

4. Photoluminescence

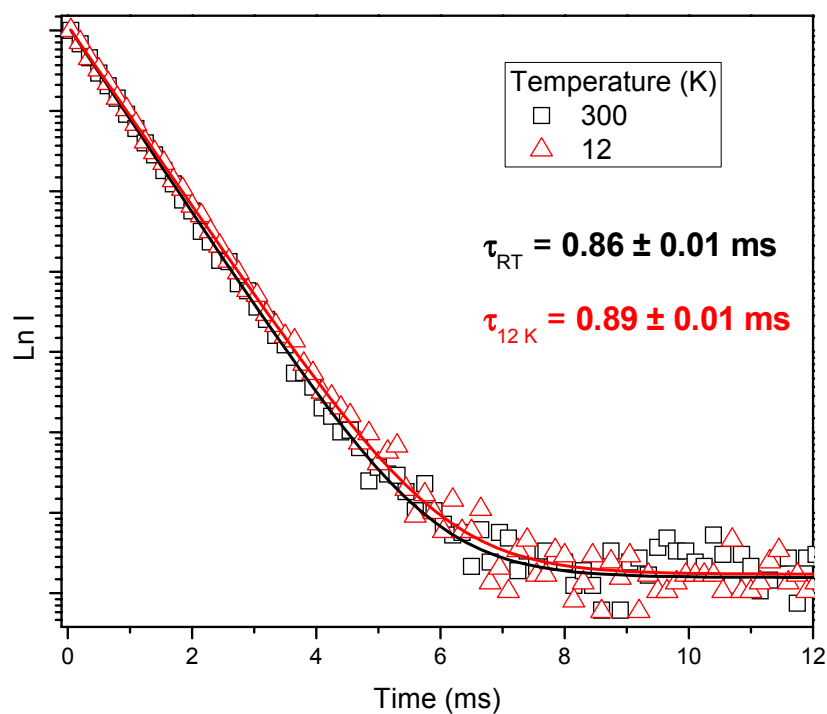


Figure S24 - 5D_0 decay curves of $[\text{Eu}(\text{H}_2\text{cmp})(\text{H}_2\text{O})]$ (**6**) recorded at room-temperature (**black**) and 12 K (**red**). The emission was monitored at 616.5 nm and the excitation was performed at 393 nm.

