Supporting Information for:

NIR Emission of Lanthanides for Ultrasensitive Luminescence Manometry - Er^{3+}-activated Optical Sensor of High Pressure

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KEYWORDS: Optical manometry; luminescent pressure sensors; NIR sensor; high-pressure gauge; optical materials; Er^{3+} and Yb^{3+} ions

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Table S1. Determined fitting parameters by using a linear fit function, i.e., $y = Ax + B$, where y is the peak centroid (in nm), A is a slope of the fitting line (spectral shift rate in pressure), B is an intercept, x is the pressure value (in GPa), and R^2 is a correlation coefficient.

Initial spectral position of the Stark sub-level (nm)	***A***	***B***	R^2
1502	-0.740 ± 0.005	1501.898 ± 0.020	0.999
1521	0.062 ± 0.005	1520.520 ± 0.019	0.935
1531	0.105 ± 0.006	1530.636 ± 0.016	0.967
1541	0.139 ± 0.003	1540.593 ± 0.011	0.995
1554	0.396 ± 0.032	1554.001 ± 0.095	0.933
1596	1.282 ± 0.015	1596.471 ± 0.045	0.998
1605	1.766 ± 0.023	1604.674 ± 0.068	0.998

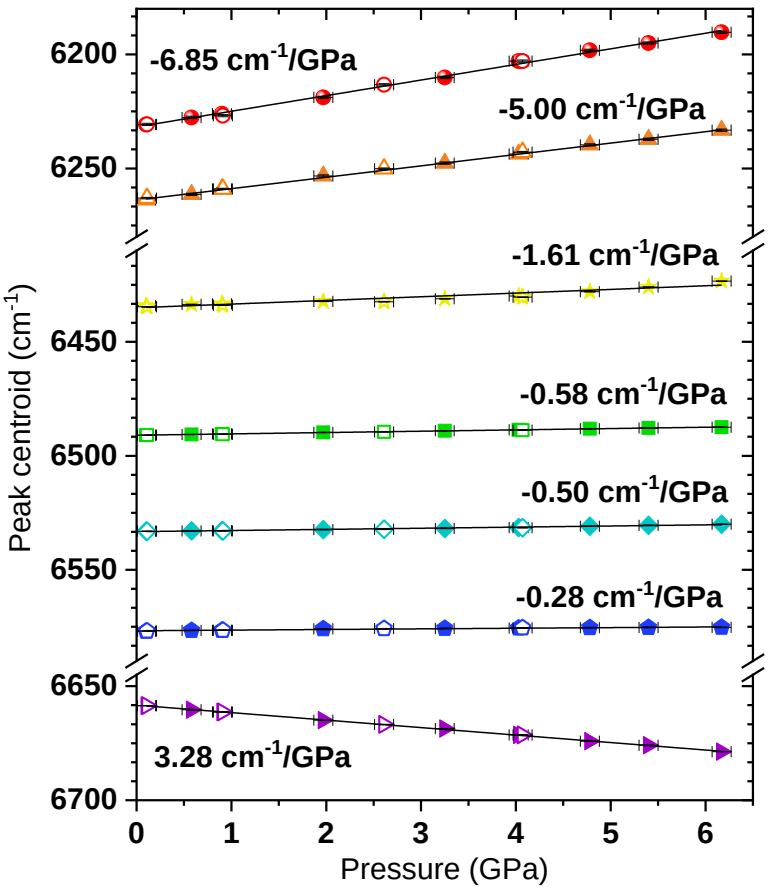

Figure S1. Determined energies of the peak centroids for the seven Stark sub-levels, corresponding to the $^4I_{13/2} \rightarrow {}^4I_{15/2}$ transition of Er^{3+} as a function of pressure; the continues lines represent the applied linear fits; the filled and empty symbols are the data points determined based on the measurements performed during the compression and decompression cycles, respectively.

