Supporting information

Nd^{3+} doped TiO_2 nanoparticles as nanothermometer: high sensitivity in temperature evaluation inside biological windows

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Table S1. Summarized data for phase composition, neodymium content and band gap for undoped and Nd^{3+}-doped TiO_2 samples.

Sample's label	Phase composition	Nd content / wt. %*	Band gap / eV
TiO_2	anatase, rutile	/	**3.1** (3.11)
0.5-Nd-TiO_2	anatase	0.6 wt%±0.3	**3.0** (3.04)
1-Nd-TiO_2	anatase	0.9 wt%±0.2	**3.1** (3.11)
3-Nd-TiO_2	anatase	2.9 w%±0.4	**3.00** (2.99)

*Nd content was determined with EDS in combination with SEM

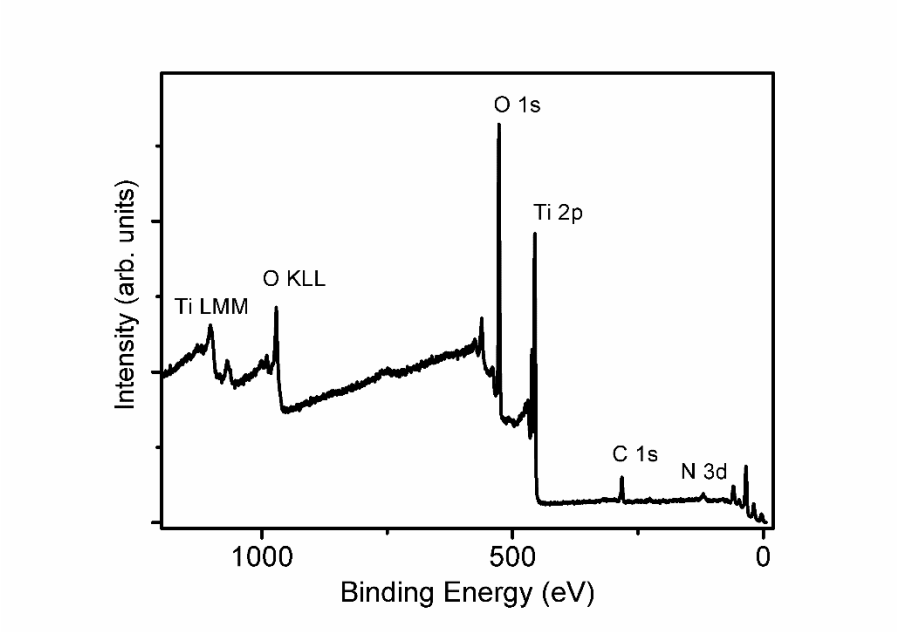

Figure S1: XPS survey spectrum recorded on 3-Nd-TiO_2 sample.

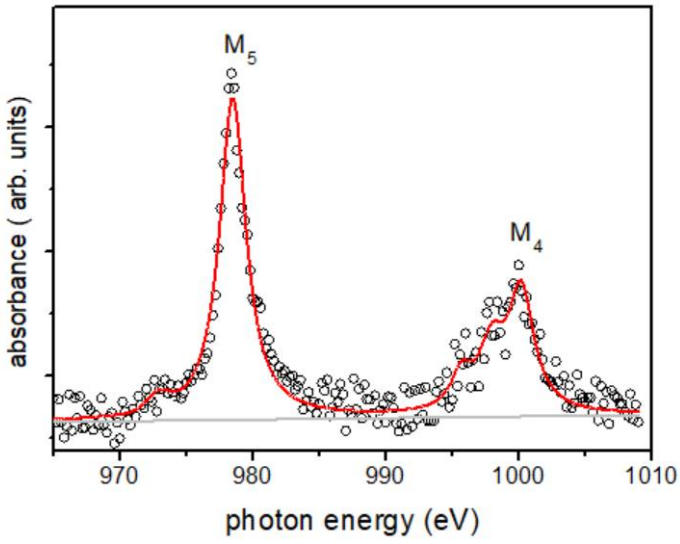

Figure S2. M-edges spectrum recorded on the 0.5-Nd-TiO_2 sample. The horizontal axe gives the excitation photon energy in eV. The open circles are the experimental data and the red line a guide to eye.

The photoluminescence spectra of the samples excited with 350 nm are showed in **Figure S3**. All these spectra have a broad band ranging from 380 nm to 750 nm. The broad band corresponds to emissions from the defect band in TiO_2 due to the self-trapped excitons (STE) luminescence in TiO_2 (**Figure 4**).

