SUPPLEMENTARY INFORMATION

LiGd$_x$Y$_{1-x}$F$_4$ and Eu^{3+}:LiGdF$_4$ microparticles as potential materials for optical temperature sensing

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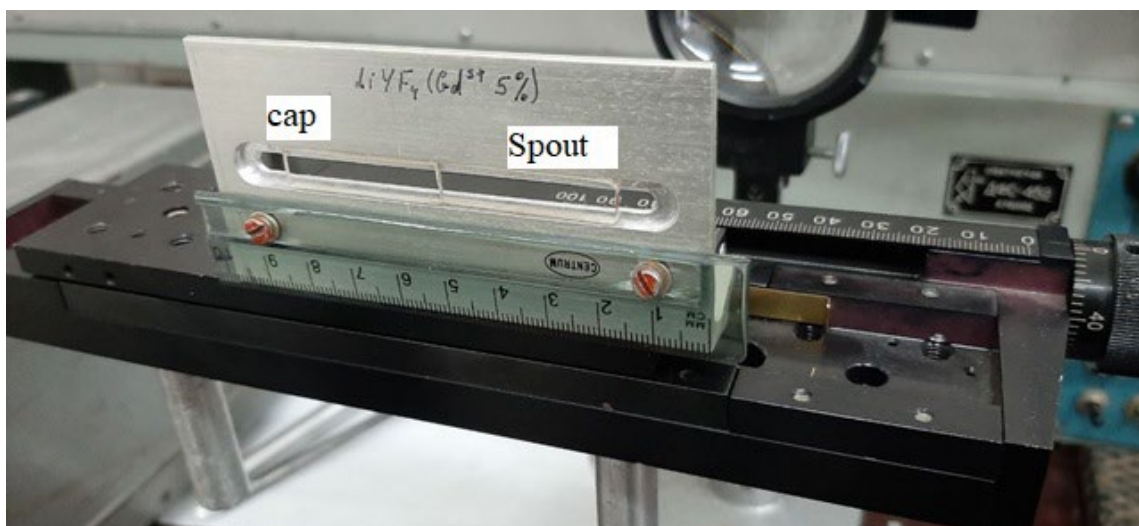
Figure S1. The photo of the Gd^{3+} (5 at.%):LiYF$_4$ sample for the determination of the distribution coefficient

