

Supporting Information for:

Vacuum assisted colossal enhancement of up-conversion luminescence of lanthanide-doped nanoparticles upon NIR laser irradiation – a new strategy for phosphors development

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Figure S1 shows the corresponding up-conversion emission spectra of the YVO₄: 20% Yb³⁺, 2% Er³⁺ material recorded with the same system (after the experiment), by measuring the spectra at decreasing laser power. It is clear, that the intensity of the Er³⁺ ions emission increased even more (due to the limited thermal quenching) and the 525/550 nm band ratio decreased, when the sample cooled down to room temperature, and the laser heating was not further observed.

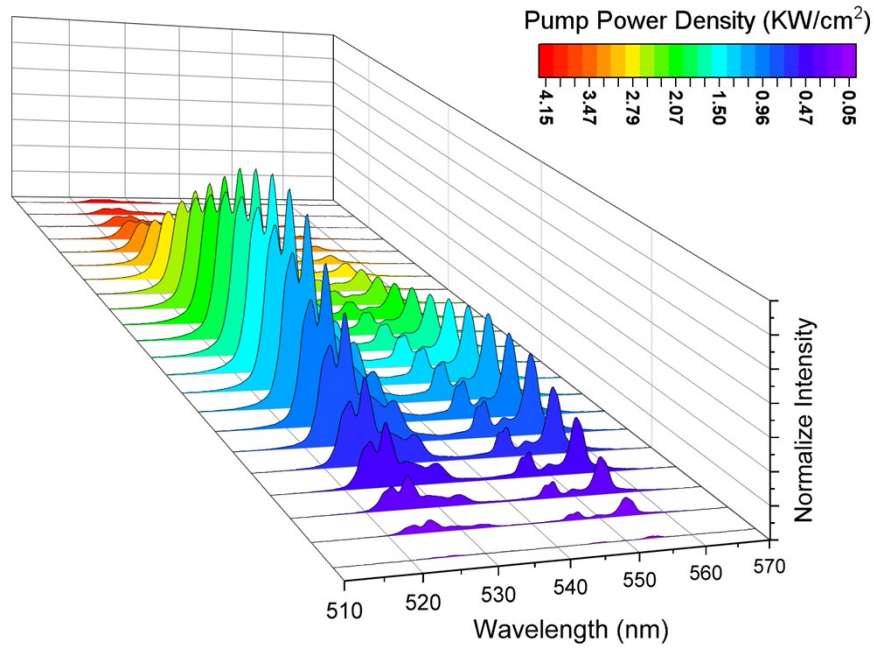


Figure S1. Emission spectra as function of pump power density of the YVO₄: 20% Yb³⁺, 2% Er³⁺.

In **Figure S2a** and **b**, it can be seen the blackbody radiation spectra for the Tm³⁺ and Er³⁺-doped samples, respectively, when the maximum temperature values were achieved. The spectra were fitted to the Plank equation in order to obtain the maximum temperature achieved:

$$I(\lambda, T) = A \frac{2\pi hc^2}{\lambda^5} \frac{1}{e^{\left(\frac{hc}{\lambda k_B T}\right)} - 1} \quad (1)$$

where A is a constant, $h = 6.626 \cdot 10^{-34}$ J·s is Planck constant, $c = 3 \cdot 10^8$ m/s is the speed of light, λ is the wavelength, $k_B = 1.381 \cdot 10^{-23}$ J/K is Boltzmann constant, and T is the temperature. The estimated temperature values obtained from this fitting were $T = 1422$ K and $T = 1769$ K for YVO_4 : 20% Yb^{3+} , 0.5% Tm^{3+} and YVO_4 : 20% Yb^{3+} , 2% Er^{3+} , respectively.

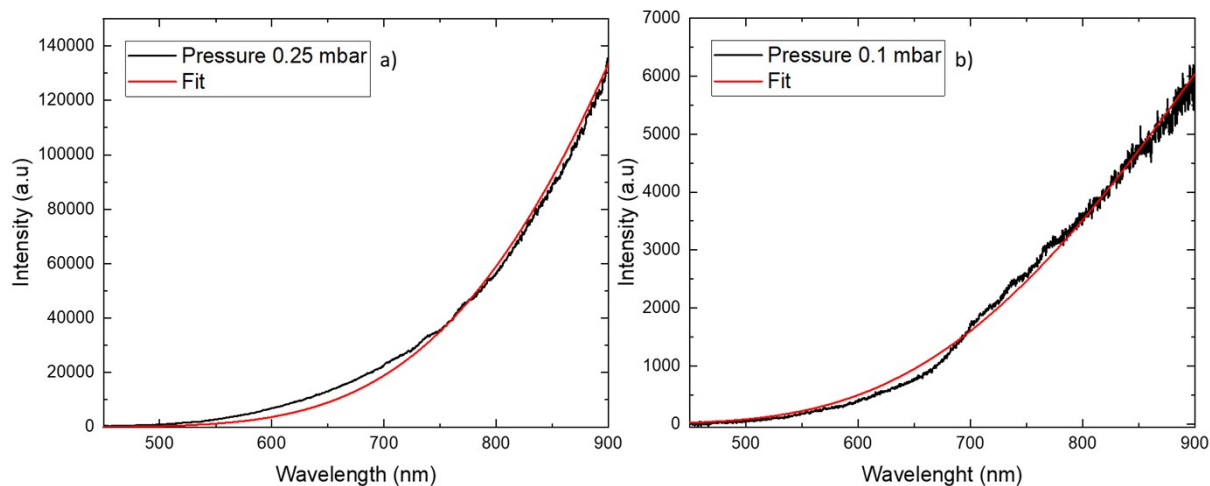


Figure S2. Fitting of one of the corrected curves to calculate the temperature reached with laser and vacuum at the same time for samples (a) YVO_4 : 20% Yb^{3+} , 0.5% Tm^{3+} and (b) YVO_4 :20% Yb^{3+} , 2% Er^{3+} .