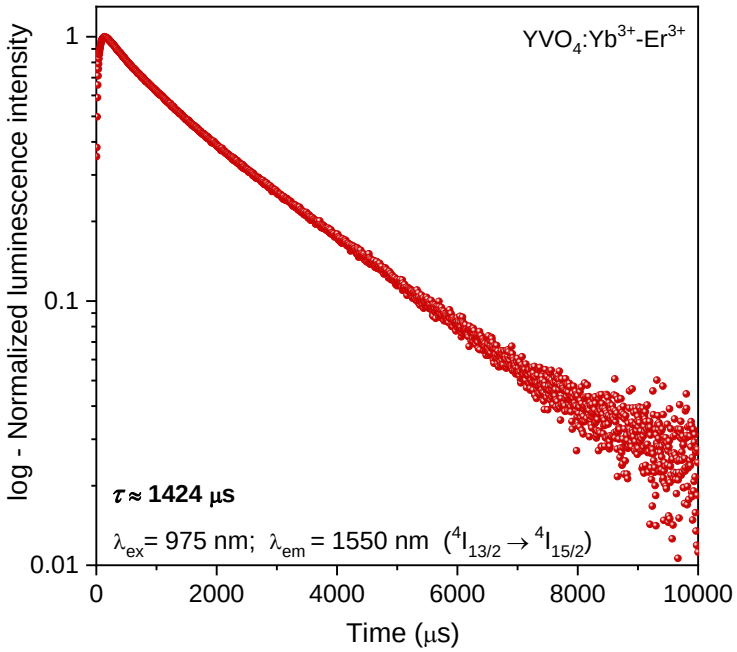

Figure S2. Normalized luminescence decay curve for the YVO_4:Yb^{3+}-Er^{3+} material (λ_{ex} = 975 nm; λ_{em} = 1550 nm), related to the $^4I_{13/2} \rightarrow {}^4I_{15/2}$ transition of Er^{3+}.

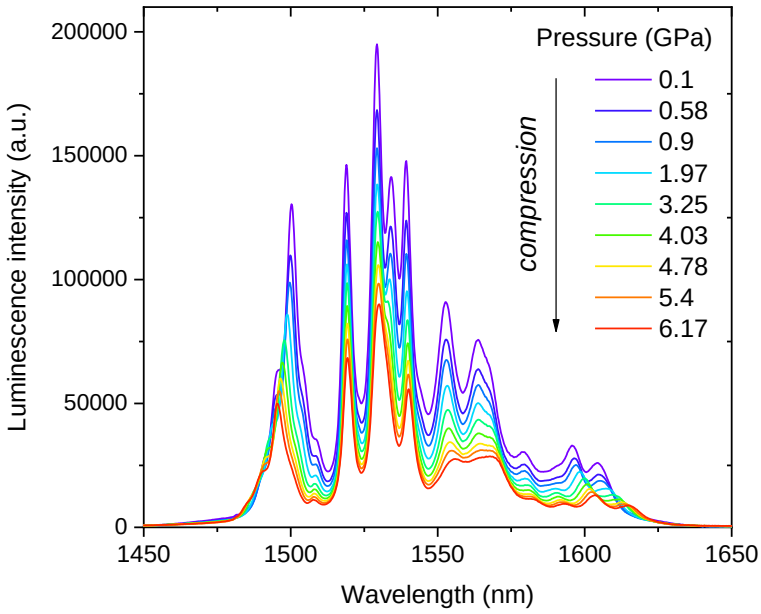

Figure S3. NIR emission spectra (non-normalized) of the YVO_4:Yb^{3+}-Er^{3+} material (λ_{ex} = 975 nm), recorded with increasing pressure values (compression cycle), presenting $^4I_{13/2} \rightarrow {}^4I_{15/2}$ transition of Er^{3+}.

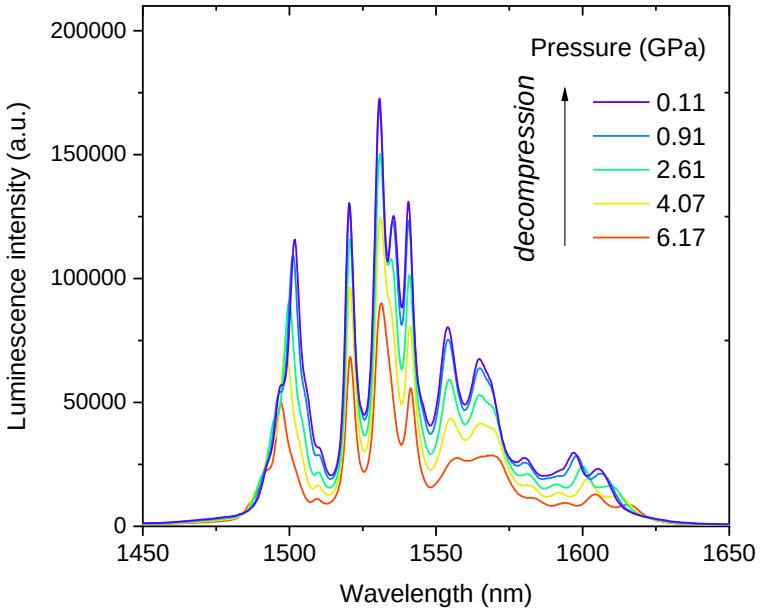

Figure S4. NIR emission spectra (non-normalized) of the YVO_4:Yb^{3+}-Er^{3+} material (λ_{ex} = 975 nm), recorded with decreasing pressure values (decompression cycle), presenting $^4I_{13/2} \rightarrow {}^4I_{15/2}$ transition of Er^{3+}.