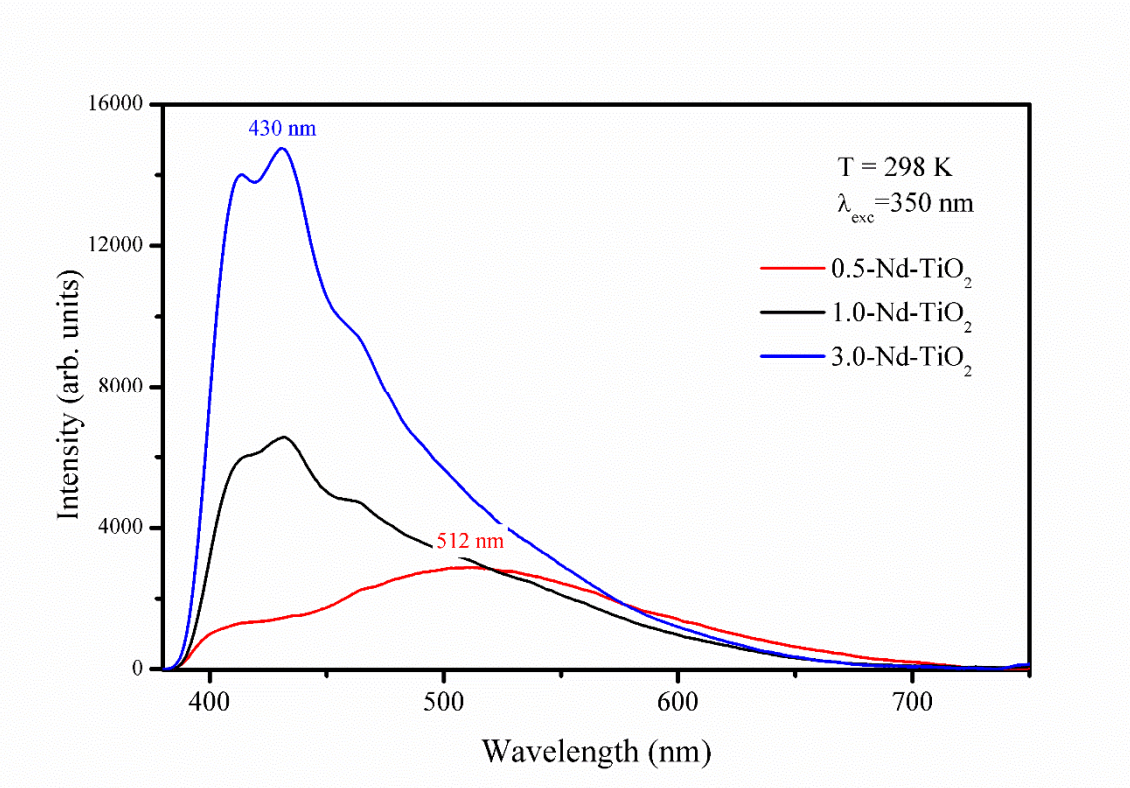

Figure S3. Luminescence spectra of *x*-Nd-TiO_2 (*x*=0.5, 1.0 and 3.0 wt%) nanoparticles, excitation at 350 nm and temperature of 298 K.

The normalized photoluminescence spectra of the samples excited with 514 nm are showed in **Figure S4**. The spectra were corrected to the Nd^{3+} concentration. The emissions at 917 nm, 1096 nm and 1381 nm are due to the Nd^{3+}:$^4F_{3/2} \rightarrow {}^4I_{9/2}$, $^4F_{3/2} \rightarrow {}^4I_{11/2}$ and $^4F_{3/2} \rightarrow {}^4I_{13/2}$ transitions. Pulsed laser excitation at 532 nm was used to estimate the average decay times (τ) and are shown in the legend.

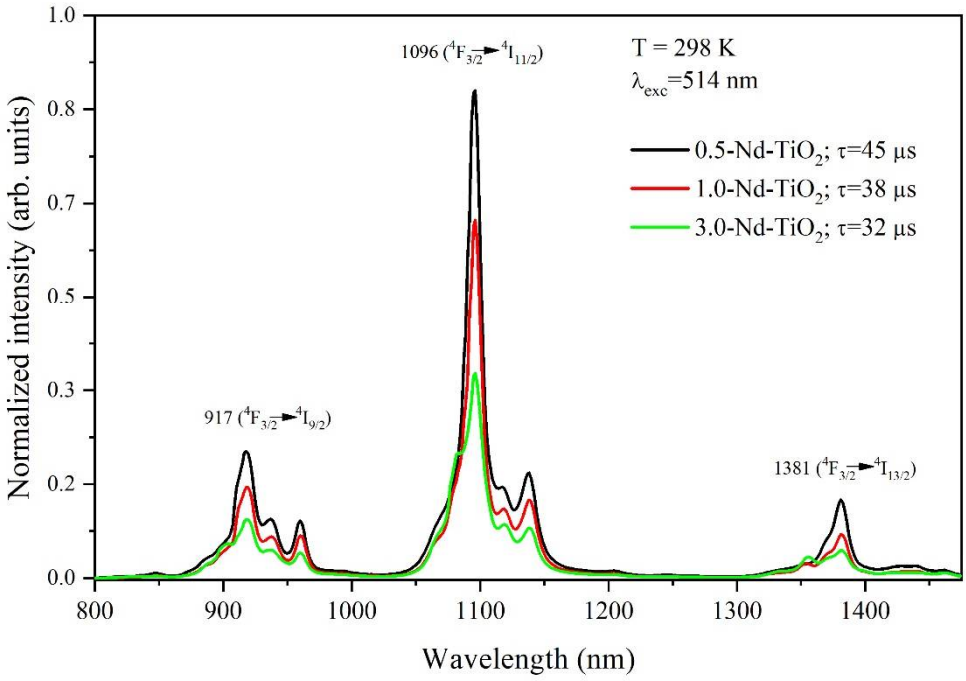

Figure S4. Normalized infrared photoluminescence spectra of *x*-Nd-TiO_2 (*x*=0.5, 1.0 and 3.0 wt%) under 514 nm excitation. The spectra were corrected to the Nd^{3+} concentration. The average decay times (τ) of each sample are shown in the legend.