Electronic Supplementary Material (ESI) for Dalton Transactions.

Chiral dinuclear Ln(III) complexes derived from *S*- and *R*-2-(6-methoxy-2-naphthyl)propionate. Optical and Magnetic Properties.

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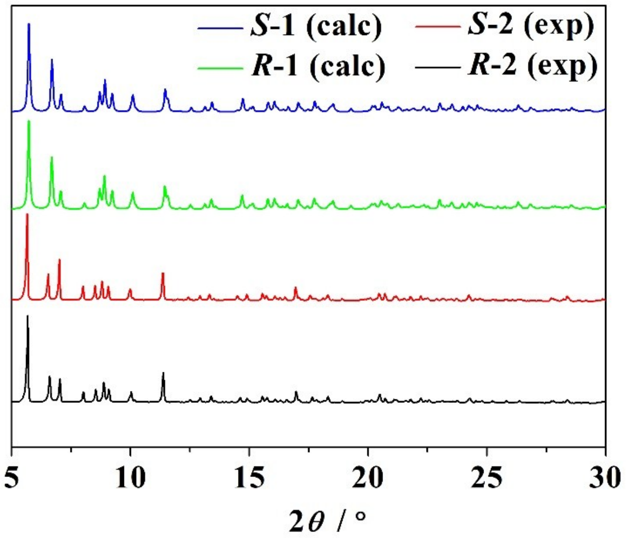

Figure S1. XRD patterns of complexes ***R*/*S*-1** (simulated from single-crystal X-ray difraction) and ***R*/*S*-2** (experimental).

Table S1. Crystal data and collection details for the X-ray structure for ***R*/*S*-1, 3** and **4**.

	***S*-1**	***R*-1**	***S*-3**	***R*-3**	***S*-4**	***R*-4**
Formula	$C_{108}H_{94}Eu_2N_4O_{18}$, 3($C_3H_7NO$), H_2O	$C_{108}H_{94}Eu_2N_4O_{18}$, 3($C_3H_7NO$), H_2O	$C_{108}H_{94}N_4O_{18}Tb_2$, 3($C_3H_7NO$), H_2O	$C_{108}H_{94}N_4O_{18}Tb_2$, 3($C_3H_7NO$), H_2O	$C_{108}H_{94}Dy_2N_4O_{18}$, 3($C_3H_7NO$), H_2O	$C_{108}H_{94}Dy_2N_4O_{18}$, 3($C_3H_7NO$), H_2O
F. W. / g·mol^{-1}	2277.1	2277.1	2291.04	2291.04	2298.18	2298.18
System	Triclinic	Triclinic	Triclinic	Triclinic	Triclinic	Triclinic
Space group	P1	P1	P1	P1	P1	P1
***a*/Å**	12.8688(4)	12.8552(5)	12.8145(5)	12.8446(9)	12.8193(4)	12.8163(5)
***b*/Å**	13.2752(4)	13.2618(6)	13.2959(6)	13.2530(11)	13.2636(5)	13.2907(7)
***c*/Å**	15.8294(5)	15.8132(7)	15.8108(7)	15.8329(13)	15.7926(6)	15.8134(8)
***α*/°**	90.038(1)	90.122(2)	89.955(2)	90.020(3)	89.848(2)	89.888(2)
***β*/°**	102.534(1)	102.580(2)	77.517(2)	102.538(3)	77.537(1)	77.570(2)
***γ*/°**	95.685(1)	95.812(2)	84.175(2)	95.859(3)	84.055(1)	84.163(2)
V/ Å^3	2626.11(14)	2616.8(2)	2616.0(2)	2616.5(4)	2607.30(16)	2616.3(2)
Z	1	1	1	1	1	1

T/ K	100	100	100	100	100	100
λ(MoKα)/ Å	0.71073	0.71073	0.71073	0.71073	0.71073	0.71073
D_{calc} /g·cm^{-3}	1.44	1.445	1.454	1.454	1.464	1.459
μ(MoKα) / mm^{-1}	1.259	1.264	1.417	1.417	1.499	1.493
F(000)	1170	1170	1174	1174	1176	1176
Total reflections collected	56397	69466	90676	50103	98017	15029
Unique reflections (R_{int})	21343 (0.031)	21342 (0.042)	21321 (0.030)	20969 (0.028)	21267 (0.044)	15029 (0.027)
No. of refined parameters	1111	1369	1382	1381	1152	1223
R_1,wR_2 [$I \geq 2\sigma(I)$]	0.0306, 0.0685	0.0294, 0.0624	0.0242, 0.0569	0.0273, 0.0604	0.0338, 0.0811	0.0198, 0.0507
R_1,wR_2 (all data)	0.0379, 0.0725	0.0387, 0.0664	0.0286, 0.0592	0.0334, 0.0632	0.0413, 0.0851	0.0221, 0.0516
Goodness of fit	1.04	1.06	1.08	1.06	1.03	1.03

Table S2. Distances for shortest intermolecular Ln···Ln interactions of ***R*/*S*-1, 3** and **4**.

