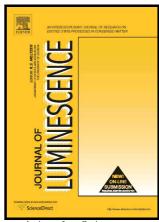
### Author's Accepted Manuscript

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#### **ACCEPTED MANUSCRIPT**

# Examination of Judd-Ofelt calculation and temperature self-reading for Tm<sup>3+</sup> and Tm<sup>3+</sup>/Yb<sup>3+</sup> doped LiYF<sub>4</sub> single crystals

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#### **ABSTRACT**

To validate the reliability of Judd-Ofelt results and the influence of involving absorption transition number, the Judd-Ofelt calculations, in which various transitions were adopted, were carried out for  $Tm^{3+}$  doped LiYF<sub>4</sub> single crystal. It was found that introducing more transitions into the calculation procedure might get more reliable results. In order to clarify the feasibility of temperature self-reading in  $Tm^{3+}/Yb^{3+}$  doped LiYF<sub>4</sub> single crystal during laser operation, the temperature sensing properties of the single crystal were studied. It was found that the fluorescence intensity ratio of  ${}^3F_{2+}{}^3F_{3} \rightarrow {}^3H_6$  to  ${}^3H_4 \rightarrow {}^3H_6$  can be used for achieving better temperature detection, and the temperature sensitivity was found much better than that in other materials. *Keywords:* Judd-Ofelt theory; Temperature sensing; Up-conversion luminescence; LiYF<sub>4</sub>: $Tm^{3+}/Yb^{3+}$  single crystal

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