Electronic Supplementary Informations

Comments on crystal structure:

Compound Eu9

A better reflection / parameters ratio for this structure was not obtained for the following reasons: the number of reflections with I > 3sigma(I) was not very different from the number of those with I < 3sigma(I) conditions. Moreover, the latter were not well measured probably due to bad crystal quality and stability. Thus we found it was not pertinent in this case to use stronger conditions such as I > 2sigma(I) or I > 1sigma(I)) to improve the reflection / parameters ratio as this increase the R and R_w values.

Compound Eu5

This structure has already been reported but there are no co-ordinates given in the CIF file available from CCDC or in the paper referenced. Moreover the cell dimensions show reasonable variation (up to 0.3Å and 1 deg) between both crystals and our R-factors are better. Although it is most likely they are identical structures, we think the provision of what appears to be a more accurate determination, along with atom co-ordinates, is worthwhile.

Compound Tb5

Due to the low number of reflections compared to parameters which have to be refined and in order to keep an acceptable reflection / parameter ratio, carbon atoms from aromatic cycles have been refined used isotropic terms and I > 1sigma(I) condition has been used during the refinement.

Table S1. Important bond lengths for Eu_x compounds (x = 9 (*table S1a*), x = 5 (*table S1b*))

Table S1a (Eu_9)					
Eu1 - O3	2.49 (1) (×4)	Eu1 - O4	2.48 (1) (×4)	Eu2 - O10#	2.48 (1)
Eu2 - O4#	2.36 (1)	Eu2 - O2	2.608 (3)	Eu2 - O4	2.35 (1)
Eu2 - O10	2.41 (1)	Eu2 - O14	2.38 (1)	Eu2 - O17	2.32 (1)
Eu2 - O21	2.39 (1)	Eu3 - O35#	2.46 (1)	Eu3 - O3#	2.36 (1)
Eu3 - O1	2.638 (3)	Eu3 - O3	2.35 (1)	Eu3 - O24	2.36 (1)
Eu3 - O28	2.34 (1)	Eu3 - O31	2.37 (1)	Eu3 - O35	2.48 (1)

Table S1b (Eu_5)					
Eu1 - O1	2.580 (8)	Eu1 - O12	2.384 (8)	Eu1 - O14	2.357 (8)
Eu1 - O142	2.364 (9)	Eu1 - O146	2.410 (8)	Eu1 - O163	2.478 (9)
Eu1 - O176	2.337 (8)	Eu1 - O180	2.304 (8)	Eu2 - O1	2.583 (8)
Eu2 - O11	2.361 (9)	Eu2 - O13	2.395 (8)	Eu2 - O21	2.382 (9)
Eu2 - O25	2.391 (8)	Eu2 - O55	2.294 (8)	Eu2 - O59	2.365 (8)
Eu2 - O73	2.480 (8)	Eu3 - O1	2.774 (8)	Eu3 - O13	2.341 (8)
Eu3 - O14	2.343 (8)	Eu3 - O25	2.451 (8)	Eu3 - O38	2.340 (9)
Eu3 - O42	2.32 (1)	Eu3 - O159	2.401 (9)	Eu3 - O163	2.381 (9)
Eu4 - O1	2.538 (8)	Eu4 - O11	2.397 (8)	Eu4 - O12	2.337 (8)
Eu4 - O73	2.425 (8)	Eu4 - O77	2.348 (8)	Eu4 - O91	2.323 (9)
Eu4 - O95	2.325 (8)	Eu4 - O146	2.508 (8)	Eu5 - O11	2.446 (8)
Eu5 - O12	2.456 (8)	Eu5 - O13	2.418 (9)	Eu5 - O14	2.476 (7)
Eu5 - O108	2.378 (8)	Eu5 - O112	2.343 (9)	Eu5 - O125	2.344 (9)
Eu5 - O129	2.397 (8)				

Symmetry operator # = -y+1/2, x, z

Table S2. Important bond lengths for Tb_x compounds (x = 9 (*table S2a*), x = 5 (*table S2b*))

