Electronic Supplementary Material (ESI) for Journal of Materials Chemistry C.

SUPPLEMENTARY INFORMATION

For "From up-conversion to thermal radiation: spectroscopic properties of submicron Y_2O_3: Er^{3+}, Yb^{3+} ceramic under IR excitation in an extremely broad temperature range"

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1. Fluorescence decay

The decrease of radiative recombination probability following the increase of temperature was additionally investigated by the means of fluorescence lifetime spectroscopy in series of temperature of the ceramic. Measurements were performed using a SureLite optical parametric oscillator. For excitation, pulsed signal of 486 nm laser was used with a 10 Hz repetition rate, while the monitored wavelength was 550.05 nm. In the available measurement range, the temperature dependence of average decay time could be approximated with a linear function, showing that the average decay time decreased at a rate of 4.62 μs per 100 K (Figure S1).

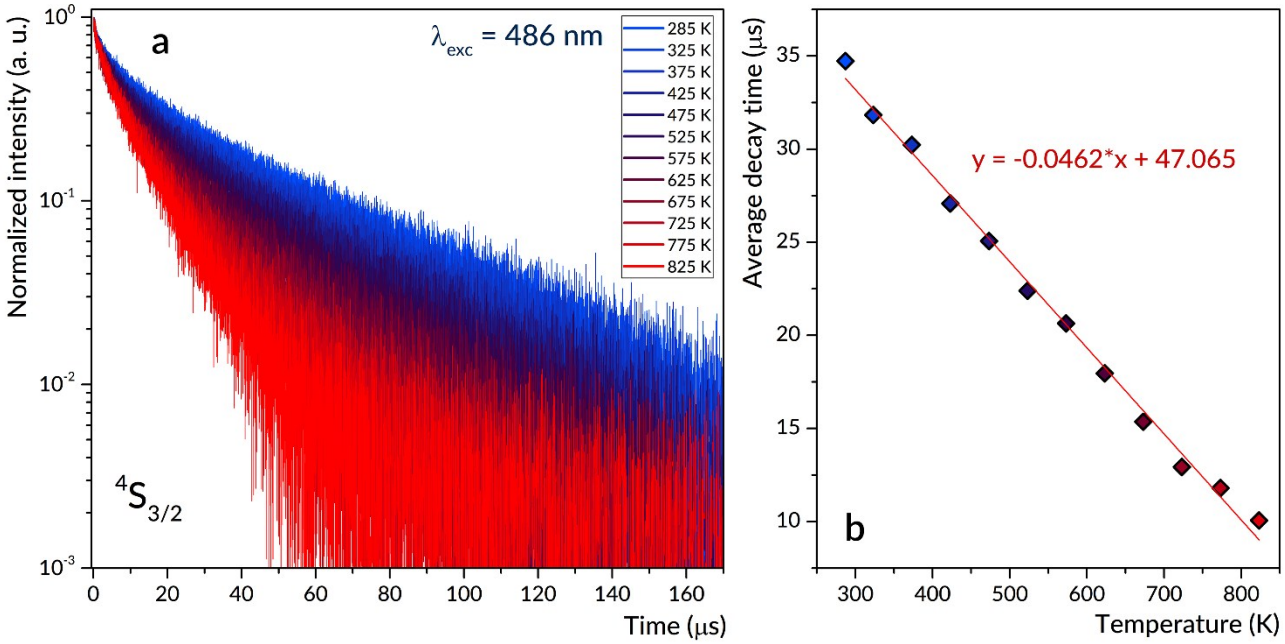

Figure S1. (a) Fluorescence decay curves of Y_2O_3: 20% Yb^{3+}, 1% Er^{3+} submicron ceramic in series of sample temperature between 285 K and 825 K and (b) average decay time in a function of sample temperature, including a linear fit.

2. Chromaticity

To emphasize the non-constant in a function of temperature intensity ratio between the red ($^4F_{9/2}\rightarrow{}^4I_{15/2}$)and green ($^2H_{11/2}\rightarrow{}^4I_{15/2}$ and $^4S_{3/2}\rightarrow{}^4I_{15/2}$) branches of Er^{3+} upconversion changing with temperature, (u' v') chromaticity coordinates of the emission at subsequent values of temperature were plotted on the CIE 1976 diagram (Figure S2).