Table S1. Lattice parameters of

LiGd$_x$Y$_{1-x}$F$_4$

x=0.05 a=5.174 A c=10.76 A

x=0.3 a=5.192 A c=10.84 A

x=0.7 a=5.219 A c=10.92 A

x=1 a=5.233 A c=10.99 A

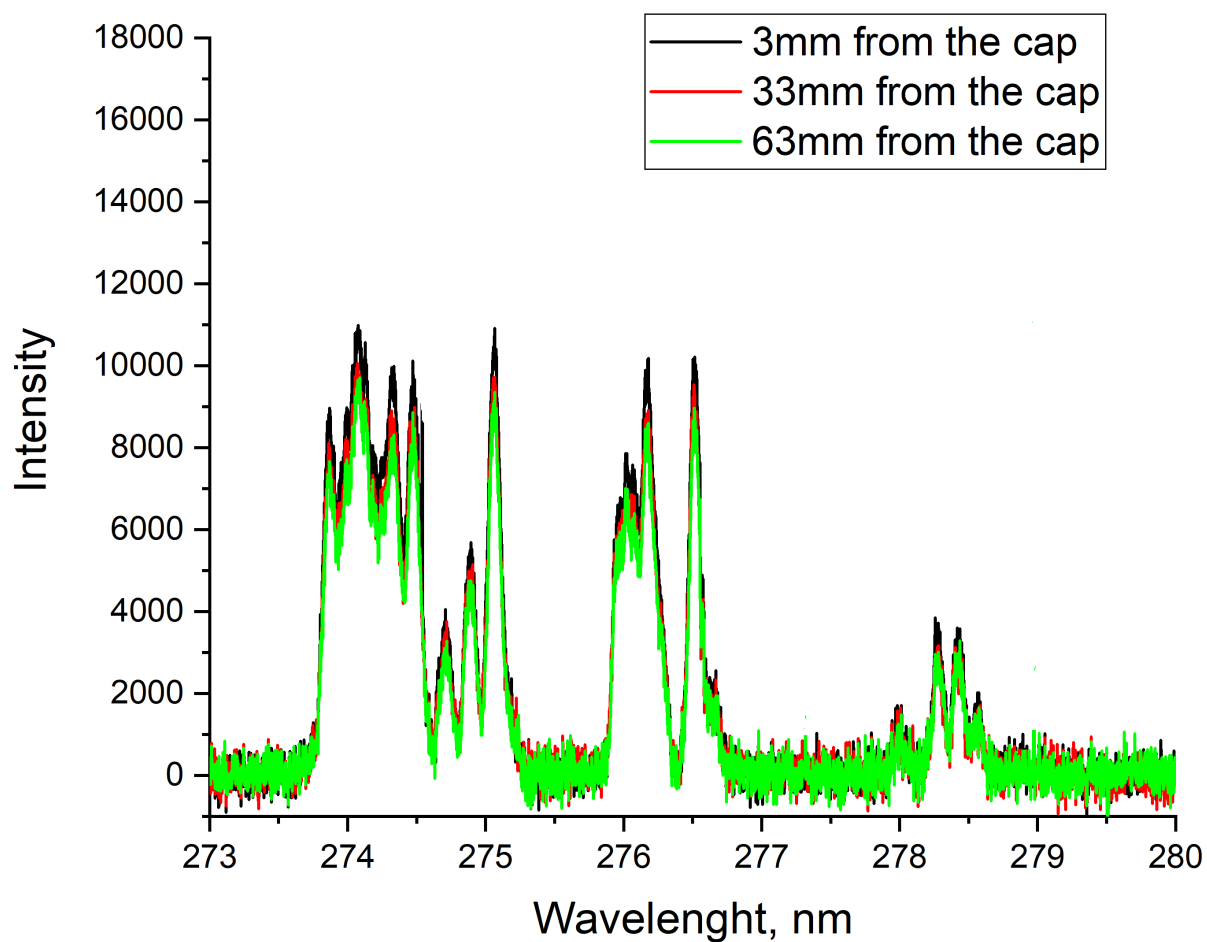**Figure S2**. Absorption spectra of the LiGd$_x$Y$_{1-x}$F$_4$ sample (x=0.05) at different distances from the crystal cap
