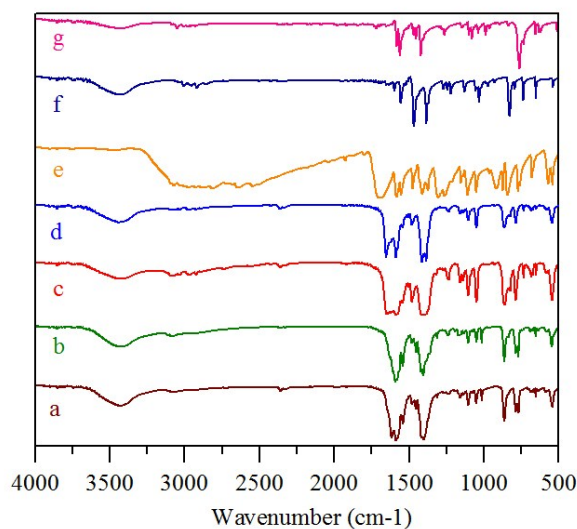


**Fig. S1** a) Simulated and experimental PXRD spectra of the complexes 1-2 (a= experimental complex 1; b=experimental complex 2. b) Simulated and experimental PXRD spectra of the complexes 3-4 (c= experimental complex 3; d=experimental complex 4).



**Fig. S2** IR spectra of complex 1 (a), complex 2 (b), complex 3 (c), complex 4 (d), 2,4-DCIHBA (e), 5,5'-DM-2,2'-bipy (f), terpy (g).

**Table S1** Selected bond lengths (Å) of the title complexes<sup>a</sup>

Complex 1			
Eu(1)-O(5)	2.309(10)	Eu(1)-N(1)	2.537(13)
Eu(1)-O(3)	2.406(10)	Eu(1)-N(3)	2.560(13)
Eu(1)-O(2)	2.426(10)	Eu(1)-N(2)	2.570(12)
Eu(1)-O(7)	2.429(9)	Eu(1)-O(4)	2.620(9)
Eu(1)-O(1)	2.474(10)		
Complex 2			
Tb(1)-O(5)	2.306(3)	Tb(1)-N(1)	2.539(4)
Tb(1)-O(7)	2.389(3)	Tb(1)-N(3)	2.547(4)
Tb(1)-O(3)	2.418(3)	Tb(1)-N(2)	2.577(4)
Tb(1)-O(1)	2.449(4)	Tb(1)-O(4)	2.633(4)
Tb(1)-O(2)	2.459(4)		
Complex 3			
Eu(1)-O(1)	2.354(6)	Eu(1)-O(7)	2.486(6)
Eu(1)-O(4)#1	2.367(6)	Eu(1)-N(2)	2.596(7)
Eu(1)-O(5)	2.368(6)	Eu(1)-N(1)	2.617(7)
Eu(1)-O(2)#1	2.383(6)	Eu(1)-Eu(1)#1	4.4615(10)
Eu(1)-O(3)	2.432(6)		
Complex 4			
Tb(1)-O(1)	2.327(4)	Tb(1)-O(7)	2.456(4)
Tb(1)-O(5)	2.348(5)	Tb(1)-N(2)	2.578(5)
Tb(1)-O(2)#1	2.353(5)	Tb(1)-N(1)	2.597(5)
Tb(1)-O(4)#1	2.355(4)	Tb(1)-Tb(1)#1	4.4505(7)
Tb(1)-O(3)	2.396(5)		

<sup>a</sup>Symmetry transformations used to generate equivalent atoms: #1: - x + 1, -y + 1, -z .

**Table S2** Experimental molar heat capacities of complexes 1-4

T(K)	Complex 1	Complex 2	Complex 3	Complex 4
	C <sub>p,m</sub> (J·mol <sup>-1</sup> ·K <sup>-1</sup> )	C <sub>p,m</sub> (J·mol <sup>-1</sup> ·K <sup>-1</sup> )	C <sub>p,m</sub> (J·mol <sup>-1</sup> ·K <sup>-1</sup> )	C <sub>p,m</sub> (J·mol <sup>-1</sup> ·K <sup>-1</sup> )
263.15	672.72	704.47	1384.75	1511.08
264.15	675.17	706.69	1389.41	1515.60
265.15	677.43	708.77	1393.86	1519.87
266.15	679.70	710.87	1398.15	1523.95
267.15	682.05	713.06	1402.52	1528.15
268.15	684.32	715.14	1406.97	1532.46
269.15	686.52	717.13	1411.36	1536.72
270.15	688.77	719.14	1415.55	1540.78
271.15	691.02	721.11	1419.69	1544.76
272.15	693.20	723.02	1424.05	1548.98
273.15	695.31	724.88	1428.54	1553.36
274.15	697.32	726.70	1432.89	1557.53
275.15	699.28	728.51	1437.09	1561.59
276.15	701.25	730.37	1441.31	1565.74
277.15	703.26	732.22	1445.64	1569.99
278.15	705.30	734.02	1449.97	1574.09
279.15	707.31	735.76	1454.12	1578.06
280.15	709.24	737.49	1458.22	1582.10
281.15	711.11	739.21	1462.21	1586.02
282.15	713.02	741.05	1466.03	1589.65
283.15	715.04	743.01	1469.99	1593.34
284.15	717.17	745.03	1474.17	1597.37
285.15	719.30	747.08	1478.32	1601.53
286.15	721.36	749.02	1482.34	1605.59
287.15	723.42	750.90	1486.34	1609.48
288.15	725.54	752.86	1490.42	1613.31
289.15	727.70	754.91	1494.52	1617.10
290.15	729.90	756.99	1498.57	1620.87
291.15	732.14	759.09	1502.68	1624.80
292.15	734.49	761.29	1506.92	1628.86
293.15	737.01	763.63	1511.11	1632.76
294.15	739.51	765.91	1515.19	1636.56
295.15	741.94	768.13	1519.14	1640.28
296.15	744.37	770.45	1523.21	1644.14
297.15	746.77	772.79	1527.46	1648.22
298.15	749.12	775.09	1531.75	1652.32
299.15	751.46	777.42	1535.85	1656.19

