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SUPPORTING INFORMATION

Intentional modification of the optical spectral response and relative sensitivity of luminescent thermometers based on Fe^{3+},Cr^{3+},Nd^{3+} co-doped garnets nanocrystals by the crystal field strength optimization

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KEYWORDS: iron; neodymium; garnets nanocrystals; luminescence; luminescent thermometry; crystal field strength

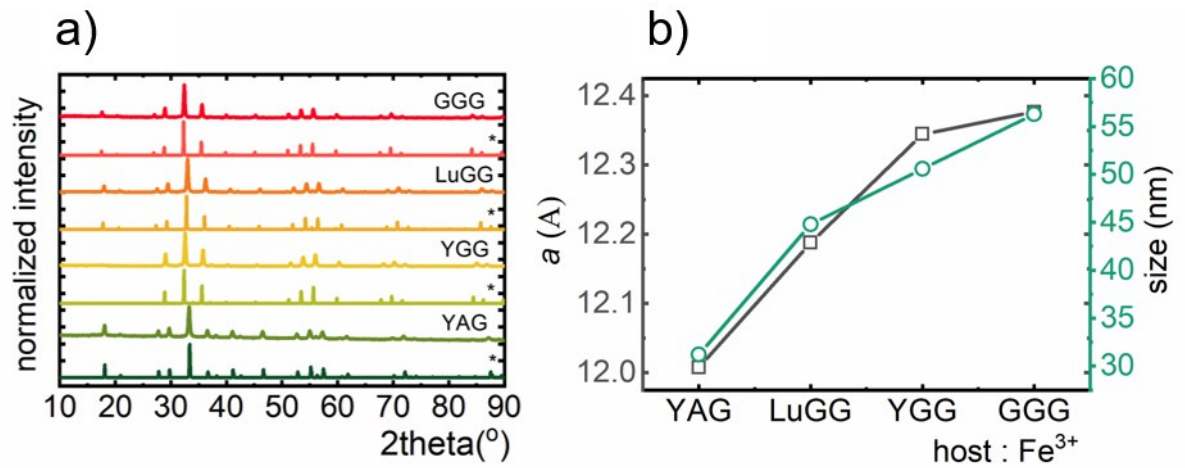

Fig. S1 XRD patterns of synthesized garnets co-doped with Fe^{3+}, Cr^{3+} and Nd^{3+}– a); the cell parameter and grain size depending on the crystal composition - b)

Table S1. The molar Fe^{3+} to Cr^{3+} ions amount measured using ICP technique.

Host	Fe^{3+} [mol]	Cr^{3+} [mol]
YGG	0.008845881	0.001669741
YAG	0.007413245	0.001047195
LuGG	0.01055591	0.001962414
GGG	0.006568147	0.001092928