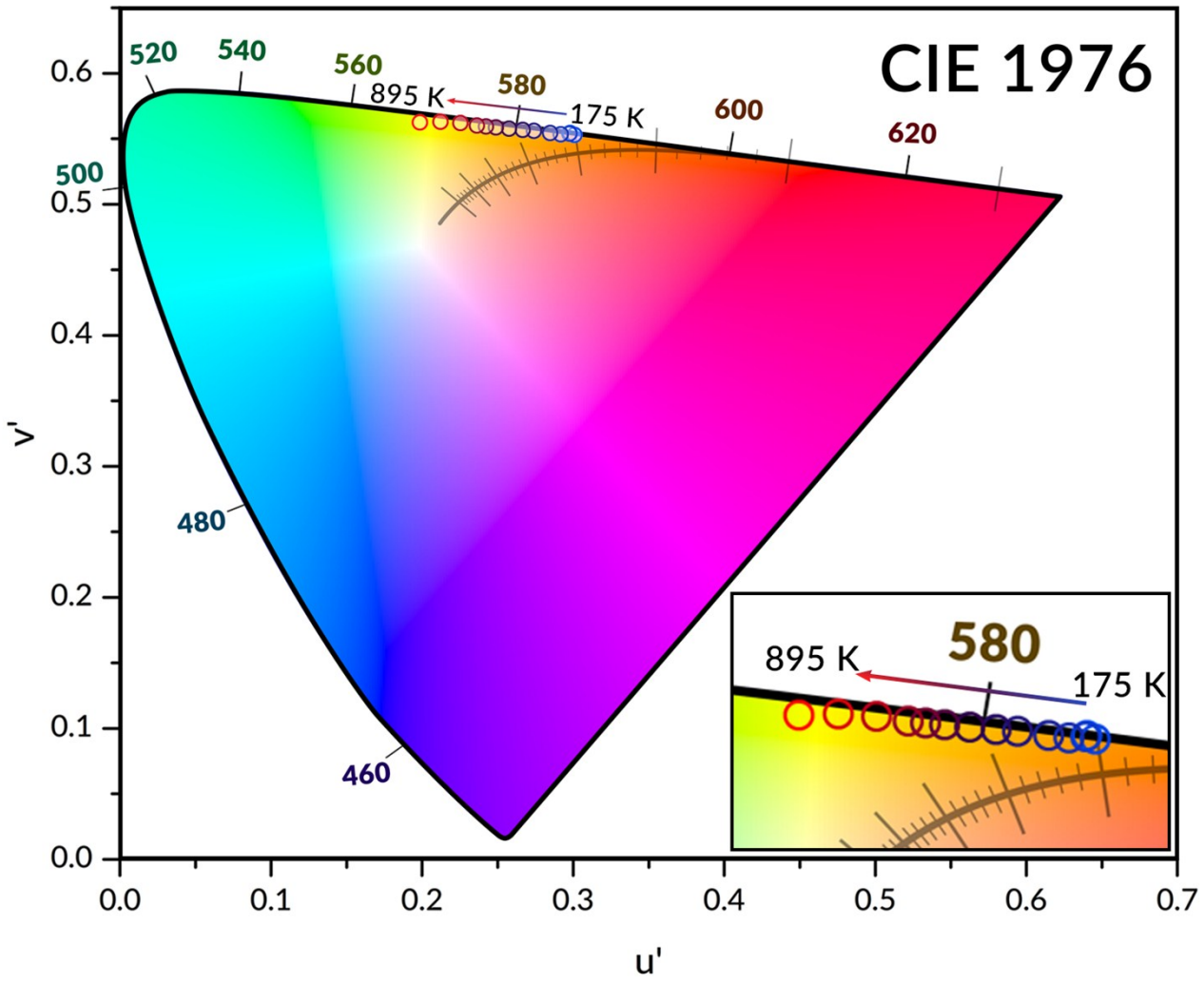

Figure S2. CIE 1976 chromaticity coordinates of 975 nm-excited upconversion of Y_2O_3: 20% Yb^{3+}, 1% Er^{3+} submicron ceramic in series of sample temperature between 175 K and 895 K.

3. Emission spectra of upconversion power dependence in air (defocused excitation beam) and in vacuum (defocused and focused excitation beam)

The emission spectra presented in Figure 6 in the main body of this work are presented here in extended range, including the emission bands of $^4F_{7/2} \rightarrow {}^4I_{15/2}$ and $^4F_{9/2} \rightarrow {}^4I_{15/2}$ (Figures S3-S5).

