GROWTH STUDY OF SINGLE CRYSTAL FIBERS OF Nd^{3+},Yb^{3+}-DOPED $NaLa(WO_4)_2$ AND $LiLa(WO_4)_2$ BY THE µ-PD METHOD

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The production of single crystalline fibers has been presented in the last years as an interesting tool in the investigation of optical and structural properties of many materials. The growth of single-crystalline fibers is fast and relatively low-cost compared to traditional bulk crystal growth from the melt. Additionally, their unique properties point to their use for production of a variety of optical and electronic devices, as for example, compact solid state lasers. Several works were reported on the optical properties and bulk crystal growth of alkali rare earth tungstates $A(RE)(WO_4)_2$, where A= K, Na, Li; and (RE) = rare earth elements. However, very little investigations were performed on single crystal fiber growth of double tungstates. In fact, only two reports were found on fiber growth of $NaGd(WO_4)_2$ (NGW) [1] and $NaBi(WO_4)_2$ (NBW) [2]. In this work we report the preparation of pure and Nd^{3+},Yb^{3+}-doped single crystal fibers of $NaLa(WO_4)_2$ (NLW) and $LiLa(WO_4)_2$ (LLW). The compounds were prepared by solid state reaction from Na_2CO_3, Li_2CO_3, La_2O_3, Nd_2O_3, Yb_2O_3 and WO_3 respectively; and the growth process was performed by the micro-pulling-down method (µ-PD) [3]. Fibers were growth with pulling rates of 0.06 – 0.40mm/min in Pt and Pt:Au crucibles. The water adsorption from environment by the La_2O_3 reagent can became a problem on the synthesis of these materials. Higher evaporation was observed on NLW when compared to LLW fibers growth. Further, the capillary stability (uniform diameter), was much more difficult to control in the case of NLW fiber growth. The mainly reason is the higher melting temperature of this compound which is very close to the limit of the resistive µPD equipment used. It was also observed that the substitution of the La^{3+} by Yb^{3+} resulted in the increase of evaporation of the melt compound. Despite of the observed problems single crystal fibers of pure and Nd and Yb doped LLW and NLW were obtained and characterized concerning structural and optical properties.

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