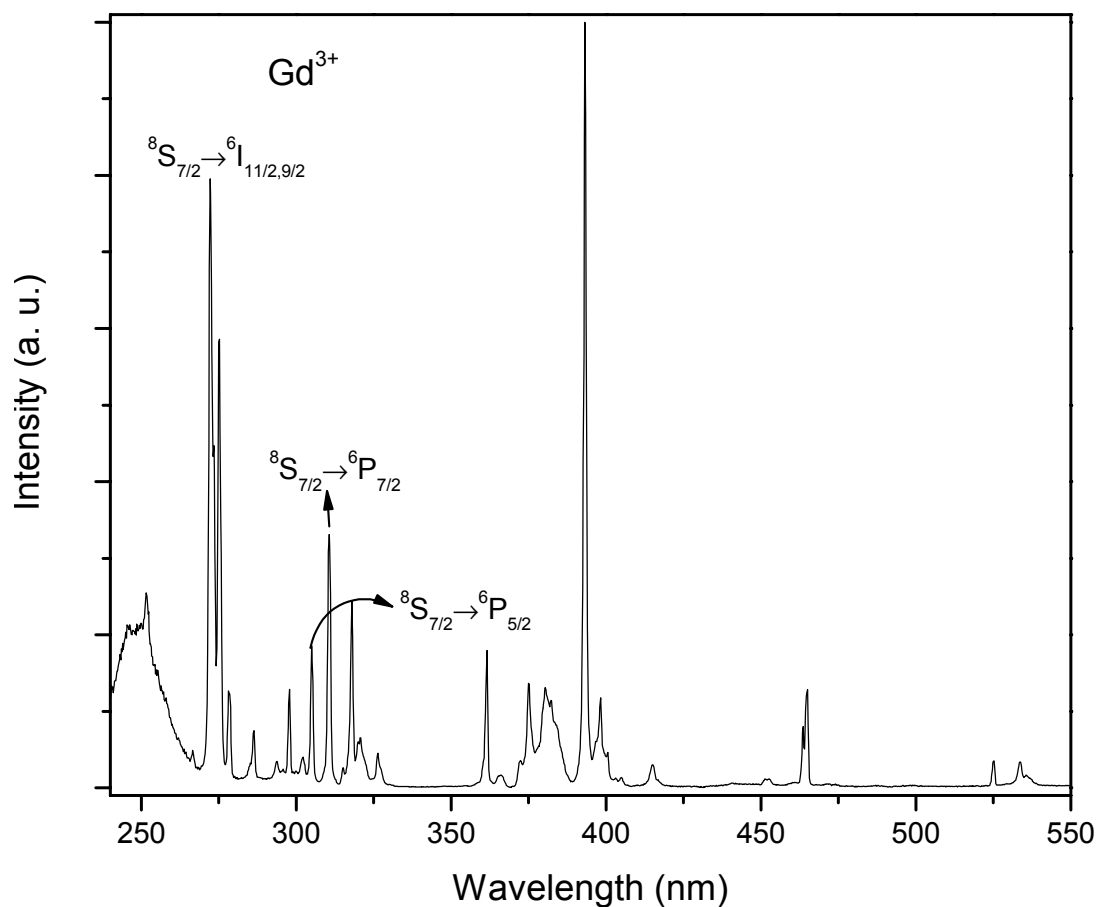


Figure S25 - Excitation spectrum of $[(Gd_{0.95}Eu_{0.05})(H_2cmp)(H_2O)]$ (**12**) recorded at room-temperature by monitoring the Eu^{3+} emission at 616.5 nm.