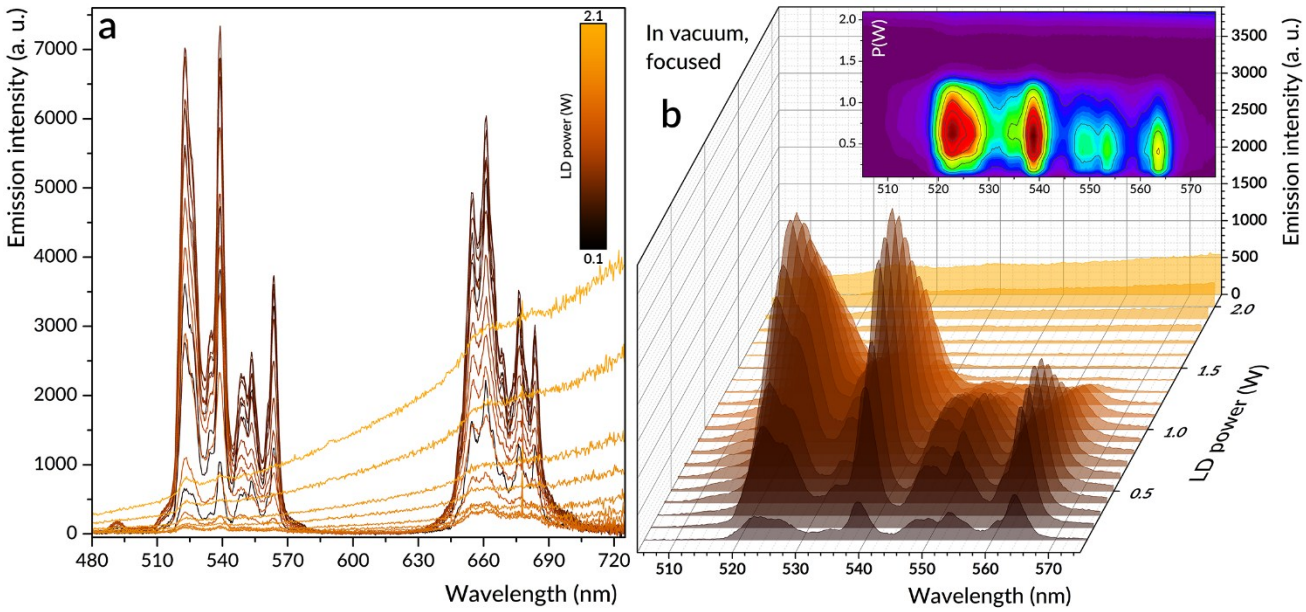

Figure S3. Emission spectra of Y_2O_3: Er^{3+}, Yb^{3+} ceramic under 975 nm excitation in a series of laser diode power in 480-730 nm range, acquired in vacuum with a focused excitation beam.

