Supplementary information:

Table of content:

S1: Complementary characterization

S2: ORTEP drawing for: La-, Pr-, Nd- and Sm-RPF8 asymmetric units. (CCDC deposition numbers 728638-72641).

S3: PXRD for the RPF8 compounds, including Rietveld Refinements

S4: Details on the Magnetic measurements

S1: Elemental chemical analysis:

Table S1-1: The results of the elemental analyses for the RPF8 compounds compared with their calculated values.

		$[La(C_{14}H_6S_2O_8)(H_2O)_3]$	$[Pr(C_{14}H_6S_2O_8)(H_2O)_3]$	$[Nd(C_{14}H_6S_2O_8)(H_2O)_3]$
%	*Calc.*	30.04	29.93	29.76
C	*Exp.*	30.28	30.25	29.21
%	*Calc.*	2.17	2.16	2.15
H	*Exp.*	2.22	2.16	2.09

		$[Sm(C_{14}H_6S_2O_8)(H_2O)_3]$	$[Eu(C_{14}H_6S_2O_8)(H_2O)_3]$	$[Gd(C_{14}H_6S_2O_8)(H_2O)_3](H_2O)$
%	*Calc.*	29.44	29.35	28.20
C	*Exp.*	29.30	28.90	28.06
%	*Calc.*	2.12	2.12	2.35
H	*Exp.*	2.11	2.09	2.08

		$[Tb(C_{14}H_6S_2O_8)(H_2O)_3](H_2O)_3$	$[Dy(C_{14}H_6S_2O_8)(H_2O)_3](H_2O)_3$	$[Ho(C_{14}H_6S_2O_8)(H_2O)_3](H_2O)_2$	$[Er(C_{14}H_6S_2O_8)(H_2O)_3](H_2O)_4$
%C	*Calc.*	26.52	26.44	27.04	25.48
	Exp.	26.46	26.89	27.09	25.04
%H	*Calc.*	2.34	2.83	2.57	3.00
	Exp.	2.09	2.12	2.09	2.10