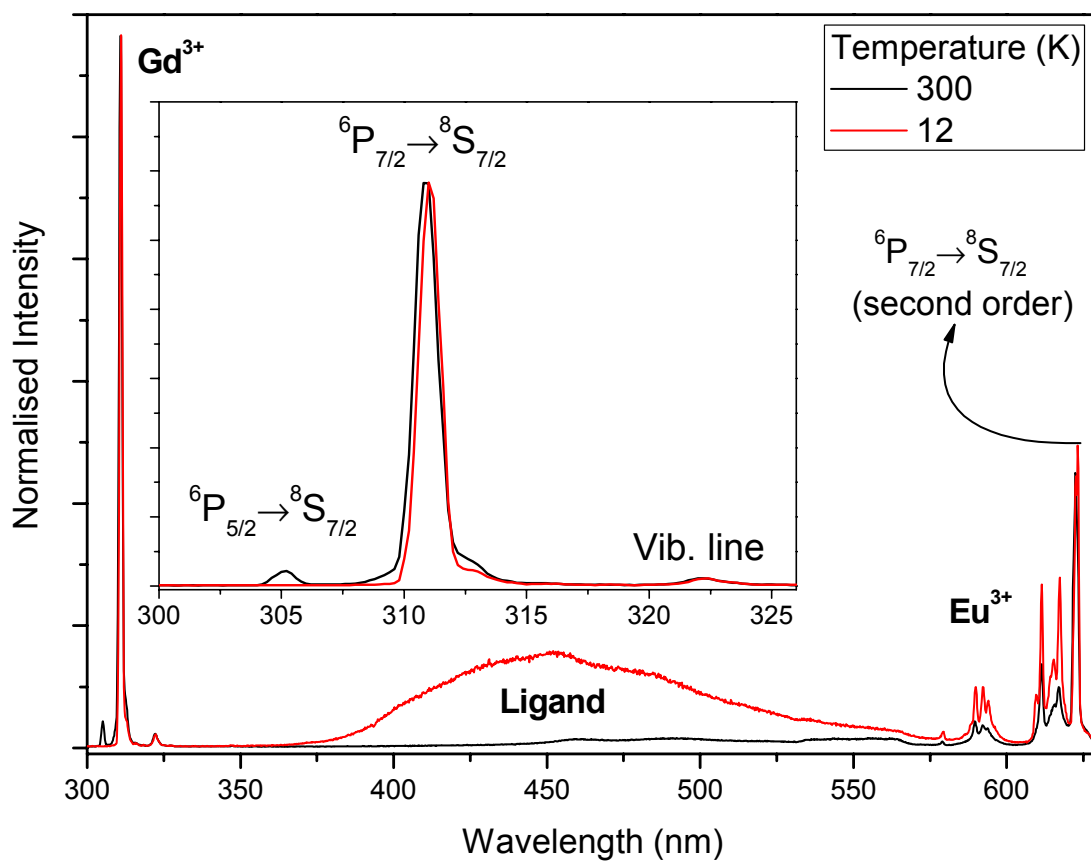


Figure S26 - Time-resolved emission spectra of $[(\text{Gd}_{0.95}\text{Eu}_{0.05})(\text{H}_2\text{cmp})(\text{H}_2\text{O})]$ (12), with an initial delay of 0.05 ms, at 300 (black line) and 12 K (red line) excited at 272 nm. The inset shows an expansion of the Gd³⁺ emission. Please note: the spectra were not corrected for the spectral response of the monochromators and the detector.

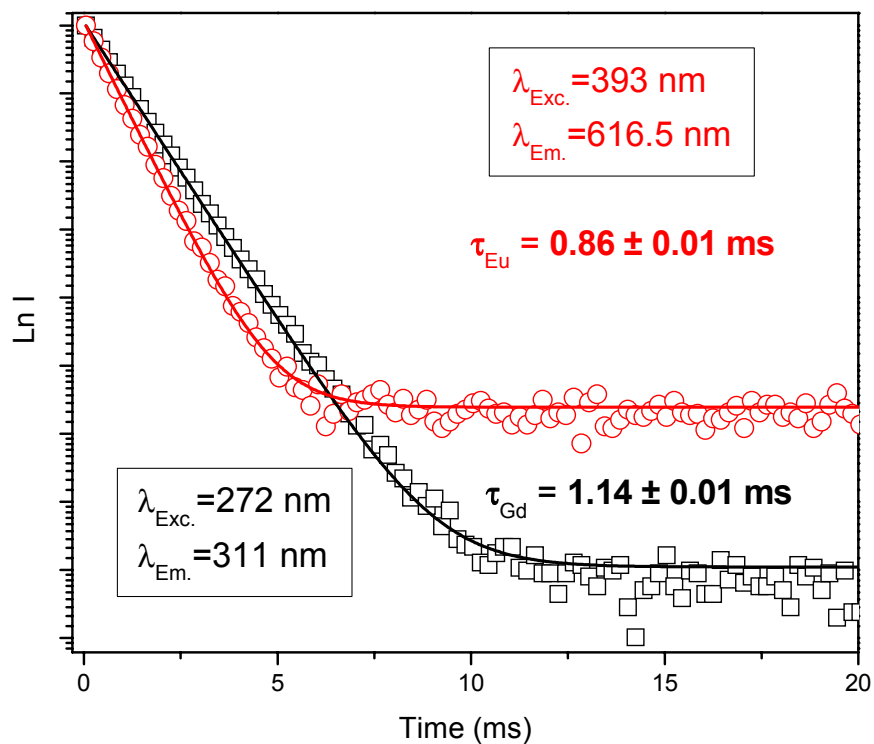


Figure S27 - Decay curves of [(Gd_{0.95}Eu_{0.05})(H₂cmp)(H₂O)] (**12**) recorded at room-temperature for the ⁵D₀ state of Eu³⁺ (**red**) and the ⁶P_{7/2} state of Gd³⁺ (**black**) emission.