Table S2a (Tb_9)					
Tb1 - O3	2.456 (7) (×4)	Tb1 - O4	2.433 (6) (×4)	Tb2 - O10#	2.456 (7)
Tb2 - O4#	2.346 (7)	Tb2 - O2	2.569 (1)	Tb2 - O4	2.306 (6)
Tb2 - O10	2.407 (7)	Tb2 - O14	2.338 (8)	Tb2 - O17	2.281 (8)
Tb2 - O21	2.349 (7)	Tb3 - O35#	2.447 (7)	Tb3 - O3#	2.338 (6)
Tb3 - O1	2.594 (2)	Tb3 - O3	2.318 (6)	Tb3 - O24	2.344 (7)
Tb3 - O28	2.325 (8)	Tb3 - O31	2.342 (8)	Tb3 - O35	2.447 (7)

Table S2b (Tb_5)					
Tb1 - O1	2.57(1)	Tb1 - O12	2.34(1)	Tb1 - O14	2.37(1)
Tb1 - O142	2.34(1)	Tb1 - O146	2.38(1)	Tb1 - O163	2.47(1)
Tb1 - O176	2.31(1)	Tb1 - O180	2.29(1)	Tb2 - O1	2.56(1)
Tb2 - O11	2.34(1)	Tb2 - O13	2.382(9)	Tb2 - O21	2.37(1)
Tb2 - O25	2.37(1)	Tb2 - O55	2.27(1)	Tb2 - O59	2.30(1)
Tb2 - O73	2.47(1)	Tb3 - O1	2.68(1)	Tb3 - O13	2.312(9)
Tb3 - O14	2.33(1)	Tb3 - O25	2.41(1)	Tb3 - O38	2.30(1)
Tb3 - O42	2.29(1)	Tb3 - O159	2.38(1)	Tb3 - O163	2.39(1)
Tb4 - O1	2.54(1)	Tb4 - O11	2.34(1)	Tb4 - O12	2.348(9)
Tb4 - O73	2.38(1)	Tb4 - O77	2.32(1)	Tb4 - O91	2.32(1)
Tb4 - O95	2.34(1)	Tb4 - O146	2.49(1)	Tb5 - O11	2.43(1)
Tb5 - O12	2.42(1)	Tb5 - O13	2.41(1)	Tb5 - O14	2.44(1)
Tb5 - O108	2.35(1)	Tb5 - O112	2.30(1)	Tb5 - O125	2.31(1)
Tb5 - O129	2.35(1)				

Symmetry operator # = -y+1/2, x, z

Table S3. Important bond lengths for Y_x compounds (x = 9 (*table S3a*), x = 8 (*table S3b*))

Table S3a (Y_9)					
Y1 - O3	2.424 (3) (×4)	Y1 - O4	2.410 (3) (×4)	Y2 - O10#	2.430(3)
Y2 - O4#	2.323 (3)	Y2 - O2	2.5410 (7)	Y2 - O4	2.283 (3)
Y2 - O10	2.402 (3)	Y2 - O14	2.325 (4)	Y2 - O17	2.267 (3)
Y2 - O21	2.321 (3)	Y3 - O35#	2.416 (3)	Y3 - O3#	2.307 (3)
Y3 - O1	2.5673 (8)	Y3 - O3	2.293 (3)	Y3 - O24	2.316 (3)
Y3 - O28	2.300 (3)	Y3 - O31	2.315 (3)	Y3 - O35	2.441 (3)

Table S3b (Y_8)					
Y1 - O26	2.45(1)	Y1 - O23	2.37(1)	Y1 - O56	2.34(2)
Y1 - O44	2.30(2)	Y1 - O11	2.35(1)	Y1 - O21	2.30(1)
Y1 - O23	2.39(1)	Y1 - O25	2.40(1)	Y2 - O21	2.45(1)
Y2 - O22	2.40(1)	Y2 - O11	2.31(1)	Y2 - O22	2.36(1)
Y2 - O24	2.35(1)	Y2 - O26	2.32(1)	Y2 - O70	2.31(2)
Y2 - O82	2.27(1)	Y3 - O26	2.32(1)	Y3 - O22	2.28(1)
Y3 - O31	2.25(2)	Y3 - O43	2.23(2)	Y3 - O24	2.29(1)
Y3 - O25	2.32(1)	Y3 - O95	2.26(2)	Y4 - O21	2.31(1)
Y4 - O23	2.32(1)	Y4 - O24	2.40(1)	Y4 - O25	2.35(1)
Y4 - O57	2.30(1)	Y4 - O69	2.23(2)	Y4 - O83	2.29(2)

