

# UV-Vis upconversion luminescence in Yb<sup>3+</sup>, Tm<sup>3+</sup>-doped fluoride nanomaterials

A. C. S. Silva<sup>1,\*</sup>, C. C. S. Pedroso<sup>2</sup>, P. Di Mascio<sup>2</sup>, H. F. Brito<sup>1</sup>

<sup>1</sup> University of São Paulo, Department of Fundamental Chemistry, Institute of Chemistry, SP, Brazil.

<sup>2</sup> University of São Paulo, Department of Biochemistry, Institute of Chemistry, SP, Brazil.

\* Corresponding author: [silvaacs@iq.usp.br](mailto:silvaacs@iq.usp.br)

Upconversion (UC) phenomenon is the conversion of low energy photons, typically in the near-infrared (NIR) region, into photons of higher energy, in the UV-Vis-NIR regions. UC luminescent materials have been exploited for the development of optical devices, temperature sensors, bioanalytical assays, labels for bioimaging, etc. Bioapplications of these materials, especially in nanometric scale, are interesting due to the excitation energy is in the biological window as well as the low fluorescence background signal [1]. In addition, UV emission is extremely important in many photochemical reactions as well as microelectronic devices and solid-state lasers applications [2]. In this work, NaYF<sub>4</sub>:Yb<sup>3+</sup>,Tm<sup>3+</sup> nanoparticles were synthesized by the modified coprecipitation method. The reaction was carried out in three-neck round bottom flask where the solution of cations, octadecene and oleic acid were heated at 140 °C to produce metal oleates. After this, under flowing argon, the fluoride precursor was added and the reaction mixture was heated to 300 °C for 90 min. The nanomaterials were characterized by XPD, SEM and TEM analyses. Upconversion luminescence spectrum was recorded under laser irradiation at 980 nm that sensitizes Yb<sup>3+</sup> ions and can be observed the characteristic lines of the Tm<sup>3+</sup> ion emission assigned to the <sup>1</sup>I<sub>6</sub>, <sup>1</sup>D<sub>2</sub>, <sup>1</sup>G<sub>4</sub> → <sup>3</sup>F<sub>4</sub> and <sup>1</sup>D<sub>2</sub>, <sup>1</sup>G<sub>4</sub> → <sup>3</sup>H<sub>6</sub> transitions (Figure 1).

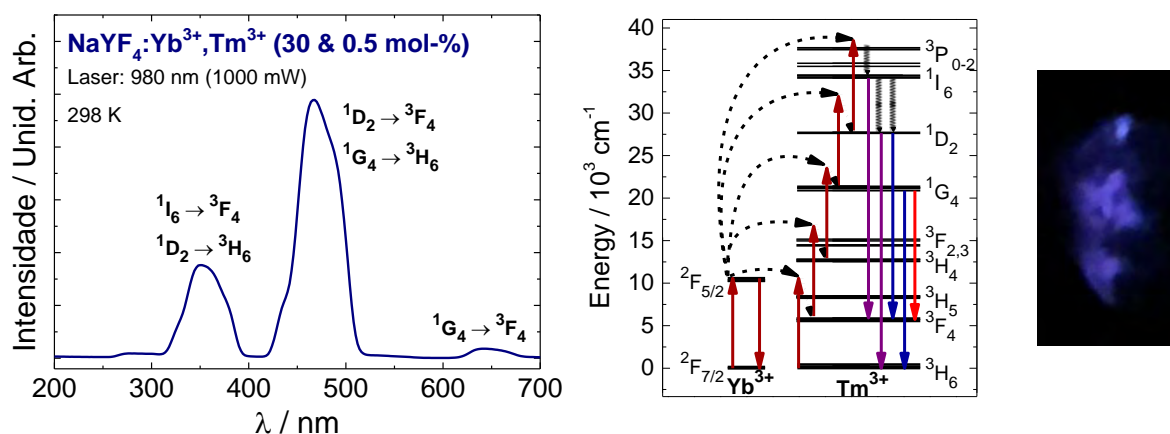


Figure 1: Upconversion emission spectrum (left), energy level diagram of NaYF<sub>4</sub>:Yb<sup>3+</sup>,Tm<sup>3+</sup> nanomaterial (middle) and photograph of the nanomaterial excited at 980 nm (right).

Keywords: Upconversion Nanoparticles, UV emission, Fluorides, Thulium, Ytterbium.

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## References

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