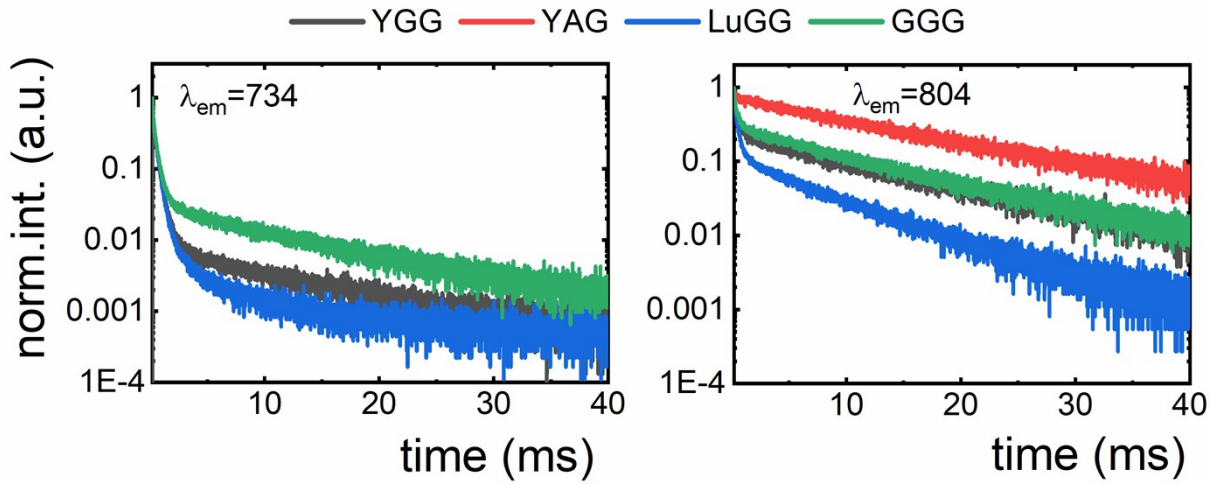

Fig. S2. Decay profile of the emission of Fe^{3+} - doped YAG, YGG, LuGG and GGG nanocrystals at 734 nm and 804 nm.

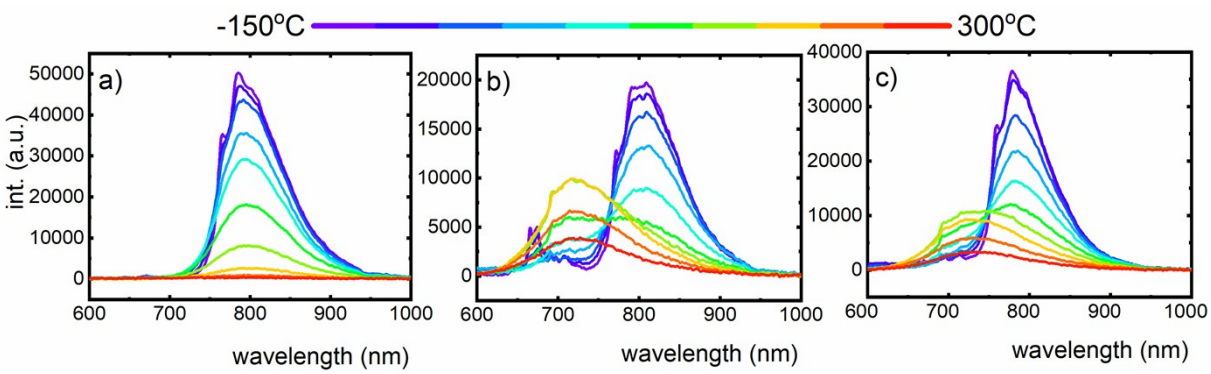

Fig. S3. The influence of temperature of the emission spectra of YAG:Fe^{3+}, Cr^{3+}, YGG:Fe^{3+}, Cr^{3+} and GGG:Fe^{3+}, Cr^{3+} nanocrystals –a), b), c), respectively.