Symmetry operator # = -y+1/2, x, z

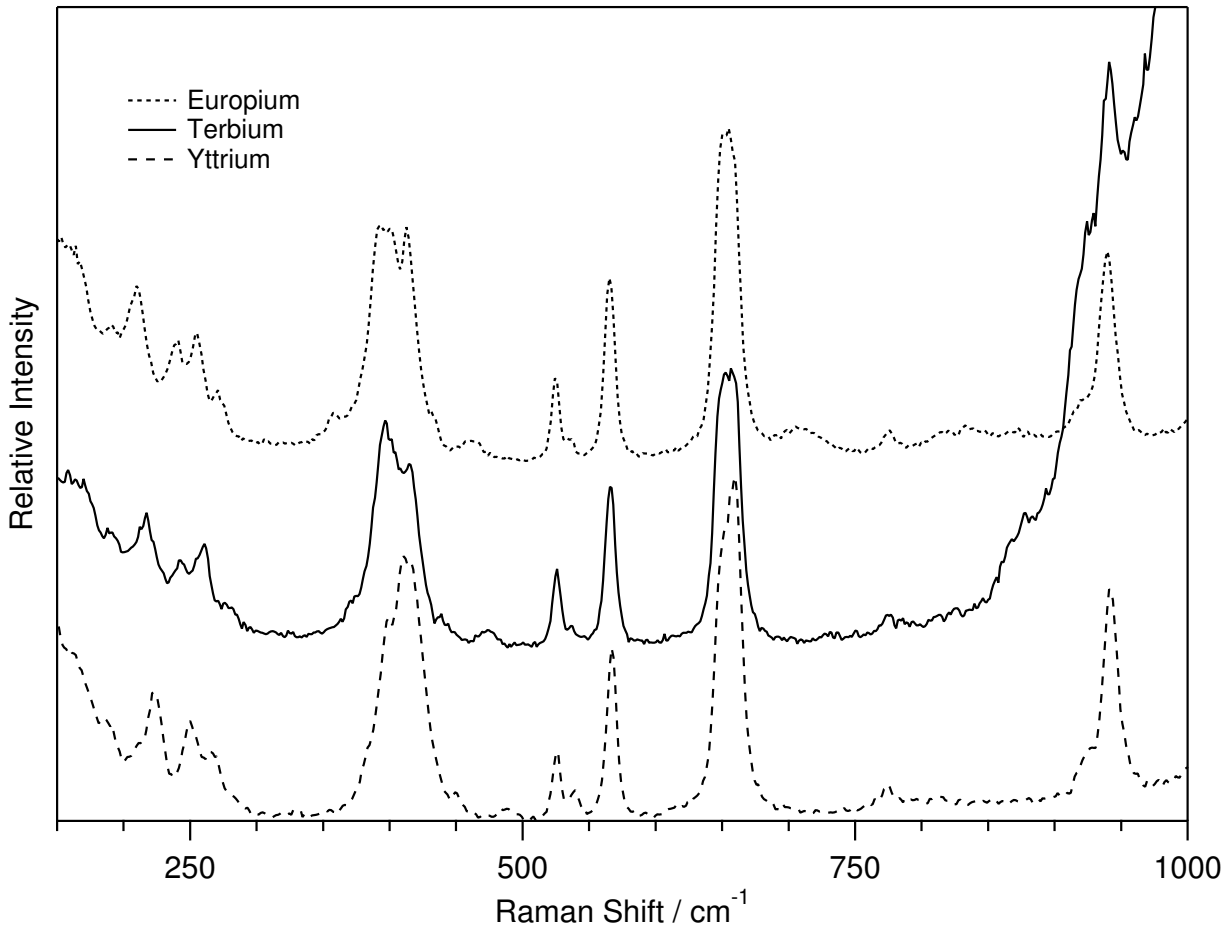

Figure 1S: Raman spectra of the **[Eu$_9$]**, **[Tb$_9$]** and **[Y$_9$]** clusters (top to bottom traces)