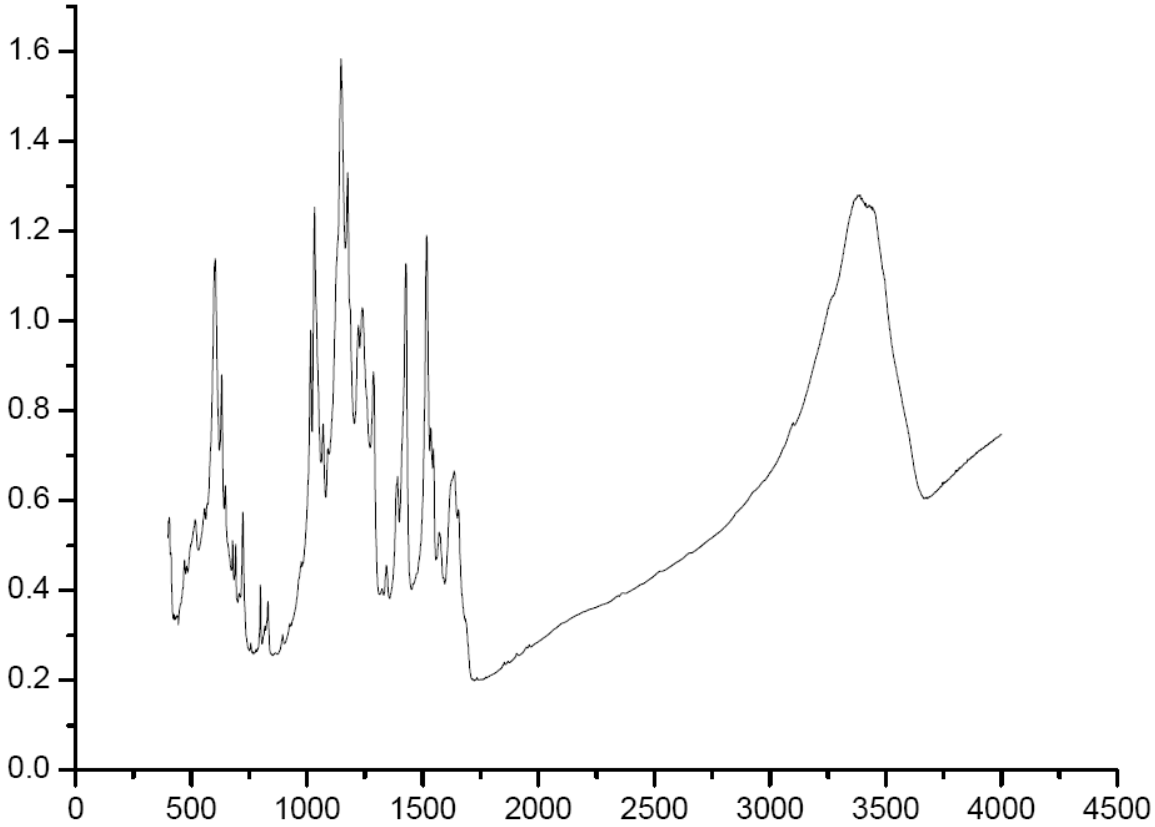
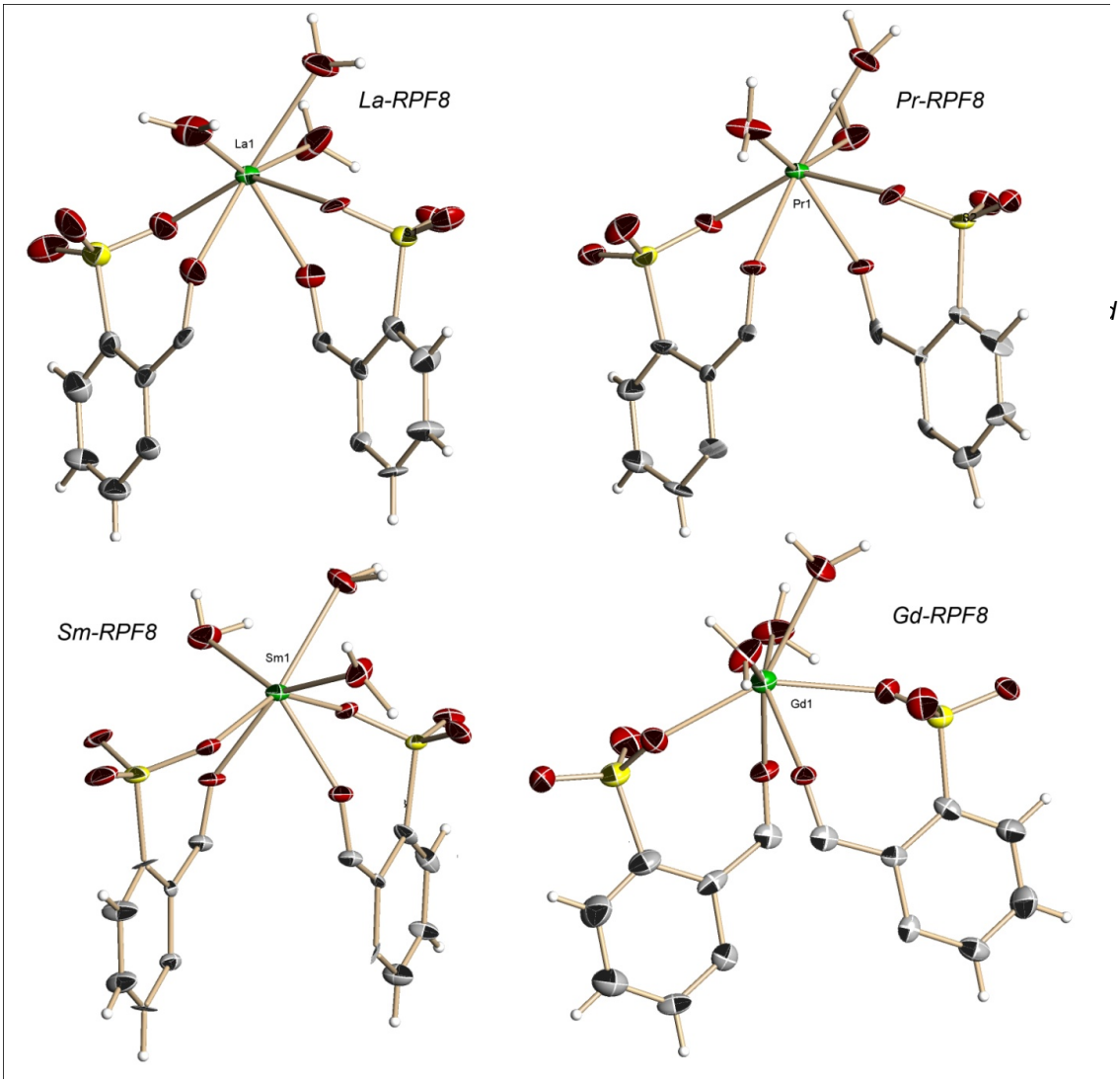