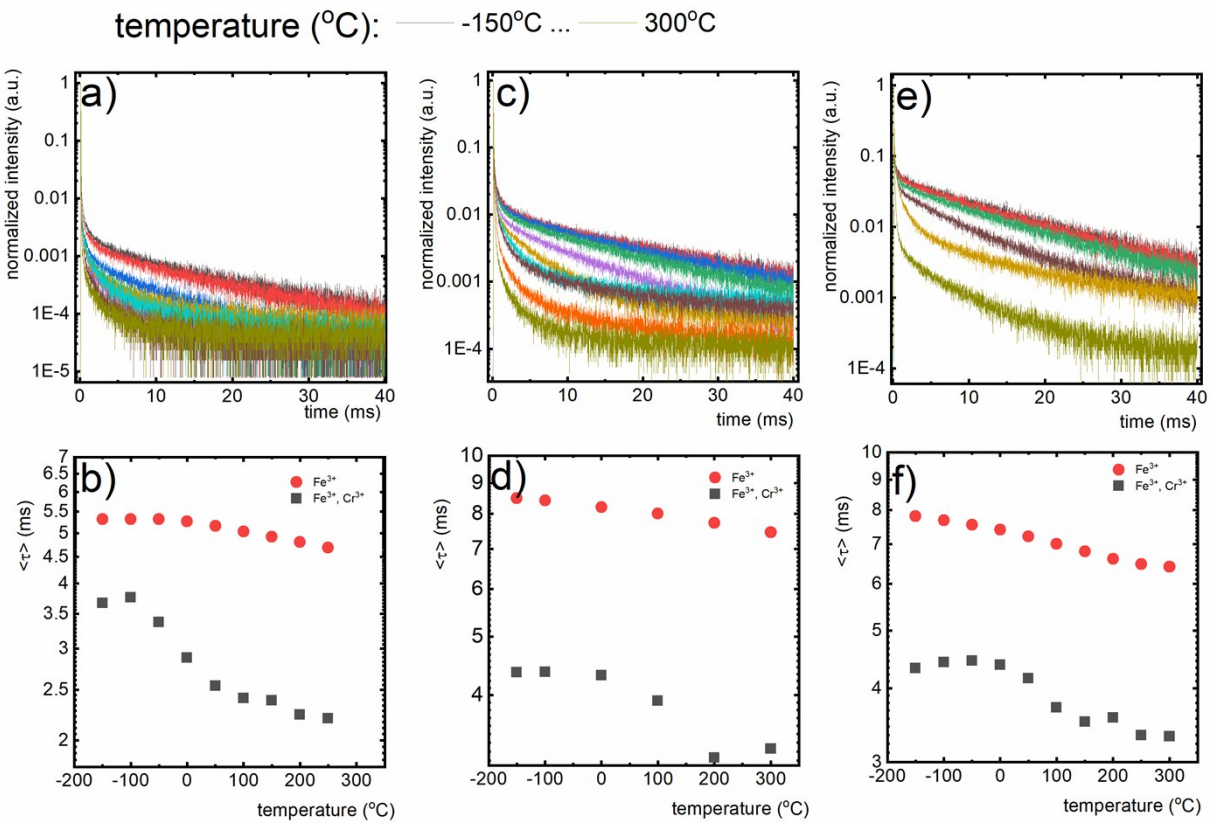

Figure S 4. Luminescence decay profiles of Fe^{3+} ions in the LuGG:Fe^{3+},Cr^{3+} -a), GGG:Fe^{3+},Cr^{3+}-c) YGG:Fe^{3+},Cr^{3+} -YGG e) measured as a function of temperature and the influence of the temperature on the average decay times for Fe^{3+} doped and Fe^{3+},Cr^{3+} co-doped systems: LuGG:Fe^{3+},Cr^{3+} -b), GGG:Fe^{3+},Cr^{3+}-d) YGG:Fe^{3+},Cr^{3+} -YGG f).

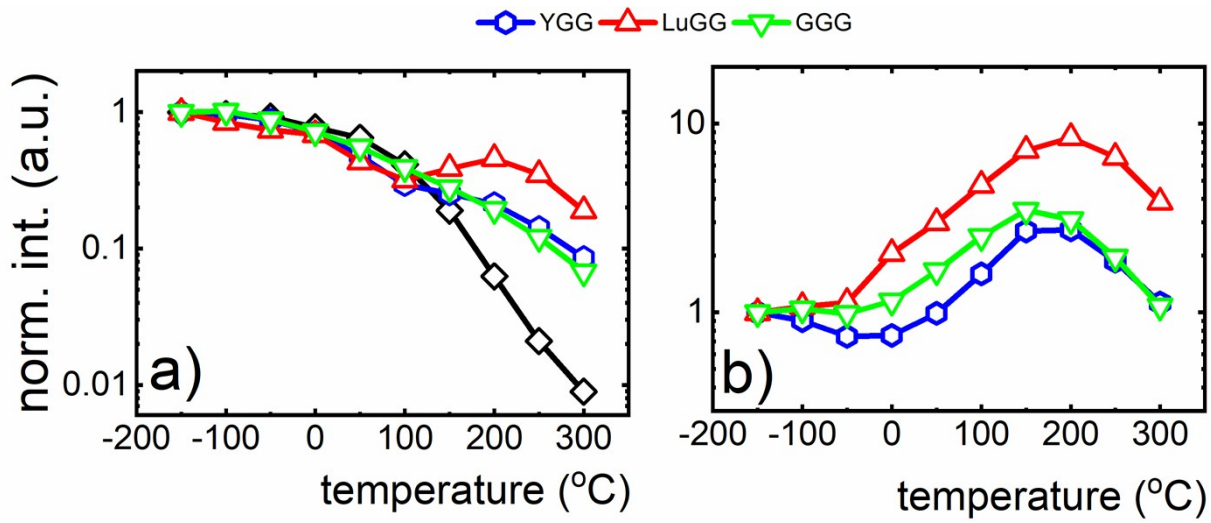

Fig. S5. Thermal dependence of $^4T_2 \rightarrow {}^6A_1$ (Fe^{3+})– a) and $^4T_2 \rightarrow {}^4A_2$ (Cr^{3+}) – b) integrated emission intensity.