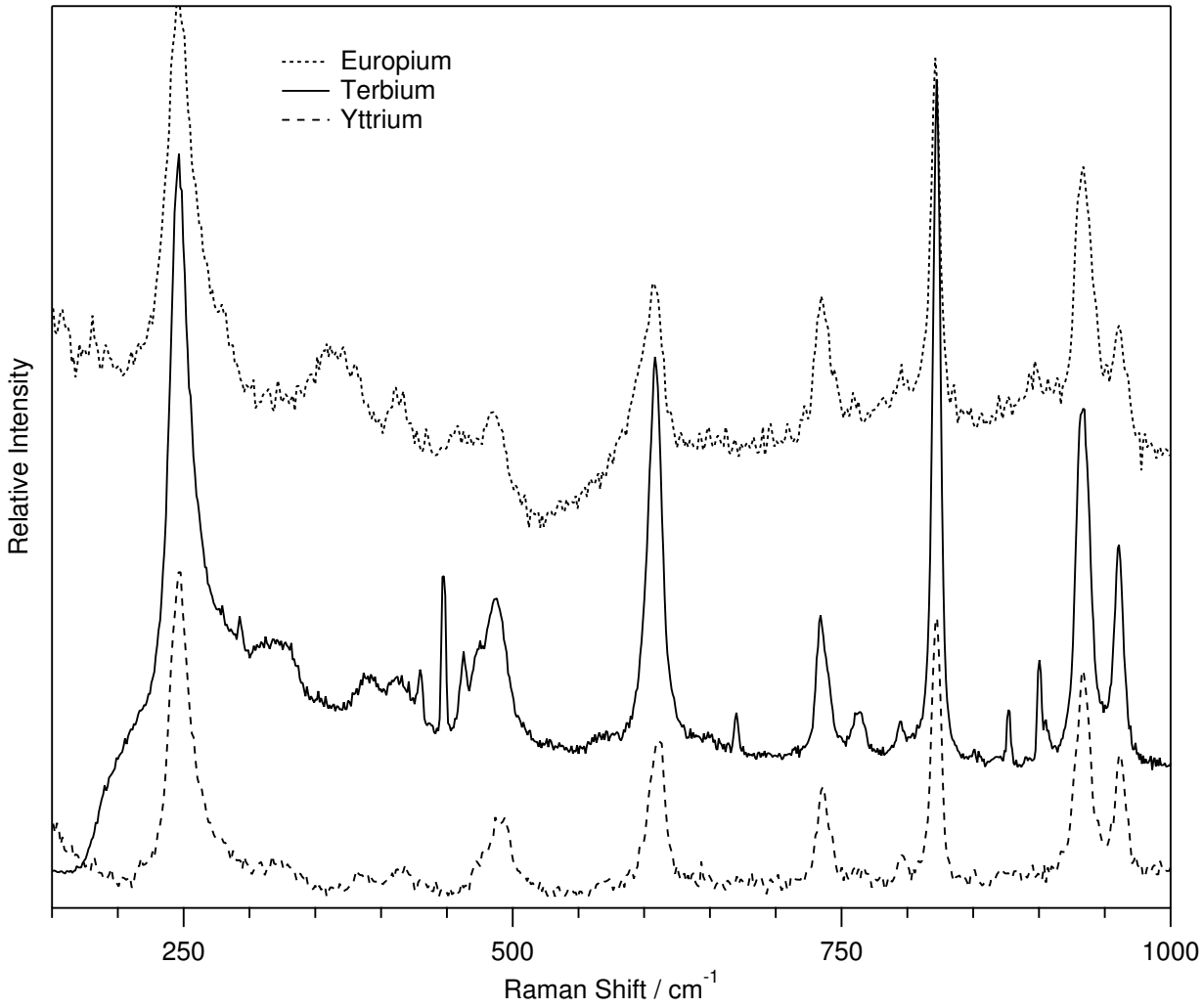

Figure 2S: Raman spectra of the **[Eu_8]**, **[Tb_8]** and **[Y_8]** clusters (top to bottom traces)