Figure S1.1: RPF8 Infrared spectrum

S2: ORTEP drawing for: La-, Pr-, Nd- and Sm-RPF8 asymmetric units. (CCDC deposition numbers 728638-72641).



1 Gd-

S3: PXRD for the RPF8 compounds. Rietveld Refinements:

X-Ray powder patterns were collected on Bruker D8 diffractomer equipped with a PSD detector. Patterns were collected in the 2θ° range 5-60, with a step size of 0.02°, and an exposure time of 2 seconds per step. Rietveld refinements were performed using the single crystal data obtained as starting point. The Fullproff programs suite[1] was employed for the refinements.

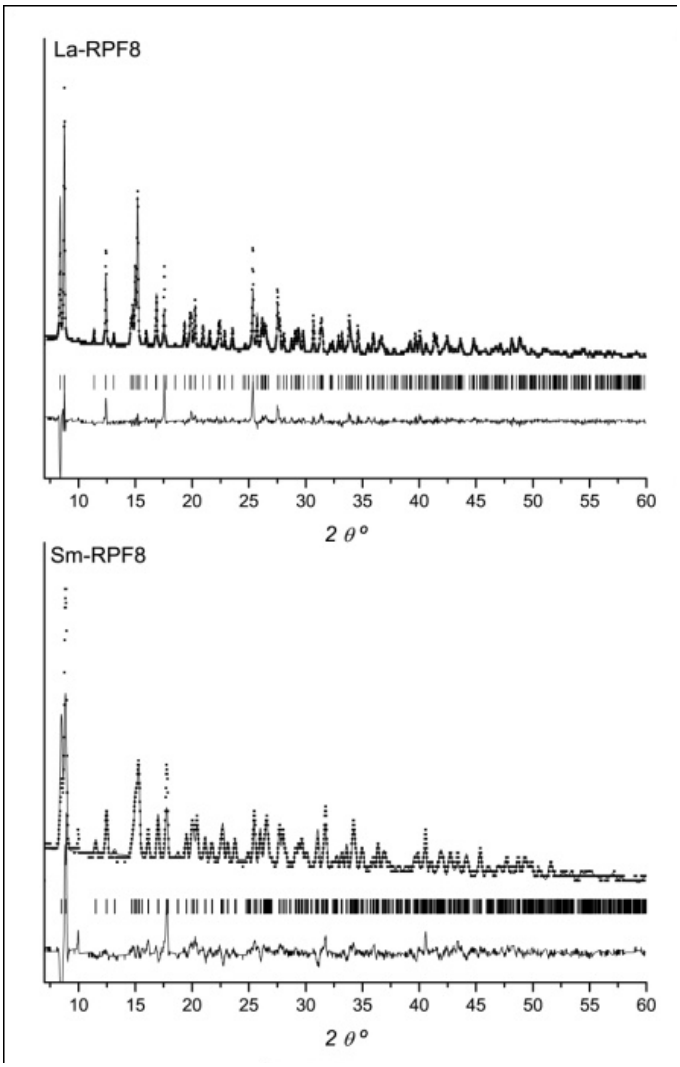


Figure S3-1: Rietveld Refinements for the La- and Sm- RPF8 compounds, showing the experimental (solid line) and simulated (dotted line) patterns, and the difference pattern. Bragg positions are marked as column

[1] J. Rodríguez-Carvajal, *Physica B: Physics of Condensed Matter* **1993**, *192*, 55.