300.15	753.86	779.78	1540.01	1660.02
301.15	756.33	782.15	1544.55	1664.08
302.15	758.88	784.60	1549.26	1668.36
303.15	761.46	787.06	1553.90	1672.59
304.15	764.03	789.51	1558.35	1676.58
305.15	766.62	792.01	1562.84	1680.75
306.15	769.18	794.60	1567.42	1685.04
307.15	771.77	797.20	1572.13	1689.18
308.15	774.44	799.74	1577.06	1693.43
309.15	777.03	802.13	1581.96	1697.85
310.15	779.52	804.49	1586.67	1702.23
311.15	782.03	806.91	1591.38	1706.51
312.15	784.60	809.44	1596.25	1710.96
313.15	787.19	811.98	1601.17	1715.55
314.15	789.69	814.47	1605.93	1720.04
315.15	792.19	817.01	1610.59	1724.33
316.15	794.79	819.72	1615.50	1728.90
317.15	797.44	822.51	1620.68	1733.79
318.15	800.07	825.24	1625.70	1738.54
319.15	802.68	827.89	1630.34	1742.91
320.15	805.26	830.64	1634.76	1747.11
321.15	807.83	833.55	1639.08	1751.25
322.15	810.52	836.64	1643.32	1755.23
323.15	813.43	839.95	1647.54	1759.23
324.15	816.39	843.35	1651.91	1763.52
325.15	819.24	846.62	1656.18	1767.76
326.15	821.98	849.76	1660.15	1771.66
327.15	824.71	852.95	1663.76	1775.23
328.15	827.43	856.21	1667.20	1778.56
329.15	830.16	859.68	1671.01	1782.09
330.15	833.05	863.58	1675.13	1785.90
331.15	836.19	867.80	1679.50	1789.85
332.15	839.35	871.88	1684.07	1793.97
333.15	842.29	875.62	1688.48	1797.84
334.15	845.20	879.37	1692.76	1801.41
335.15	848.13	883.29	1697.09	1804.97
336.15	851.06	887.25	1701.49	1808.52
337.15	854.14	891.25	1705.75	1811.97

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**Table S3** Smoothed molar heat capacities and thermodynamic functions of complex 1

<b>T(K)</b>	<b>C<sub>p,m</sub>(JK<sup>-1</sup>mol<sup>-1</sup>)</b>	<b>H<sub>T</sub>-H<sub>298.15K</sub>(kJmol<sup>-1</sup>)</b>	<b>S<sub>T</sub>-S<sub>298.15K</sub>(JK<sup>-1</sup>mol<sup>-1</sup>)</b>	<b>G<sub>T</sub>-G<sub>298.15K</sub>(kJmol<sup>-1</sup>)</b>
263.15	672.82	-24.874	-88.65	-1.546
266.15	679.73	-22.845	-80.98	-1.292
269.15	686.61	-20.795	-73.32	-1.06
272.15	693.14	-18.726	-65.68	-0.852
275.15	699.31	-16.637	-58.04	-0.666
278.15	705.25	-14.53	-50.43	-0.504
281.15	711.14	-12.406	-42.83	-0.364
284.15	717.16	-10.263	-35.25	-0.247
287.15	723.44	-8.102	-27.69	-0.152
290.15	730.02	-5.922	-20.13	-0.081
293.15	736.93	-3.722	-12.59	-0.031
296.15	744.12	-1.501	-5.05	-0.005
299.15	751.52	0.758	2.54	-0.001
302.15	759.06	3.024	10.07	-0.02
305.15	766.68	5.312	17.61	-0.062
308.15	774.32	7.624	25.15	-0.126
311.15	781.98	9.958	32.69	-0.212
314.15	789.67	12.316	40.23	-0.322
317.15	797.44	14.696	47.77	-0.454
320.15	805.34	17.101	55.31	-0.608
323.15	813.45	19.529	62.86	-0.786
326.15	821.79	21.982	70.42	-0.985
329.15	830.39	24.46	77.98	-1.208
332.15	839.2	26.964	85.56	-1.453
335.15	848.14	29.495	93.14	-1.721