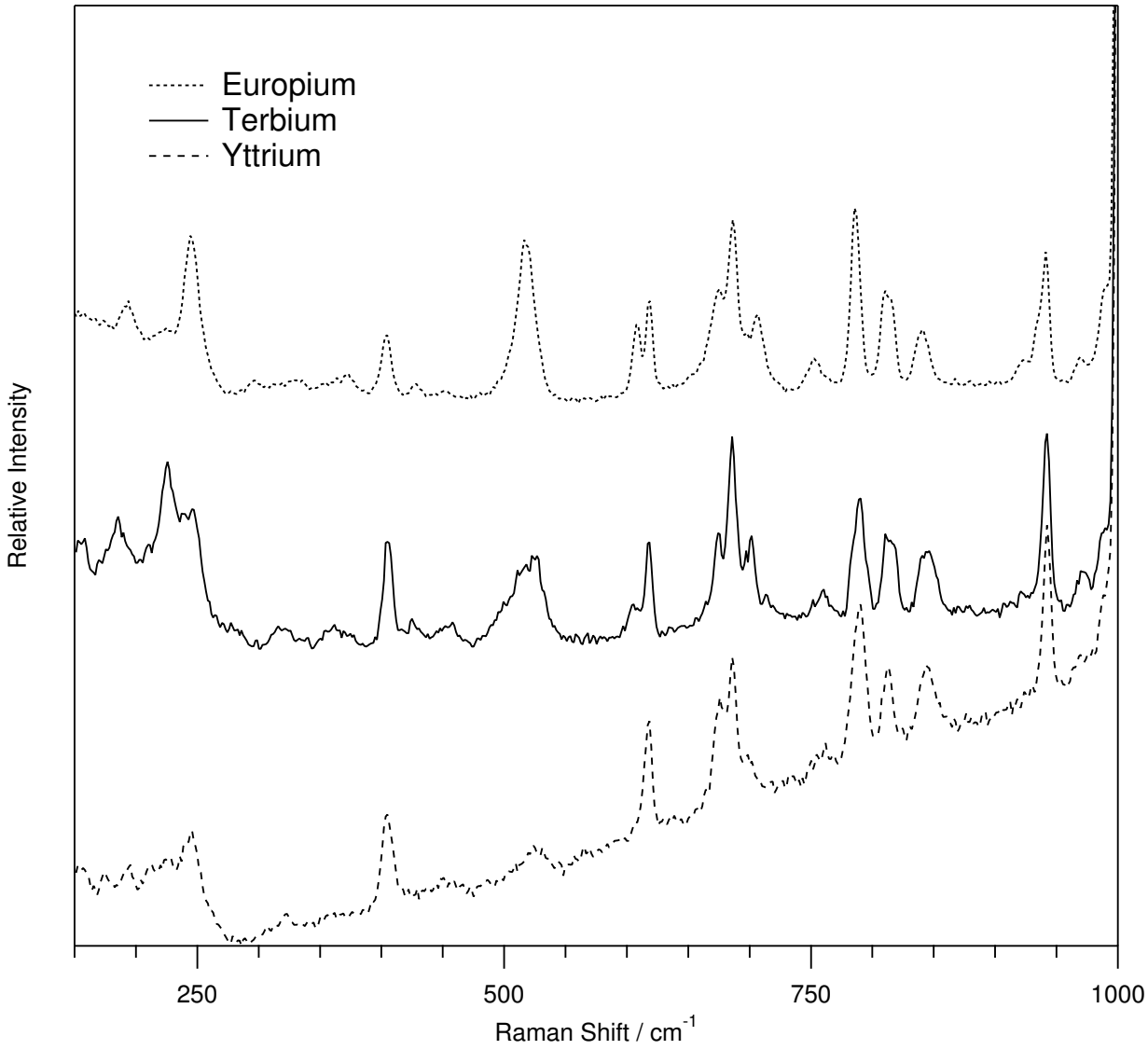

Figure 3S: Raman spectra of the **[Eu_5]**, **[Tb_5]** and **[Y_5]** clusters (top to bottom traces)