	Interaction	Symmetry	Distance (Å)
***S*-1**	Eu1…Eu2′	1+x,y,z	9.871(1)
***R*-1**	Eu1…Eu2′	1+x,y,z	9.862(1)
***S*-3**	Tb1…Tb2′	1+x,y,z	9.840(1)
***R*-3**	Tb1…Tb2′	1+x,y,z	9.869(1)
***S*-4**	Dy1…Dy2′	1+x,y,z	9.856(1)
***R*-4**	Dy1…Dy2′	1+x,y,z	9.849(1)

Table S3. Continuous shape measures (CShM's) using SHAPE software for nonacoordinated compounds ***R*/*S*-1, 3** and **4**.

	Polyhedron												
	EP	OPY	HBPY	JTC	JCCU	CCU	JCSAPR	CSAPR	JTCTPR	TCTPR	JTDIC	HH	MFF

	Ln	D_{9h}	C_{8v}	D_{7h}	C_{3v}	C_{4v}	C_{4v}	C_{4v}	C_{4v}	D_{3h}	D_{3h}	C_{3v}	C_{2v}	C_s
S-1	**Eu1**	34.359	20.463	17.590	15.435	11.708	10.215	2.626	1.577	3.557	2.634	12.167	9.781	1.183
	Eu2	33.197	20.379	17.278	15.156	10.891	9.191	2.720	1.700	3.307	2.833	12.934	8.639	1.538
R-1	**Eu1**	33.393	20.411	17.111	15.236	10.869	9.170	2.667	1.665	3.314	2.810	13.032	8.620	1.509
	Eu2	34.313	20.619	17.566	15.386	11.746	10.144	2.628	1.577	3.520	2.667	12.089	9.849	1.193
S-3	**Tb1**	34.431	20.819	17.510	15.513	11.554	10.291	2.533	1.529	3.412	2.655	12.177	9.691	1.151
	Tb2	33.299	20.504	17.246	15.102	10.805	9.108	2.609	1.613	3.231	2.755	12.902	8.595	1.464
R-3	**Tb1**	33.307	20.505	17.174	15.090	10.750	9.062	2.608	1.612	3.223	2.738	12.994	8.518	1.452
	Tb2	34.410	20.766	17.511	15.481	11.604	10.284	2.552	1.547	3.438	2.643	12.077	9.710	1.175
S-4	**Dy1**	34.270	20.787	17.479	15.533	11.549	10.206	2.509	1.511	3.359	2.623	12.119	9.640	1.144
	Dy2	33.475	20.544	17.222	15.268	10.724	9.103	2.590	1.610	3.217	2.744	12.956	8.504	1.432
R-4	**Dy1**	33.465	20.509	17.140	15.230	10.672	9.021	2.639	1.620	3.245	2.749	12.958	8.470	1.436
	Dy2	34.409	20.958	17.614	15.487	11.594	10.179	2.461	1.488	3.324	2.637	12.108	9.692	1.154

Table S4. Distances (d; A = acceptor atom, D = donor atom) and angles for supramolecular hydrogen bond interactions in compounds ***R*/*S*-1, 3** and **4**.

	Interaction	**d(OD--H)/Å**	**d(H..A)/Å**	**d(OD..A)/Å**	**Angle/°**	**(')**
S-1	O1W--H1W.. O11	0.90(2)	2.06(3)	2.921(9)	160(8)	-1+x,1+y,z
	O1W--H2W.. O1D	0.90(4)	2.01(5)	2.860(10)	158(6)	-
R-1	O1W--H1W.. O9	0.93(3)	1.98(3)	2.905(8)	170(8)	-
	O1W--H2W.. O1D	0.94(4)	1.92(4)	2.856(8)	176(12)	-
S-3	O1W--H1W.. O11	0.93(4)	2.03(4)	2.914(8)	159(9)	-
	O1W--H2W.. O1D	0.93(5)	1.93(5)	2.861(8)	173(5)	1+x,y,z
R-3	O1W--H1W.. O9	0.94(4)	1.99(4)	2.910(8)	165(5)	x,-1+y,z
	O1W--H2W.. O1D	0.94(5)	2.02(5)	2.872(8)	150(7)	-
S-4	O1W--H1W.. O11	0.95(5)	1.99(6)	2.907(11)	162(10)	1+x,-1+y,z
	O1W--H2W.. O1D	0.95(4)	1.94(5)	2.866(11)	167(11)	1+x,y,z
R-4	O1W--H1W.. O9	0.94(3)	1.98(4)	2.907(8)	167(6)	-
	O1W--H2W.. O1D	0.94(5)	1.95(5)	2.877(8)	170(10)	x,-1+y,z