5. Thermograms

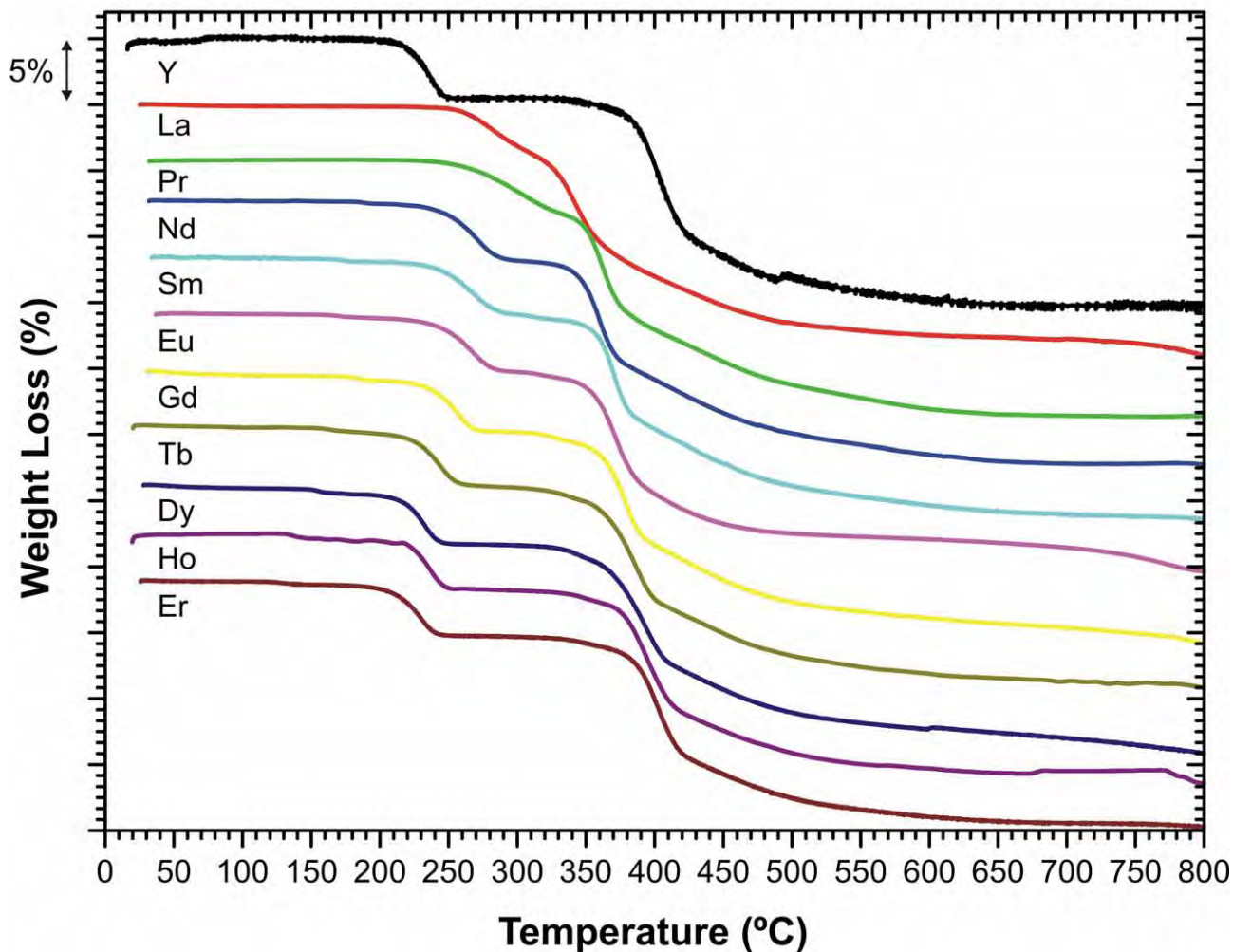


Figure S28 - Thermograms for $[\text{RE}(\text{H}_2\text{cmp})(\text{H}_2\text{O})]$ [where $\text{RE}^{3+} = \text{Y}^{3+}$ (1), La^{3+} (2), Pr^{3+} (3), Nd^{3+} (4), Sm^{3+} (5), Eu^{3+} (6), Gd^{3+} (7), Tb^{3+} (8), Dy^{3+} (9), Ho^{3+} (10) and Er^{3+} (11)].