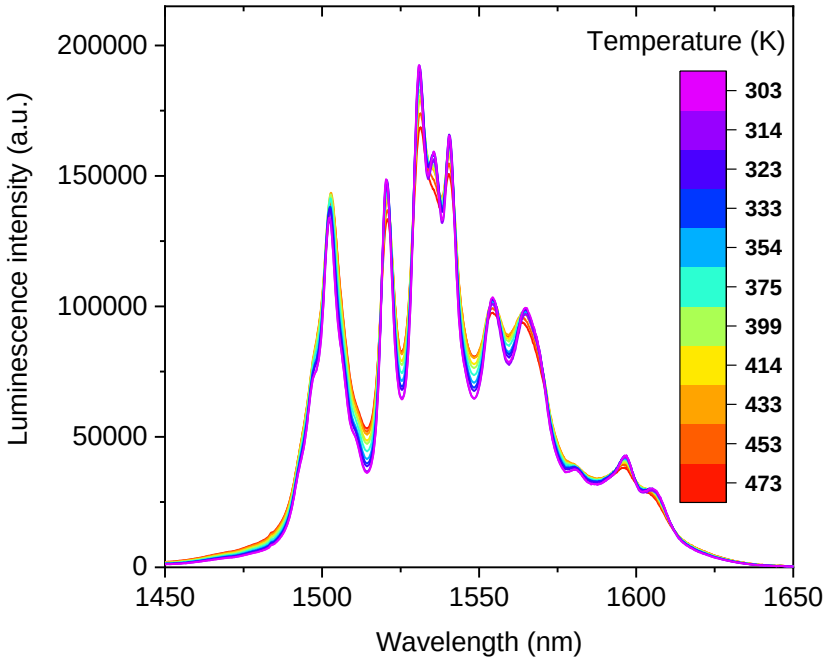

Figure S5. NIR emission spectra (non-normalized) of the YVO_4:Yb^{3+}-Er^{3+} material (λ_{ex} = 975 nm), recorded as a function of temperature, presenting $^4I_{13/2} \rightarrow {}^4I_{15/2}$ transition of Er^{3+}.

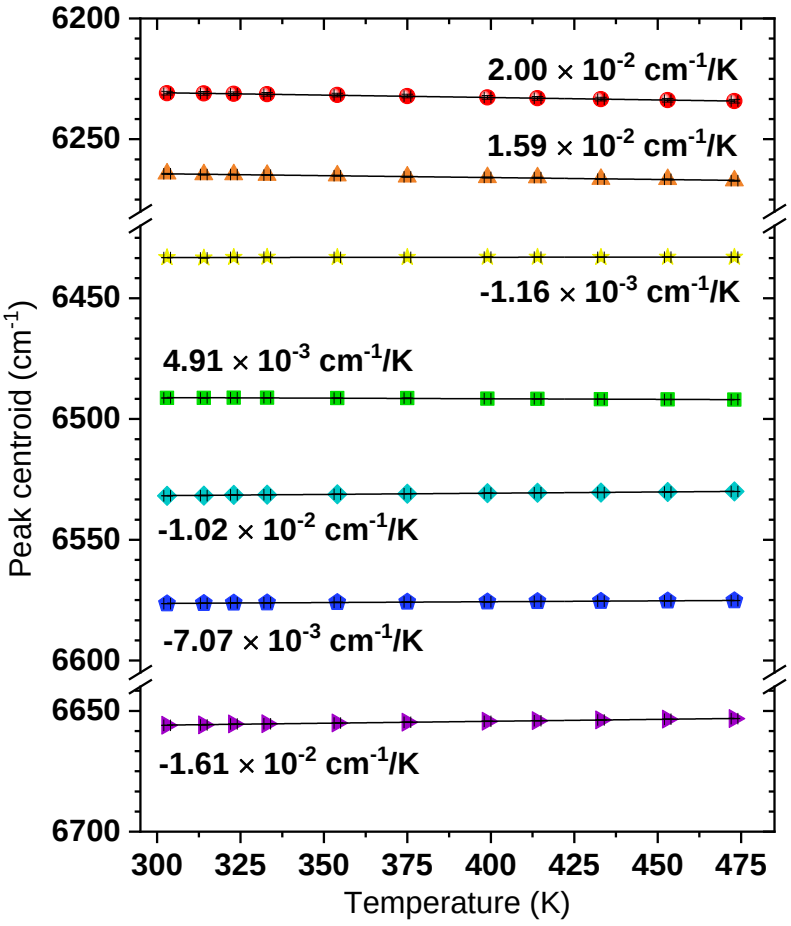

Figure S6. Determined energies of the peak centroids for the seven Stark sub-levels as a function of temperature, corresponding to the $^4I_{13/2} \rightarrow {}^4I_{15/2}$ transition of Er^{3+} in the YVO_4:Yb^{3+}-Er^{3+} material (λ_{ex} = 975 nm).

References

(1) Runowski M, Woźny P, Lis S, Lavín V, Martín IR. Optical Vacuum Sensor Based on Lanthanide Upconversion—Luminescence Thermometry as a Tool for Ultralow Pressure Sensing. Adv Mater Technol 2020;5:1901091. https://doi.org/10.1002/admt.201901091