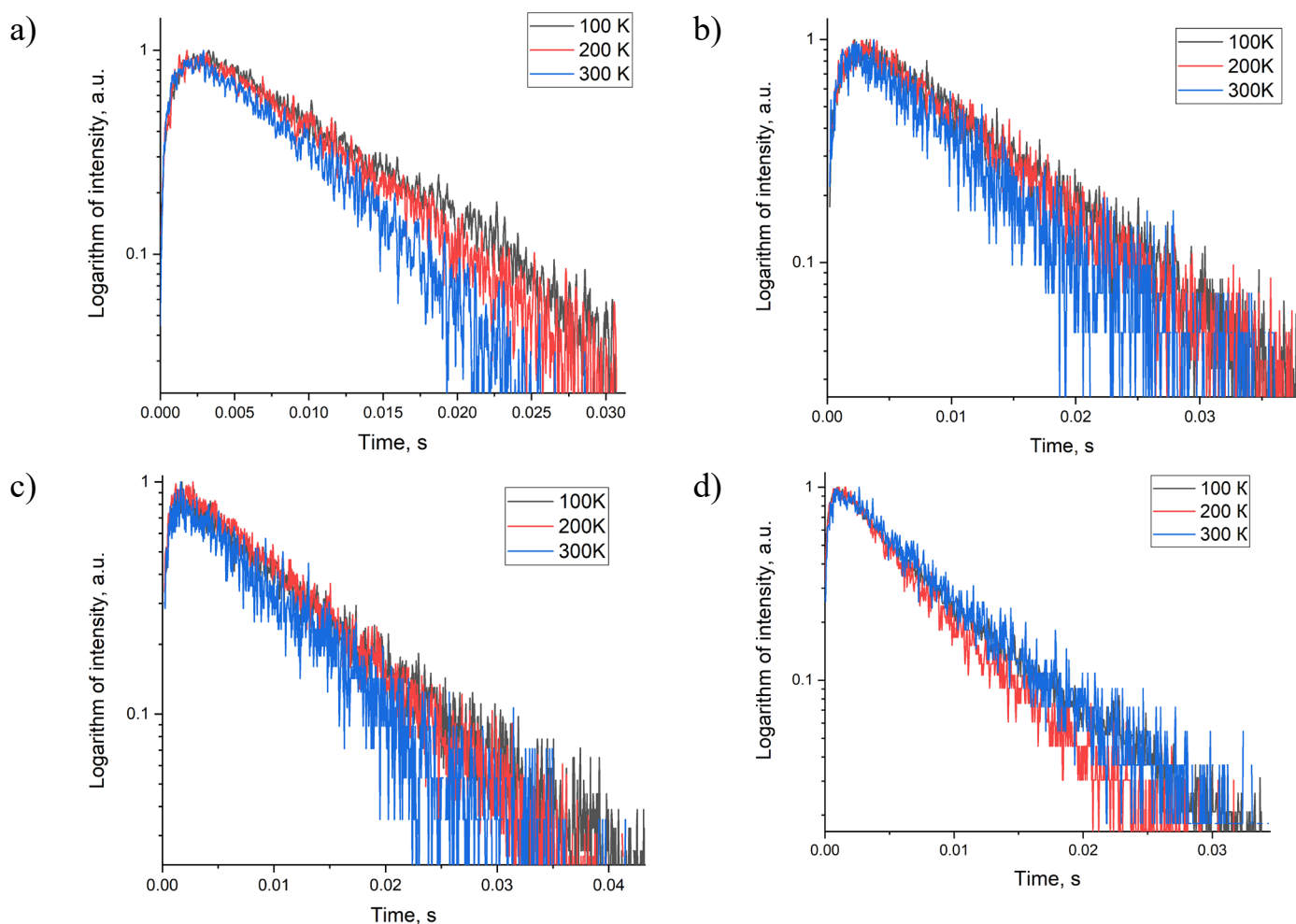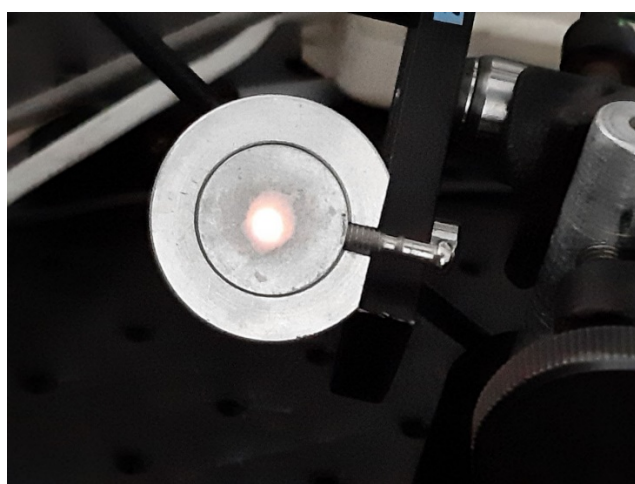
Figure S3. Kinetics of luminescence of: a) $LiGd_xY_{1-x}F_4$ (x=0.05), b) $LiGd_xY_{1-x}F_4$ (x=0.3), c) $LiGd_xY_{1-x}F_4$ (x=0.7) and d) $LiGd_xY_{1-x}F_4$ (x=1.0) at the 312 nm wavelength ($^6P_{7/2}$-$^8S_{7/2}$) at a temperature 100 K (black), 200 K (red), 300 K (blue)