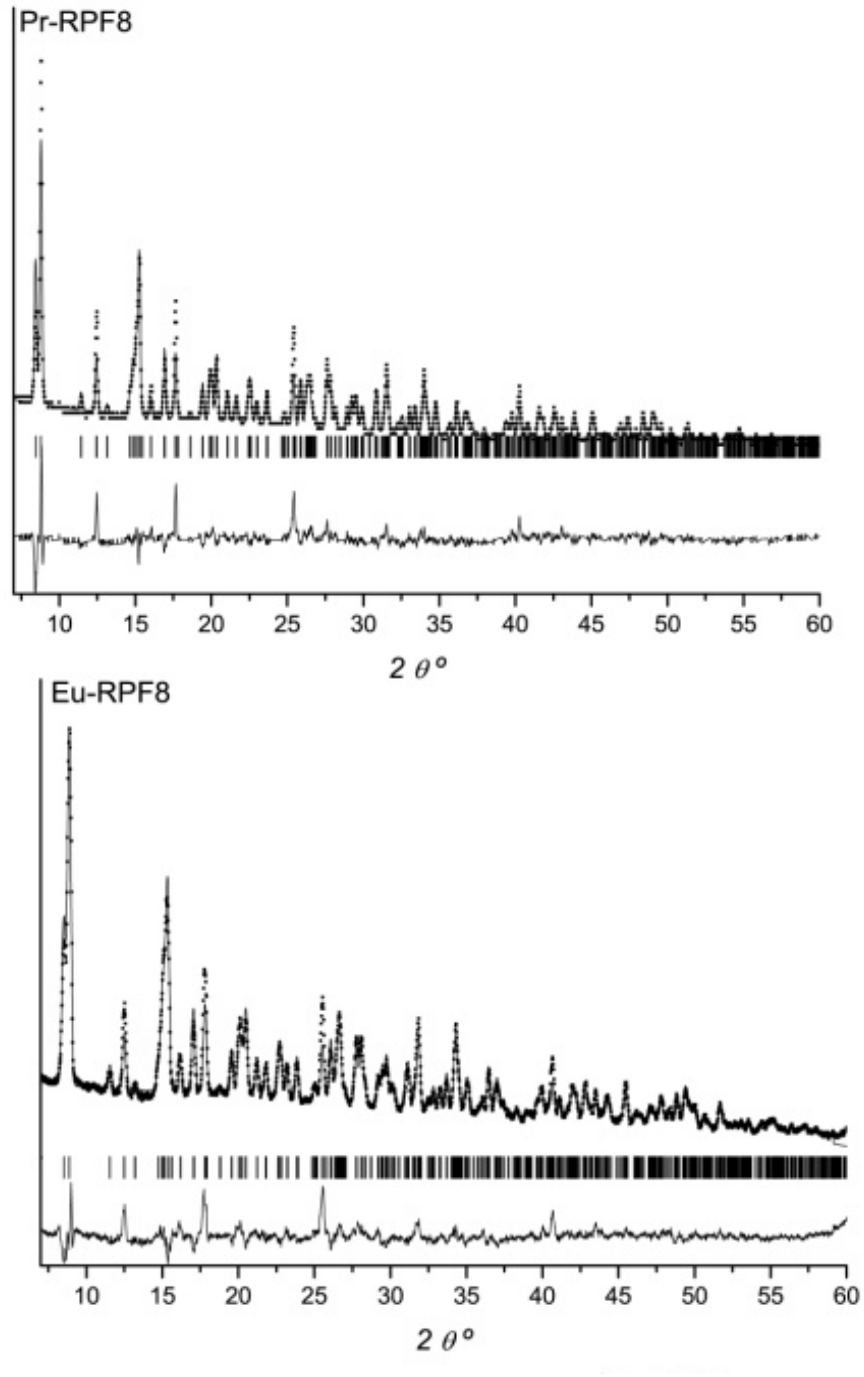


Figure S3-2: Rietveld Refinements for the Pr- and Eu- RPF8 compounds, showing the experimental (solid line) and simulated (dotted line) patterns, and the difference pattern. Bragg positions are marked as columns