6. Vibrational Spectroscopy

6.1 - FT-IR

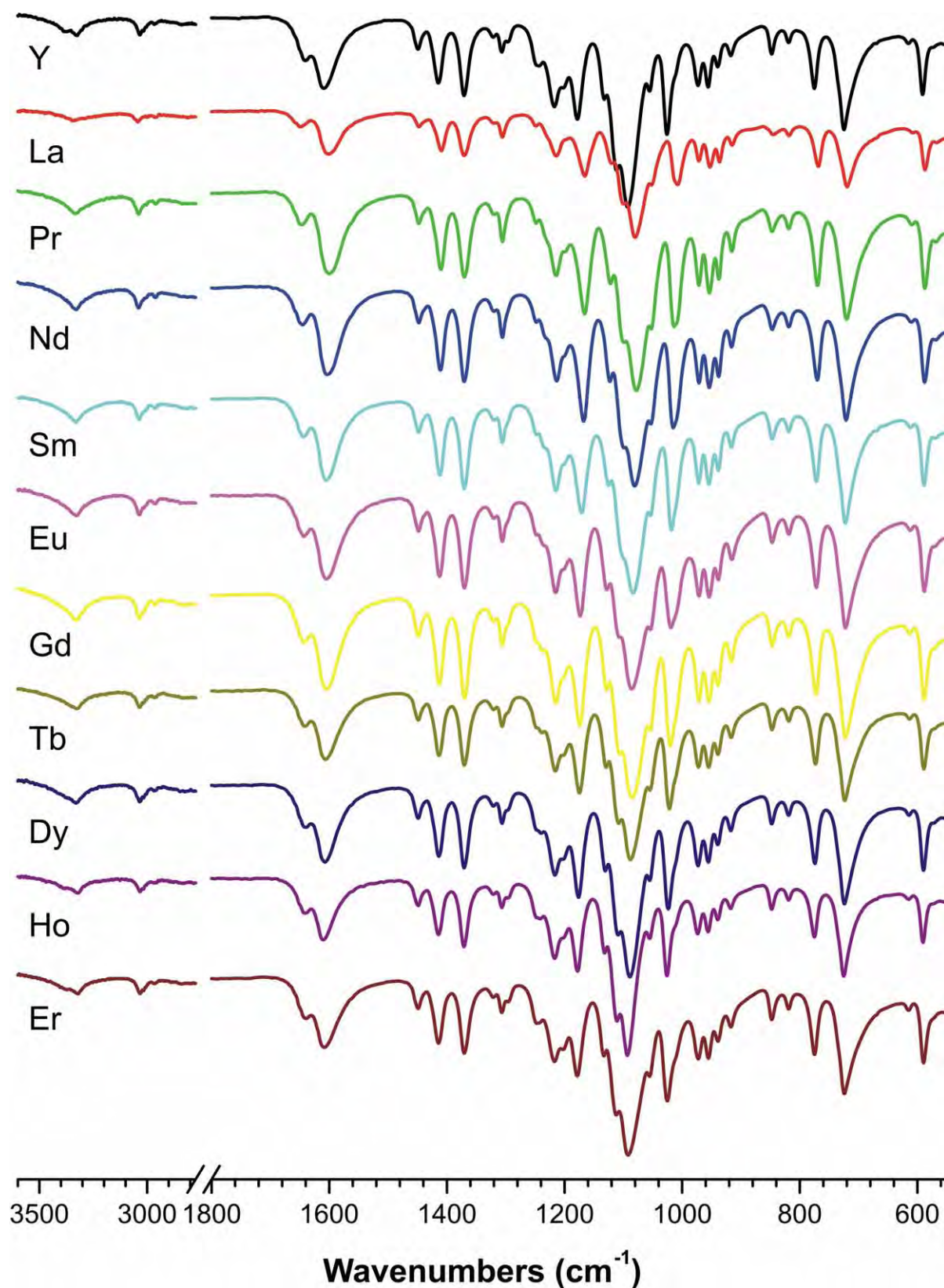


Figure S29 - ATR-FTIR for $[\text{RE}(\text{H}_2\text{cmp})(\text{H}_2\text{O})]$ [where RE³⁺ = Y³⁺ (1), La³⁺ (2), Pr³⁺ (3), Nd³⁺ (4), Sm³⁺ (5), Eu³⁺ (6), Gd³⁺ (7), Tb³⁺ (8), Dy³⁺ (9), Ho³⁺ (10) and Er³⁺ (11)].