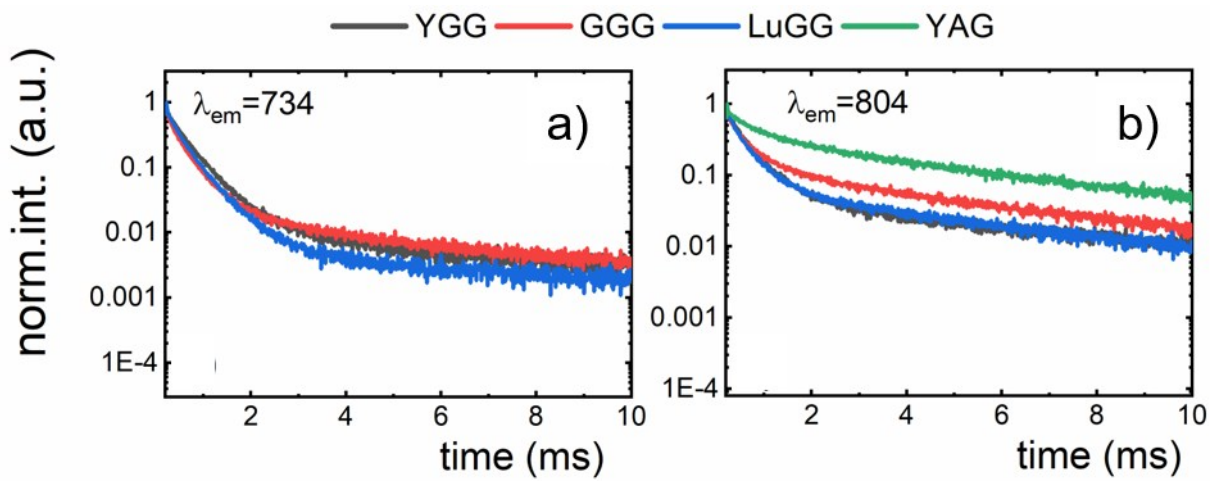

Fig. S6. Decay profile of the emission of $^4T_2$ (Cr^{3+}) –a) and $^4T_2$ (Fe^{3+})-b) states in Fe^{3+}, Cr^{3+} Nd^{3+} - codoped YAG, YGG, LuGG and GGG nanocrystals.

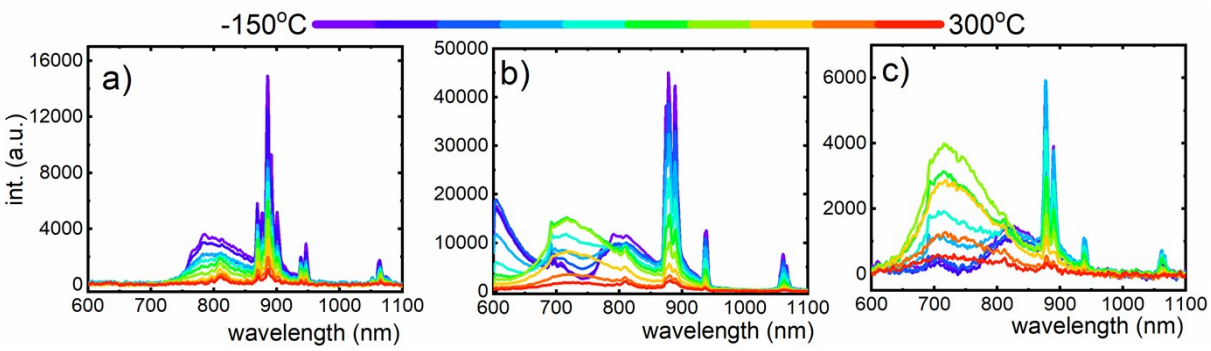

Fig. S7. The influence of temperature of the emission spectra of YAG:Fe^{3+}, Cr^{3+}, Nd^{3+} , YGG:Fe^{3+}, Cr^{3+}, Nd^{3+} and LuGG:Fe^{3+}, Cr^{3+}, Nd^{3+} nanocrystals –a), b), c), respectively.