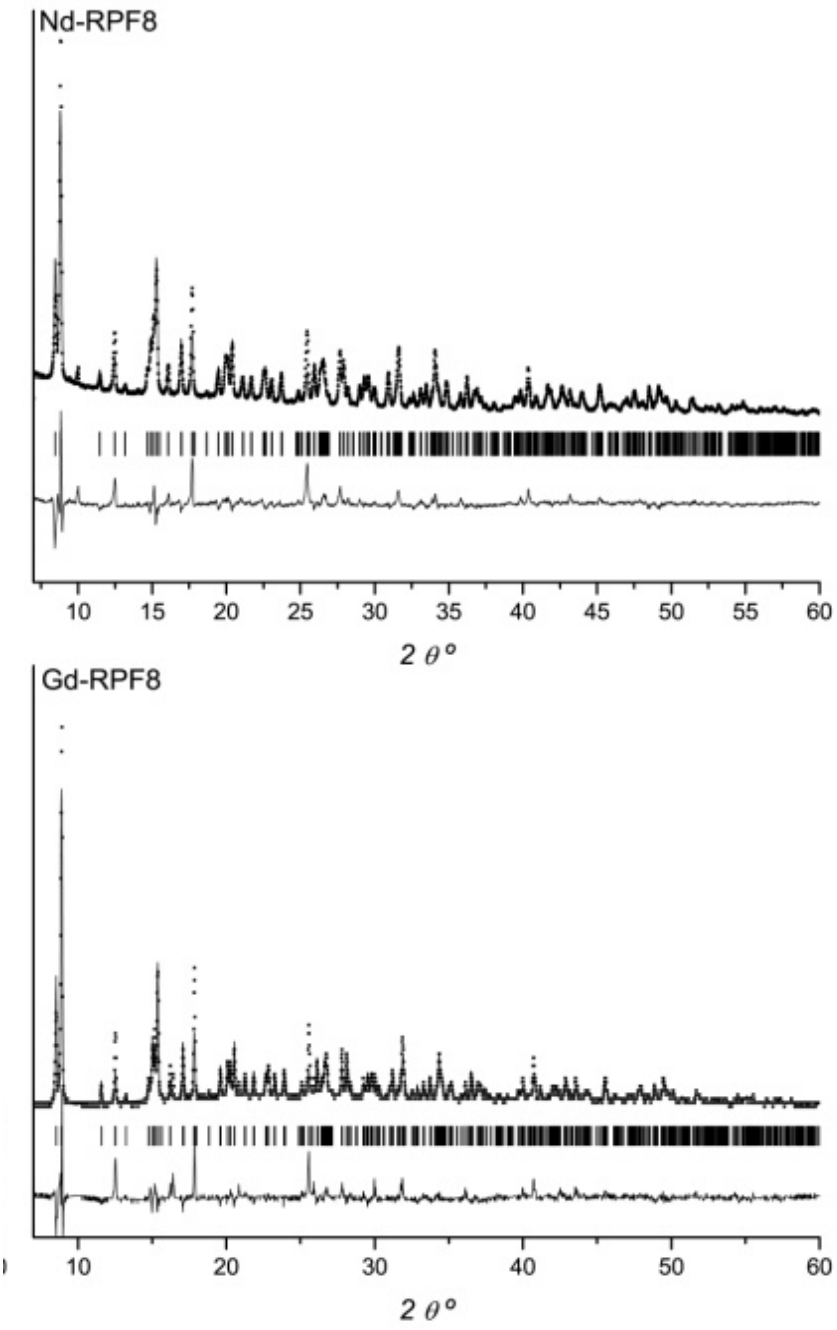


Figure S3-3: Rietveld Refinements for the Nd- and Gd- RPF8 compounds, showing the experimental (solid line) and simulated (dotted line) patterns, and the difference pattern. Bragg positions are marked as columns