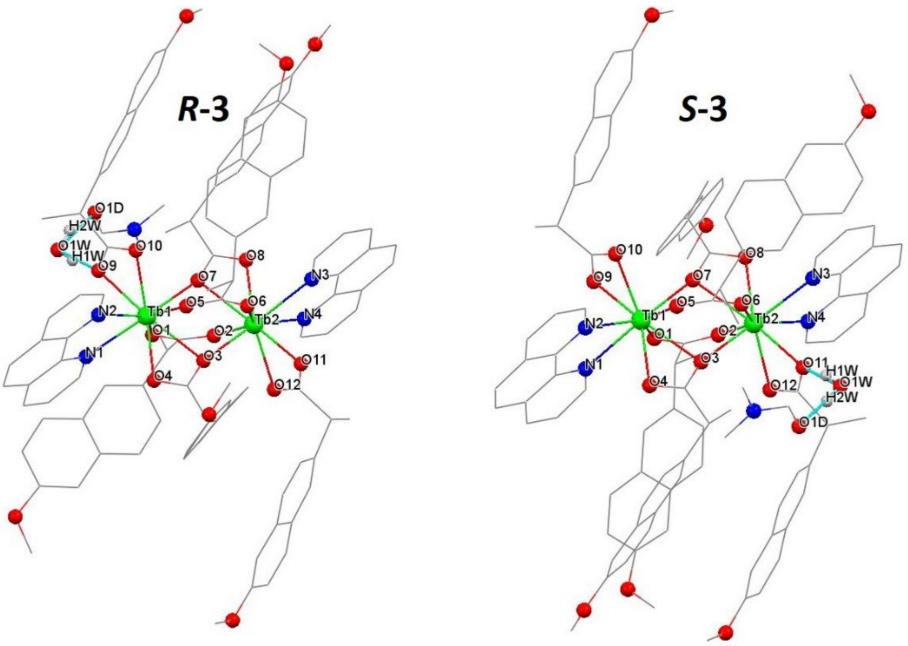

Figure S2. Supramolecular hydrogen bonds (represented in blue) in compounds ***R*-3** (left) and ***S*-3** (right).

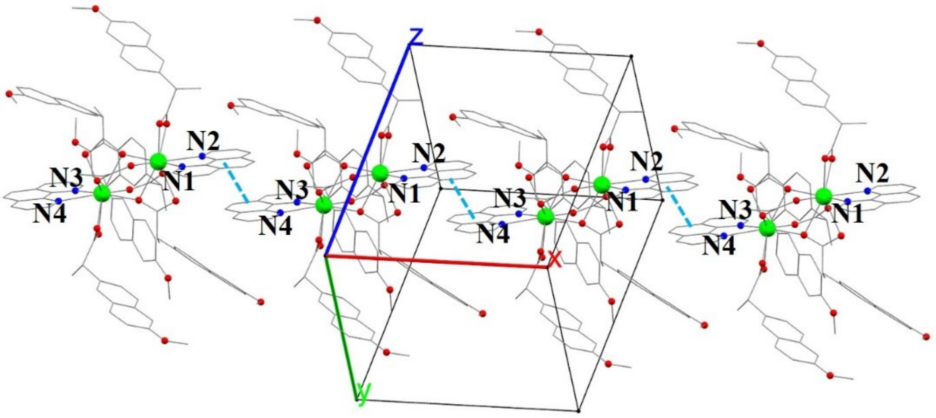

Figure S3. Supramolecular arrangement representation in compound ***S*-3** on the [100] direction. π-stacking interactions are represented in blue.

Table S5. Symmetry operations, distances (Å) and slippages (Å) from intermolecular π-π stacking interactions for compounds ***R*/*S*-1, 3** and **4**. Centroids Cg(2) and Cg(17) correspond to phen ligands containing N1 and N2 atoms, meanwhile centroids Cg(4) and Cg(18) stand for phen ligands containing N3 and N4 atoms.

Compound	Contact	Symmetry code (')	d(Cg-Cg)	Slippage
***S*-1**	Cg(2)-Cg(18)'	1+x,y,z	3.617(4)	1.437
	Cg(4)-Cg(17)'	-1+x,y,z	3.710(5)	1.522
***R*-1**	Cg(2)-Cg(18)'	1+x,y,z	3.713(4)	1.538
	Cg(4)-Cg(17)'	-1+x,y,z	3.610(4)	1.417
***S*-3**	Cg(2)-Cg(18)'	1+x,y,z	3.616(4)	1.427

	Cg(4)-Cg(17)'	-1+x,y,z	3.713(4)	1.527
***R*-3**	Cg(2)-Cg(18)'	1+x,y,z	3.713(4)	1.522
	Cg(4)-Cg(17)'	-1+x,y,z	3.611(4)	1.425
***S*-4**	Cg(2)-Cg(18)'	1+x,y,z	3.608(5)	1.43
	Cg(4)-Cg(17)'	-1+x,y,z	3.713(6)	1.54
***R*-4**	Cg(2)-Cg(18)'	1+x,y,z	3.718(4)	1.558
	Cg(4)-Cg(17)'	-1+x,y,z	3.608(4)	1.428

Table S6. Relaxation parameters values for the best fit of χ_M'' and χ_M' vs. frequency using generalised Debye model for compound ***R*-4**.