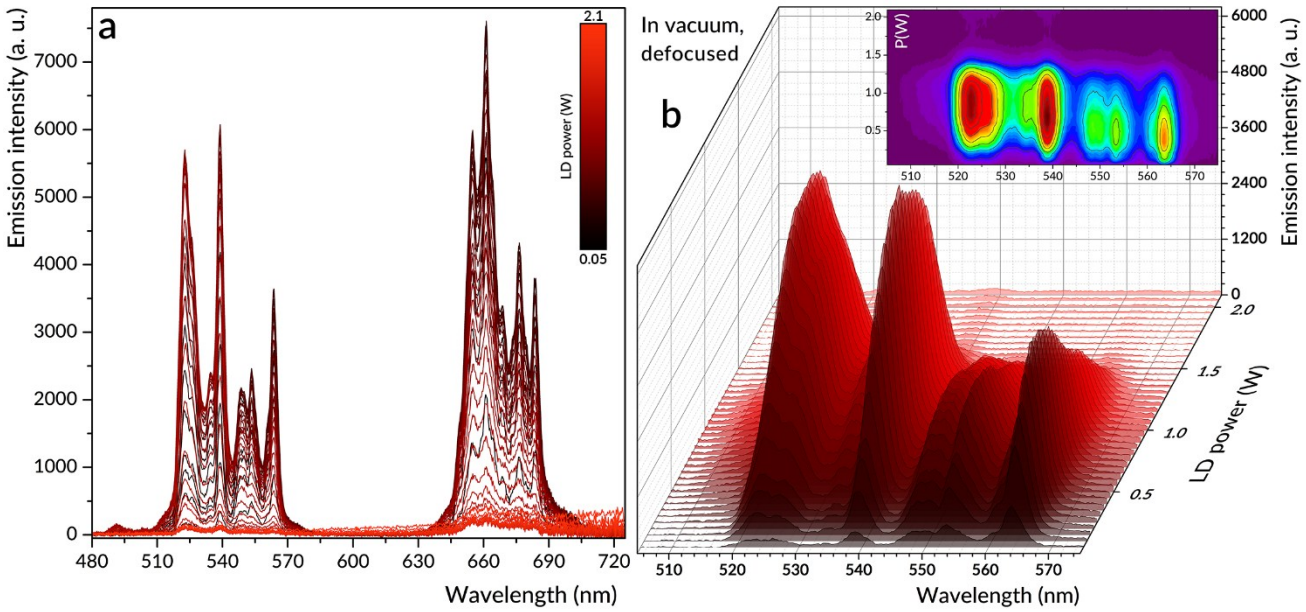

Figure S4. Emission spectra of Y_2O_3: Er^{3+}, Yb^{3+} ceramic under 975 nm excitation in a series of laser diode power in 480-730 nm range, acquired in vacuum with a defocused beam.

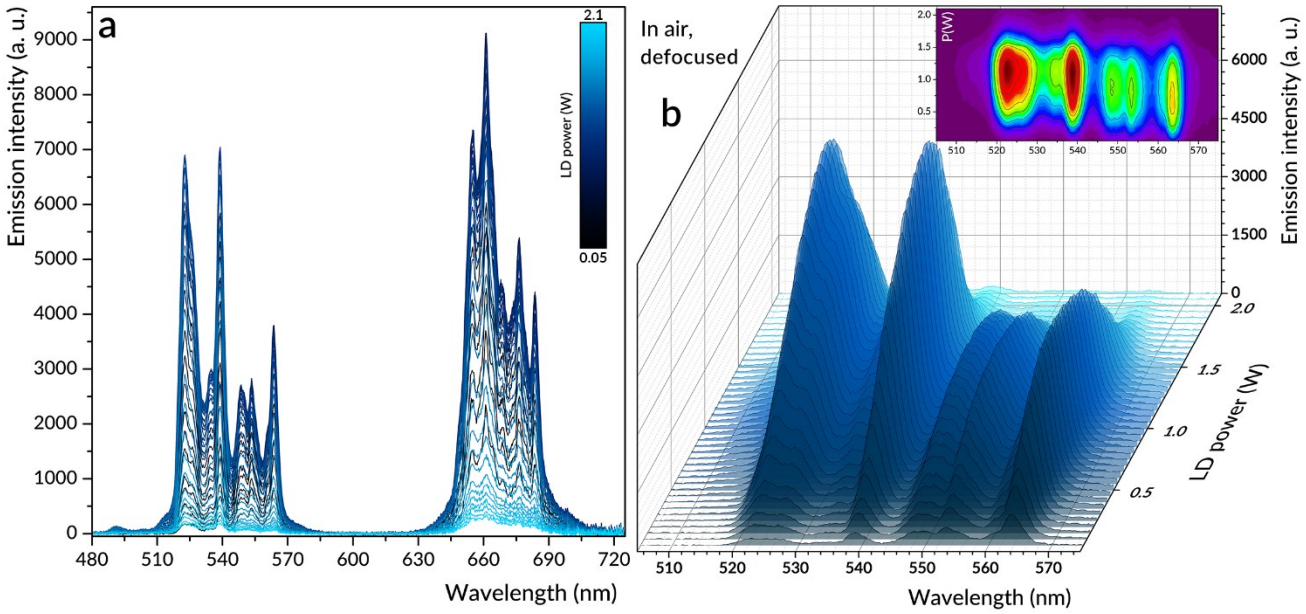

Figure S5. Emission spectra of Y_2O_3: Er^{3+}, Yb^{3+} ceramic under 975 nm excitation in a series of laser diode power in 480-730 nm range, acquired in air with a defocused beam.