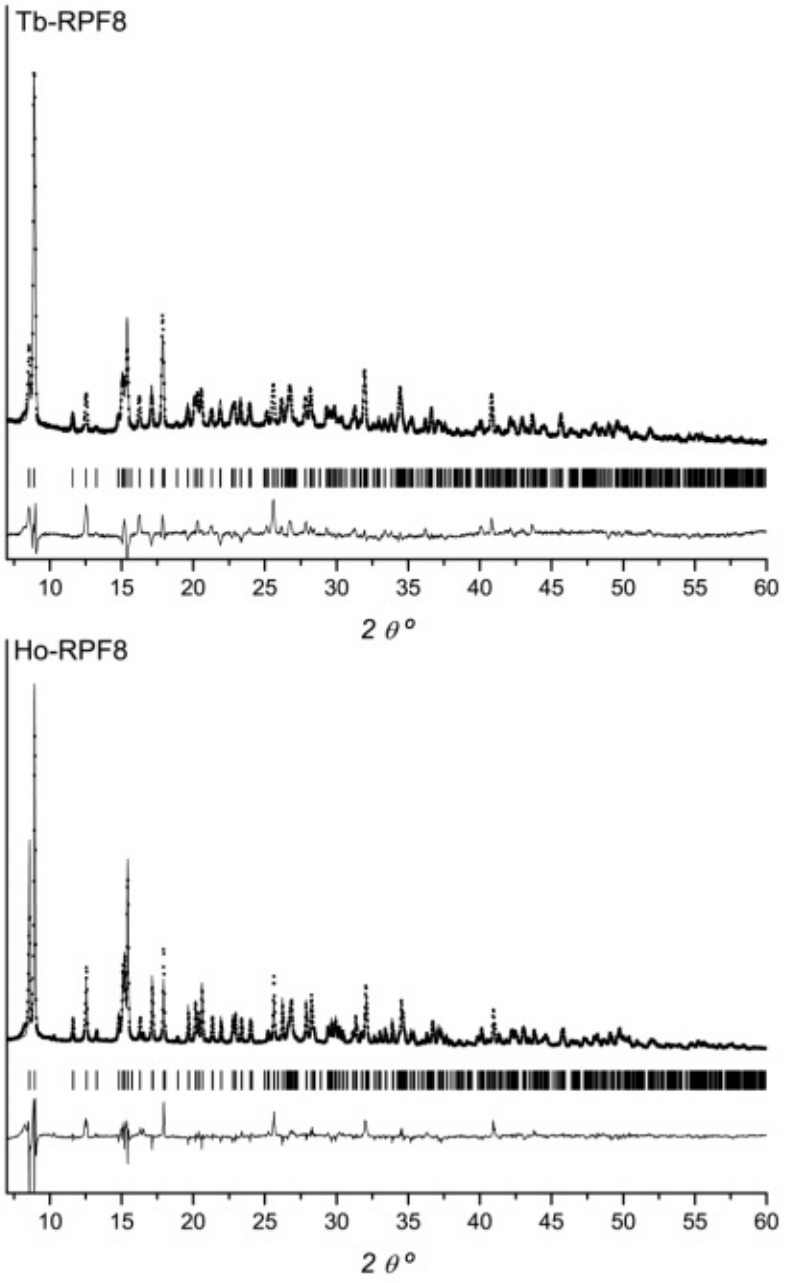


Figure S3-4: Rietveld Refinements for the Tb- and Ho- RPF8 compounds, showing the experimental (solid line) and simulated (dotted line) patterns, and the difference pattern. Bragg positions are marked as columns