6.2 - FT-Raman

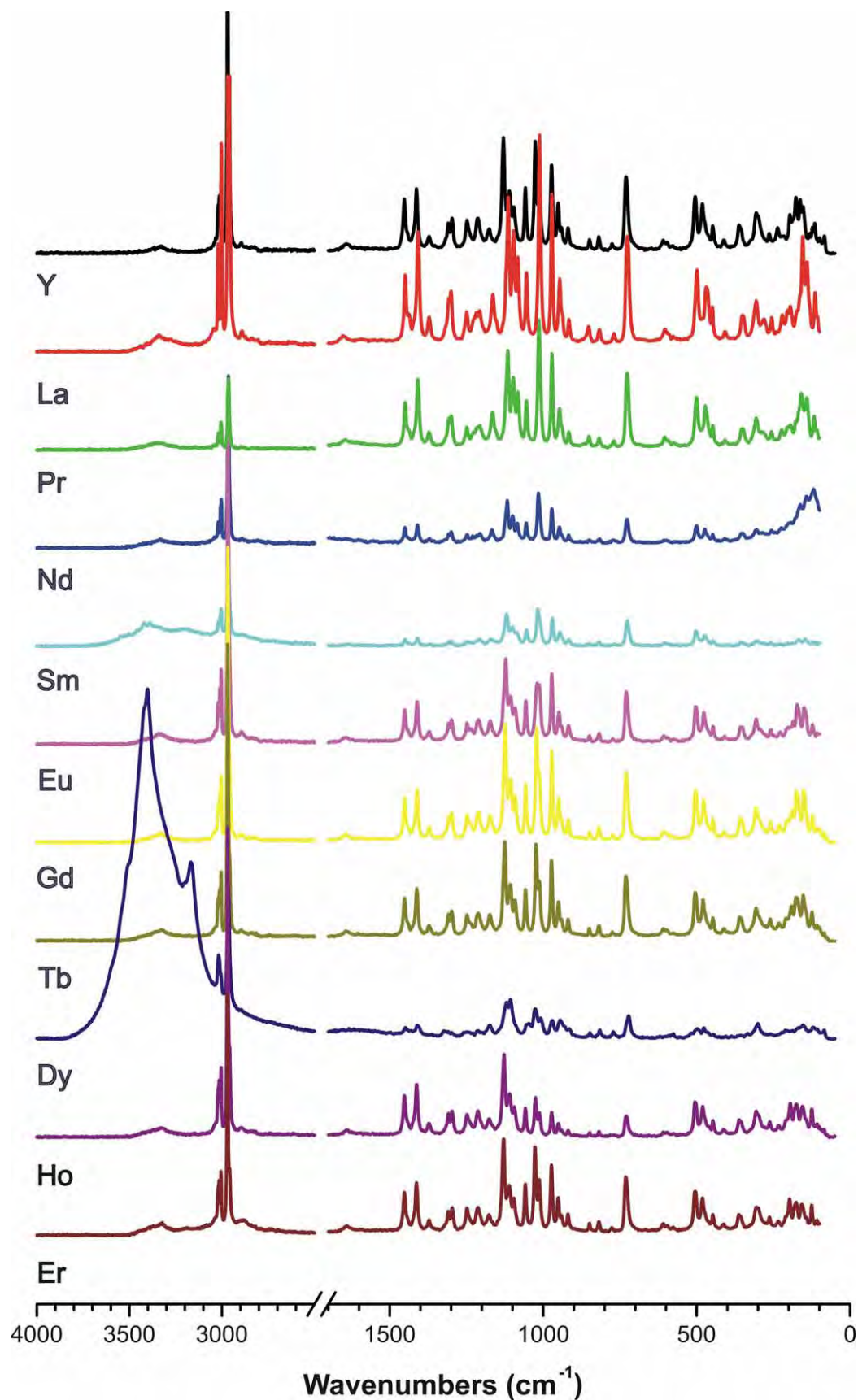


Figure S30 - FT-Raman for [RE(H₂cmp)(H₂O)] [where RE³⁺ = Y³⁺ (1), La³⁺ (2), Pr³⁺ (3), Nd³⁺ (4), Sm³⁺ (5), Eu³⁺ (6), Gd³⁺ (7), Tb³⁺ (8), Dy³⁺ (9), Ho³⁺ (10) and Er³⁺ (11)].

7. References

1. A. Boultif and D. Louer, *J. Appl. Crystallogr.*, 1991, **24**, 987-993.
2. D. Louer, in *Automatic Indexing: Procedures and Applications, Accuracy in Powder Diffraction II*, Gaithersburg, MD, USA, 1992, pp. pp. 92-104.