T / K	**χ_s / cm^3 mol^{-1}**	**χ_T / cm^3 mol^{-1}**	**τ / s**	**α**
3.2	0.78	6.20	3.14E-04	0.35
3.0	0.41	6.58	3.48E-04	0.38
2.8	0.33	6.83	4.16E-04	0.38
2.6	0.31	7.05	5.02E-04	0.38
2.4	0.28	7.32	6.10E-04	0.39
2.2	0.25	7.71	7.57E-04	0.39
2.0	0.33	8.44	9.90E-04	0.38
1.9	0.40	9.17	1.21E-03	0.37

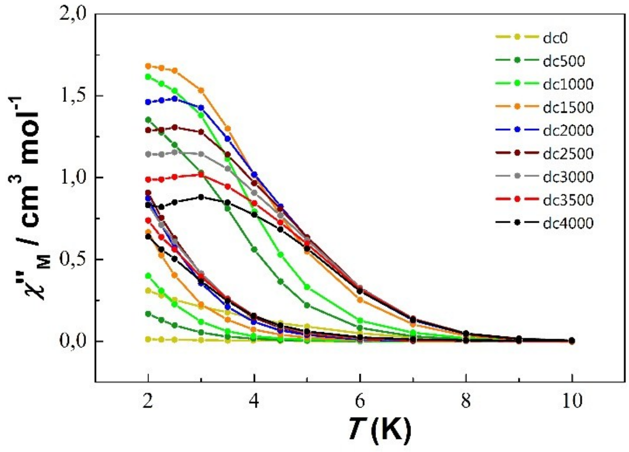

Figure S4. Dependence for **S-4** of the out-of-phase susceptibility with the temperature at different static fields at 10 and 1000 Hz.

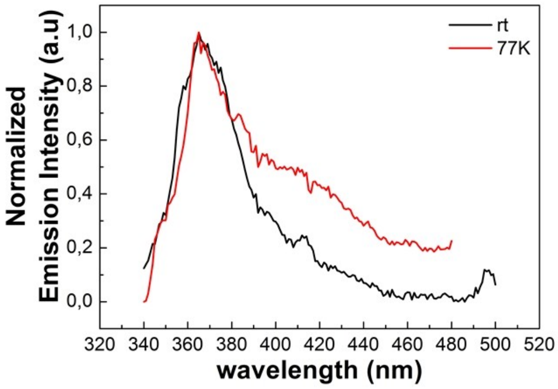

Figure S5. Emission spectrum at λ_{ex} = 300 nm of complex **S-2** at room temperature (black line) and 77 K (red line) in solid state.

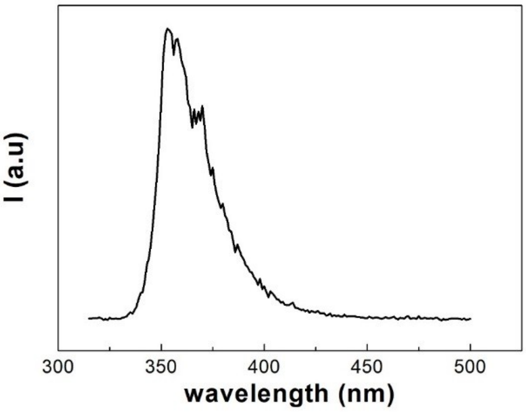

Figure S6. Emission spectrum at λ_{ex} = 300 nm of the ligand S-naproxen.

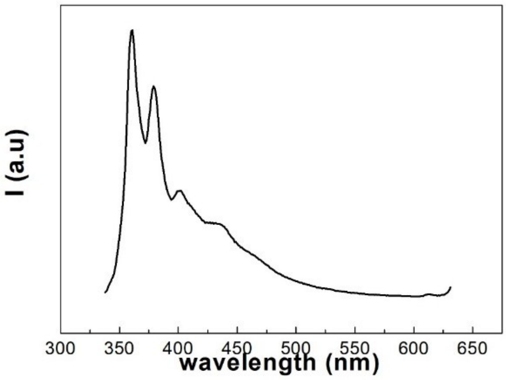

Figure S7. Emission spectrum at λ_{ex} = 300 nm of the ligand 1,10-phenanthroline.