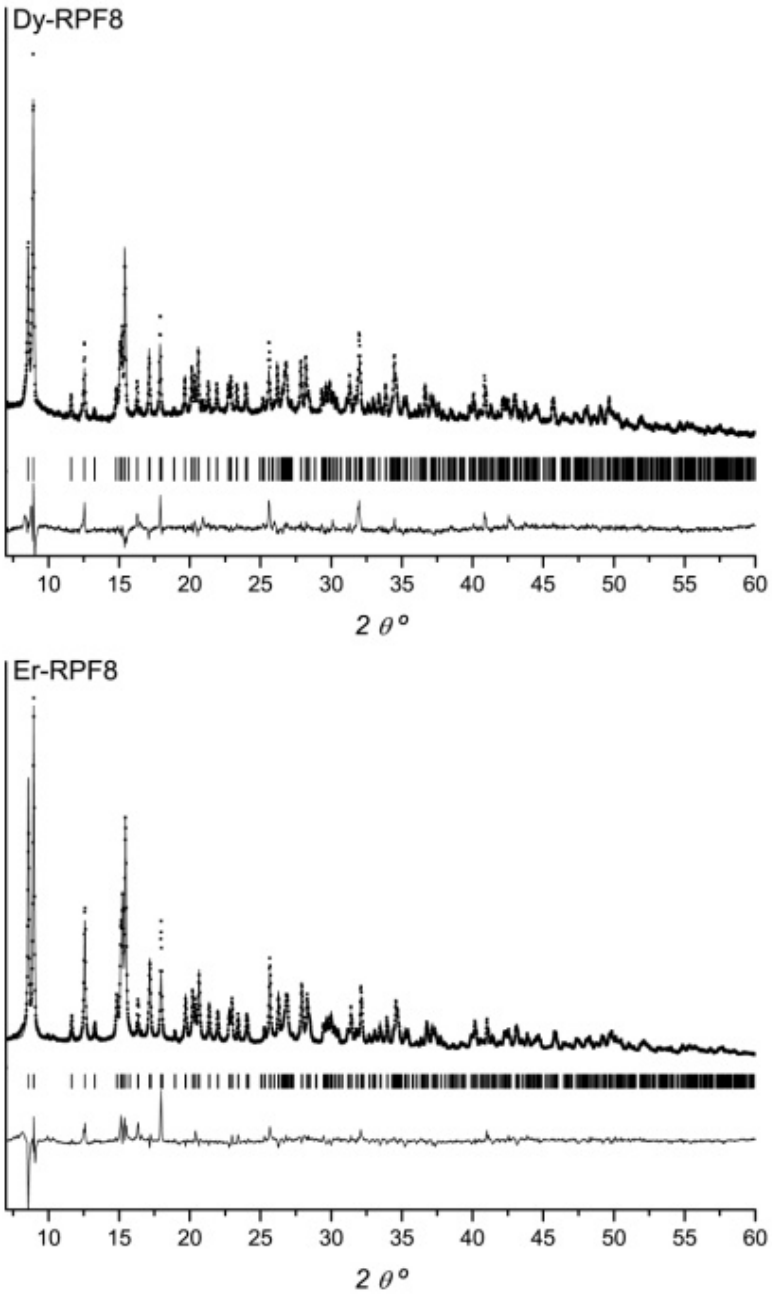


Figure S3-5: Rietveld Refinements for the Dy- and Er- RPF8 compounds, showing the experimental (solid line) and simulated (dotted line) patterns, and the difference pattern. Bragg positions are marked as columns

