ENERGY TRANSFER RATES OF KY_3F_{10}:Yb:Tm:Nd SYSTEM

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Particularly, ultraviolet and blue laser are important in the compact disc industry, optical storage systems, color displays and in new medical and dentistry applications and in atmospheric and physics research [[1]]. In this work we present the spectroscopic properties of KY_3F_{10} (KYF) single crystals doped with thulium and also co-doped with ytterbium and/or neodymium, KYF:Yb:Nd:Tm and KYF:Nd:Tm, identifying the most important processes that lead to the thulium up conversion emissions, under excitation around 797 nm and comparing the results with those obtained for $LiYF_4$ (YLF) doped with the same ions [2]. A study of the energy transfer rates of KY_3F_{10}:Yb:Tm:Nd system analyzing the population inversion between $^1G_4$ and $^3H_4$ states of Tm^{3+} was done with the calculation of the rate equations system based on numerical method using Runge-Kutta method.

The absorption spectra at room temperature of the samples in the range 200 nm-1200 nm were measured. The emission spectra were obtained by exciting the samples, with a 797 nm laser diode and were analyzed with a 0.5 m monochromator and a S-20 photomultiplier tube. The signal was amplified with a lock-in and processed by a computer. A time resolved luminescence spectroscopy technique was employed to measure the luminescence decays to determine the mechanism involved in the energy transfer up conversion processes. Analysis of the strong 465 nm emission for KYF:Yb:Tm:Nd crystal shown that energy transfer between Nd^{3+} and Yb^{3+} is the main mechanism and responsible for the blue up-conversion. In the case of KYF:Nd:Tm system we observed emissions in the range between 340 and 370 nm due to a three-ion process involving ions in $^3H_4$ level.

References

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