Ultraviolet Upconversion Luminescence Properties of Yb^{3+}, Gd^{3+} and Tm^{3+} Co-Doped Fluorophosphates Glasses.

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Frequency upconversion of infrared light to ultraviolet light in (RE)-doped glasses have many applications in the development of small-size compact lasers. Fluorophosphate glasses combine the low phonon energy of fluorides which leads to reduced multiphonon relaxation for Ln^{3+} excited states ions[1] with the glass forming ability of phosphate and when prepared with ultra-high purity powders can be transparent from 160 nm to 4000 nm. So, the understanding of the optical properties of Ln^{3+} in these glasses and the energy transfer process between these ions are of great importance for the optical applications.

In this work, Yb^{3+}, Gd^{3+} and Tm^{3+} ions were embedded into a fluorophosphate glass ($Sr(PO_3)_2$-AlF_3-SrF_2-CaF_2-MgF_2) to study the upconverted ultraviolet emissions properties and radiative and non-radiative energy transfer process between the Ln^{3+} ions through photoluminescence measurements. The glasses showed emissions in 290 nm (Tm^{3+}: $^1I_6 \rightarrow {}^3H_6$), 305 nm ($Gd^{3+}$: $^6P_{7/2} \rightarrow {}^8S_{7/2}$), 311 nm ($Tm^{3+}$: $^6P_{7/2} \rightarrow {}^8S_{7/2}$) and 360 nm ($Gd^{3+}$: $^6P_{5/2} \rightarrow {}^8S_{7/2}$) in the UV region. The mechanism of energy transfer between Yb^{3+}, Gd^{3+} and Tm^{3+} involved in the UV-upconverted emission will be discussed.

References

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