Structural characterization of Eu^{3+}:$LiLa(WO_4)_2$ single crystal fibers

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Eu^{3+}-activated compounds exhibit relatively good thermal and chemical stability, show strong absorption in the near-UV region with strong visible red emission. Therefore they are considered to be good host materials to design a several number of luminescent materials. In addition to the well know laser properties, single crystal fibers are also interesting because of their reduced cost of preparation and potential for nonlinear optical devices. The fiber shape is suitable to nonlinear optical interactions, whose efficiencies can be greatly enhanced by the long interaction lengths and tight beam confinement available in guided wave structures. In this work we report the structural investigation of Eu^{3+}:$LiLa(WO_4)_2$ (Eu:LLW) single crystal fibers in different concentrations. The starting compounds - $LiLa(WO_4)_2$ (LLW) and $LiEu(WO_4)_2$ (LEW) were obtained by solid state reaction from raw commercial reagents. The formation of both tungstates was confirmed through X-ray diffraction (XRD) analysis. The dopant concentration for crystal growth was obtained by mixing appropriated fractions of each tungstate. Single crystal fibers were grown - Eu:LLW and LEW - by the micro-pulling-down method in a resistive heating mode with pulling rates of 0.18 mm/min, in air atmosphere, and Pt-Au crucibles with 0.8 mm nozzle diameter. Transparent, crack free (except for LEW) and uniform single crystal fibers up to 45 mm length were obtained. XRD Rietveld analyses were performed with powdered samples of the fibers in order to identify the structural modifications introduced by the increase of Eu concentration.

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