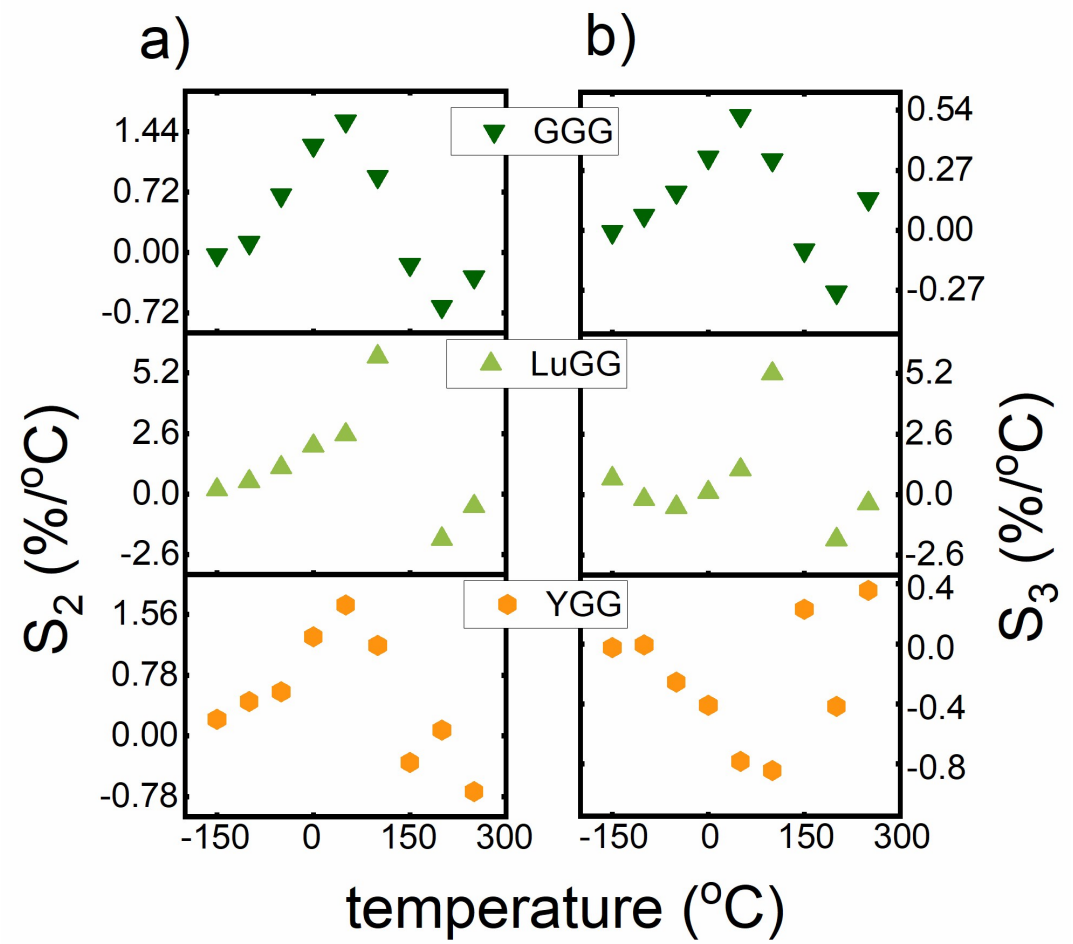

Fig. S8. The thermal dependence of S_2 –a) and S_3 –b) relatives sensitivities of Cr^{3+}, Fe^{3+}, Nd^{3+}-co-doped YGG, LuGG and GGG luminescent nanothermometers.