S4: Details of the magnetic measurements

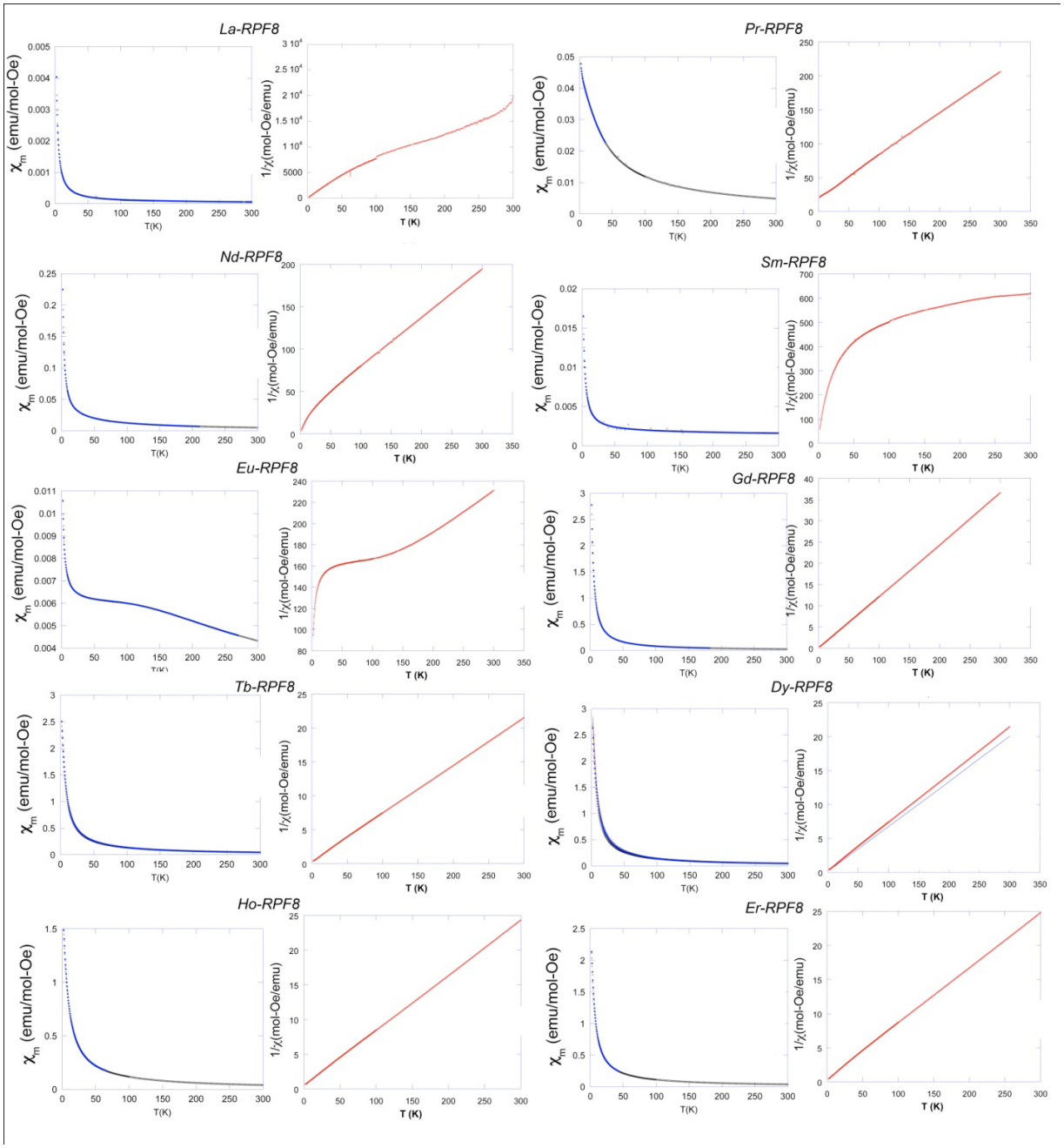


Figure S4-1: representation of the molar magnetic susceptibility (blue graphic) and its inverse (red graphic) vs temperature for the RPF8 compounds.

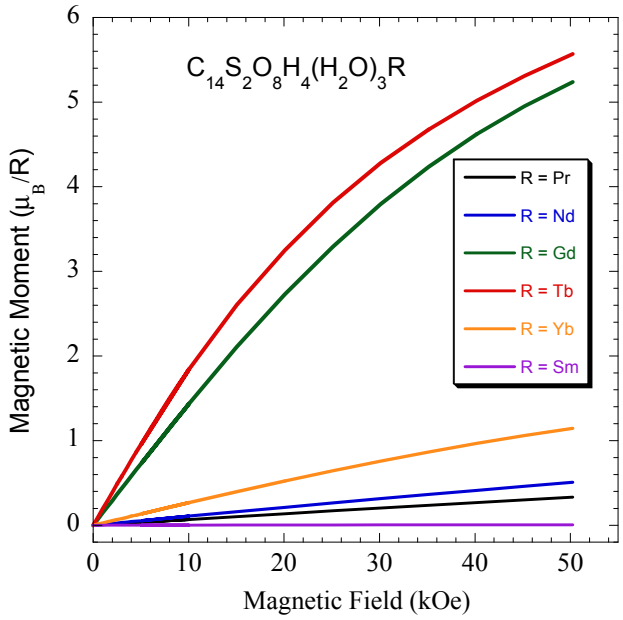


Figure S4-2: Field dependence of the magnetization for RPF8 compounds (R = Pr, Nd, Gd, Tb Yb Sm) at T =10 K

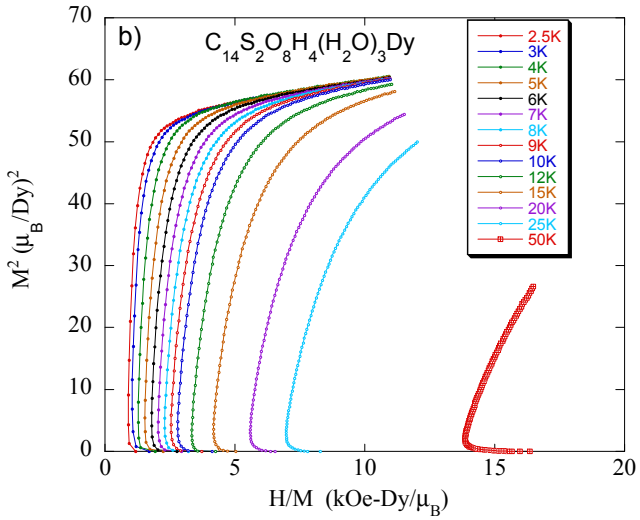


Figure S4-3: Arrot Plots for Dy-RPF8