Supporting Information

Heating-induced Abnormal Increase of Yb$^{3+}$ Excited State Lifetime and Its Potential Application in Lifetime Luminescence Nanothermometry

Zeliang Ji$^{a,b}$, Yao Cheng$^a$*, Xiangshui Cui$^a$, Hang Lin$^a$, Ju Xu$^a$, Yuansheng Wang$^a$*

a CAS Key Laboratory of Design and Assembly of Functional Nanostructures, and Fujian Provincial Key Laboratory of Nanomaterials, Fujian Institute of Research on the Structure of Matter, Chinese Academy of Sciences, Fuzhou, Fujian, 350002, PR China

b College of Chemistry and Materials Science, Fujian Normal University, Fuzhou, Fujian, 350007, PR China

Correspondence: chengyao@fjirsm.ac.cn; yswang@fjirsm.ac.cn
Fig. S1. (a) Temperature-dependent XRD patterns of NaGdF4:Yb3+/Nd3+ (20/1 mol %) sample, and (b) local amplification of the peaks indexed by (110), (201) and (102), respectively.

Fig. S2. Excitation power dependent fluorescence decay curve of the Yb$^{3+}$ emission at room temperature.

To prove the insensitivity of the lifetime for Yb$^{3+}$ emission on the excitation power, we performed the excitation-dependent lifetime measurements, as shown in the Fig. S2. Four different laser excitation powers were applied, with $P_1$/$P_2$/$P_3$/$P_4$ corresponding to 0.06W/0.55W/1.01W/1.42W, respectively. The calculated lifetime increases very slightly with the elevated excitation power. Although the luminescence lifetime is indeed excitation power dependent, the influence is tiny within the above-mentioned power region. Therefore, in our opinion, the luminescence lifetime for the present case can be regarded as insensitive to excitation power variation within the applied excitation power region.