Figure S4. The pictures of both $LiGdF_4$: Eu^{3+} (0.1 %) (a) and $LiYF_4$: Eu^{3+} (0.1 %) (b)under 274 nm excitation. For the $LiGdF_4$: Eu^{3+} (0.1 %), the characteristic red luminescence of Eu^{3+} is clearly observed. The $LiYF_4$: Eu^{3+} (0.1 %) does not show this emission

The Eu^{3+}:LiYF$_4$ growth procedure:

Powders of LiF (99.999% purity, Lanhit, Russia), YF$_3$ (99.999% purity, Lanhit, Russia), EuF$_3$ (99.999% purity, Lanhit, Russia) fluorides were used as initial materials. The YF$_3$, and EuF$_3$ components were previously dried for 5 h at 100°C in vacuum. Crystal growth process was carried out in a vacuum (~10^{-5}–10^{-6} mbar) in a graphite crucible on a seed. The crystals were grown from the melt by vertical technique of Bridgman–Stockbarger. The temperature gradient at the solid-liquid interface was in the 85–100 °C/cm range.
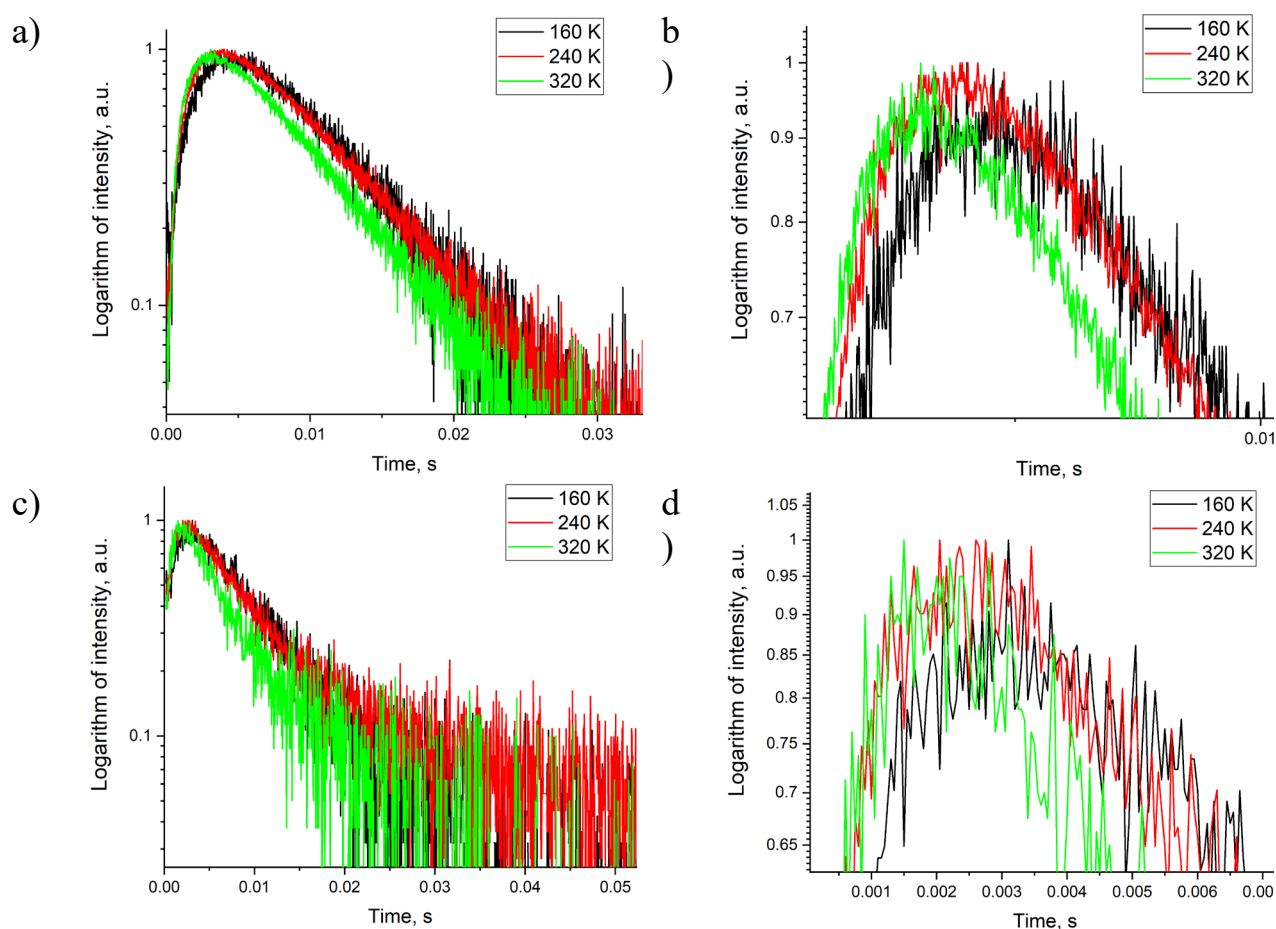

Figure S5. Kinetics of luminescence of LiGdF$_4$: Eu^{3+} (1 at.%) in the different wavelength: a) kinetics of luminescence decay in the 610.7nm, b) kinetics of luminescence rise in the 610.7nm, c) kinetics of luminescence decay in the 620.8nm and d) kinetics of luminescence rise in the 620.8 nm at a temperature 160 K (black), 240 K (red), 320 K (green)