crystals of BaY_2F_8:RE (RE= Nd^{3+}; Pr^{3+}; Er^{3+}; Tb^{3+};Dy^{3+}) were performed by Zone Melting method. The fluorides were prepared in laboratory from commercial Y_2O_3 (or RE_2O_3) and $BaCO_3$ by hydrofluorination [1]. The doped samples were prepared with concentrations of 1.5 - 2mol% of RE ions considering substitution at the Y site. The grown crystals were characterized by X-ray diffraction, scanning electron microscopy and X-ray energy dispersive spectroscopy. The melting behavior of pure and trivalent RE doped- BaY_2F_8 was investigated and the concentration and distribution of the dopants in the grown crystals were measured, and when feasible, the segregation coefficient was estimated. We observed that, at similar growth conditions, the optical quality and initial BaY_2F_8 phase crystallization modifies considerable depending of the RE added. The results will be discussed considering defects formation in the lattice [2], different incorporation of the dopants because of segregation during the growth process and modification of melting behavior (congruent or incongruent).

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[1] S. L. Baldochi, S. P Morato. “Fluoride Bulk Crystals growth” In: BUSCHOW, K.H.J.;CAHN, R. W.; FLEMINGS, M. C.; ILSCHNER, B.; KRAMER, E. J.; MAHAJAN, S. (Org.). ***Encyclopedia of Materials: Science and Technology***. Amsterdam - Holanda (2001) 3200-3205.

[2] J. B. Amaral, M. A. Couto dos Santos, M. E. G. Valério, R. A. Jackson. “Computer modeling of BaY_2F_8: defect structure, rare earth doping and optical behaviour. *Appl. Phys*. B81, 841-846(2005).