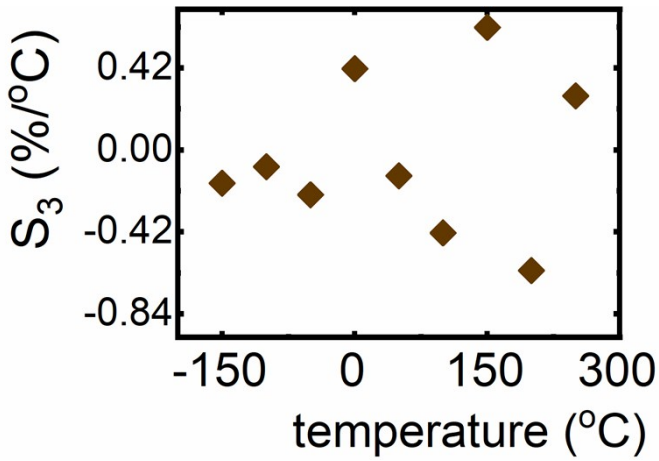

Fig. S9. The thermal dependence of S_3 relatives sensitivities of Cr^{3+}, Fe^{3+}, Nd^{3+}-co-doped YAG luminescent nanothermometers.

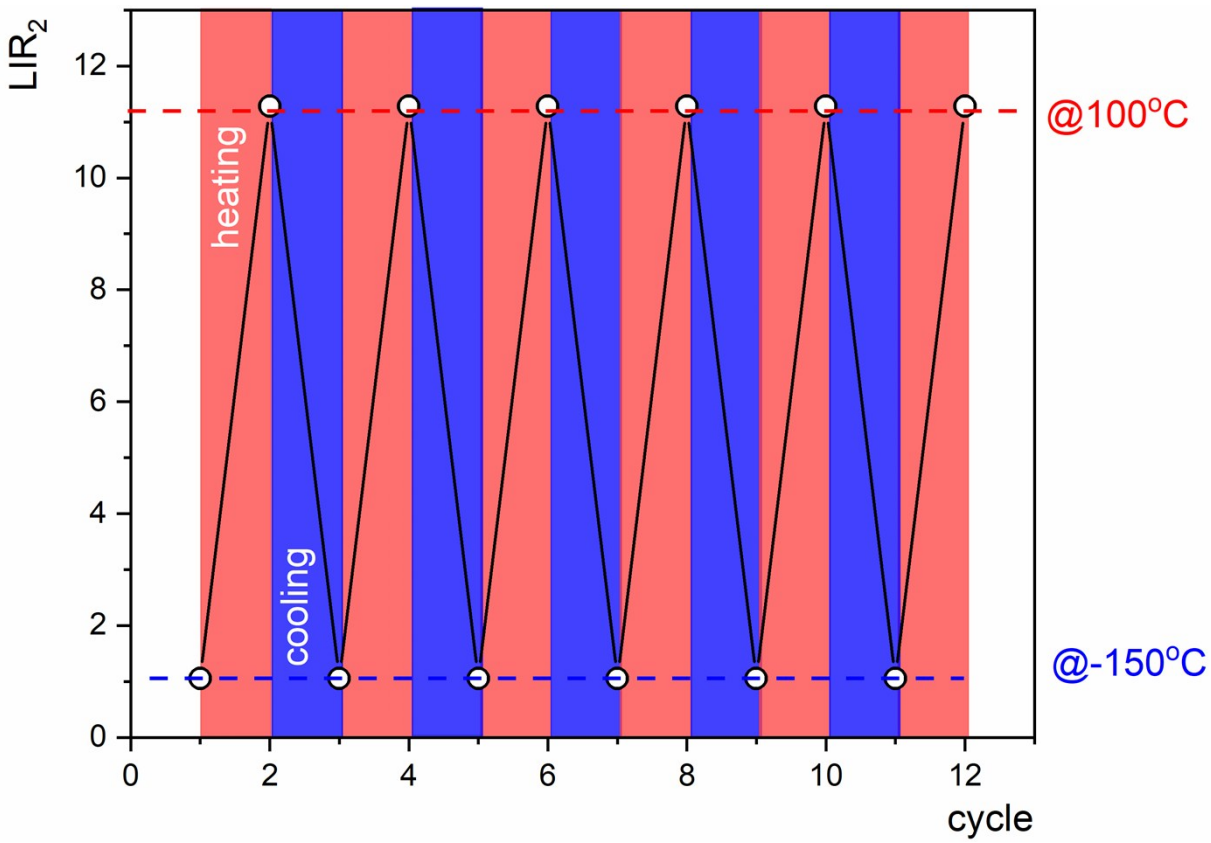

Figure S10 The verification of the thermal repeatability of LIR_2 for GGG:Fe^{3+}, Nd^{3+} within heating-cooling cycles