**Table S4** Smoothed molar heat capacities and thermodynamic functions of complex 2

<b>T(K)</b>	<b>C<sub>p,m</sub>(JK<sup>-1</sup>mol<sup>-1</sup>)</b>	<b>H<sub>T</sub>-H<sub>298.15K</sub>(kJmol<sup>-1</sup>)</b>	<b>S<sub>T</sub>-S<sub>298.15K</sub>(JK<sup>-1</sup>mol<sup>-1</sup>)</b>	<b>G<sub>T</sub>-G<sub>298.15K</sub>(kJmol<sup>-1</sup>)</b>
263.15	705.35	-25.929	-92.42	-1.609
266.15	712.12	-23.802	-84.38	-1.344
269.15	718.34	-21.657	-76.37	-1.103
272.15	724.19	-19.493	-68.37	-0.886
275.15	729.82	-17.312	-60.4	-0.693
278.15	735.36	-15.114	-52.46	-0.523
281.15	740.94	-12.9	-44.54	-0.378
284.15	746.67	-10.668	-36.64	-0.256
287.15	752.66	-8.419	-28.77	-0.158
290.15	758.97	-6.152	-20.91	-0.084
293.15	765.65	-3.865	-13.07	-0.033
296.15	772.67	-1.558	-5.24	-0.005
299.15	779.97	0.787	2.63	-0.001
302.15	787.49	3.138	10.45	-0.021
305.15	795.14	5.512	18.27	-0.064
308.15	802.87	7.909	26.09	-0.13
311.15	810.7	10.329	33.9	-0.22
314.15	818.69	12.773	41.72	-0.334
317.15	827.02	15.242	49.54	-0.471
320.15	835.93	17.736	57.37	-0.631
323.15	845.67	20.258	65.21	-0.815
326.15	856.46	22.811	73.07	-1.022
329.15	868.29	25.398	80.97	-1.253
332.15	880.72	28.022	88.9	-1.508
335.15	892.59	30.682	96.88	-1.787

**Table S5** Smoothed molar heat capacities and thermodynamic functions of complex 3

<b>T(K)</b>	<b>C<sub>p,m</sub>(JK<sup>-1</sup>mol<sup>-1</sup>)</b>	<b>H<sub>T</sub>-H<sub>298.15K</sub>(kJmol<sup>-1</sup>)</b>	<b>S<sub>T</sub>-S<sub>298.15K</sub>(JK<sup>-1</sup>mol<sup>-1</sup>)</b>	<b>G<sub>T</sub>-G<sub>298.15K</sub>(kJmol<sup>-1</sup>)</b>
263.15	1384.72	-51.09	-182.09	-3.173
266.15	1398.26	-46.916	-166.32	-2.651
269.15	1411.3	-42.701	-150.57	-2.176
272.15	1424.19	-38.448	-134.85	-1.748
275.15	1436.99	-34.156	-119.17	-1.367
278.15	1449.67	-29.826	-103.52	-1.033
281.15	1462.17	-25.459	-87.9	-0.746
284.15	1474.45	-21.054	-72.32	-0.505
287.15	1486.57	-16.612	-56.77	-0.312
290.15	1498.62	-12.135	-41.25	-0.165
293.15	1510.75	-7.621	-25.78	-0.064
296.15	1523.13	-3.07	-10.33	-0.01
299.15	1535.89	1.549	5.19	-0.003
302.15	1549.14	6.177	20.58	-0.041
305.15	1562.9	10.845	35.95	-0.126
308.15	1577.1	15.555	51.31	-0.257
311.15	1591.6	20.308	66.66	-0.434
314.15	1606.15	25.104	82	-0.657
317.15	1620.5	29.944	97.34	-0.925
320.15	1634.36	34.827	112.66	-1.24
323.15	1647.53	39.75	127.96	-1.601
326.15	1659.96	44.712	143.25	-2.008
329.15	1671.85	49.709	158.5	-2.461
332.15	1683.74	54.743	173.72	-2.959
335.15	1696.67	59.813	188.92	-3.503

**Table S6** Smoothed molar heat capacities and thermodynamic functions of complex 4

T(K)	C <sub>p,m</sub> (JK <sup>-1</sup> mol <sup>-1</sup> )	H <sub>T</sub> -H <sub>298.15K</sub> (kJmol <sup>-1</sup> )	S <sub>T</sub> -S <sub>298.15K</sub> (JK <sup>-1</sup> mol <sup>-1</sup> )	G <sub>T</sub> -G <sub>298.15K</sub> (kJmol <sup>-1</sup> )
263.15	1511.19	-55.421	-197.55	-3.436
266.15	1524.01	-50.868	-180.34	-2.87
269.15	1536.64	-46.277	-163.19	-2.354
272.15	1549.16	-41.649	-146.09	-1.891
275.15	1561.57	-36.983	-129.04	-1.478
278.15	1573.82	-32.28	-112.04	-1.116
281.15	1585.88	-27.54	-95.09	-0.806
284.15	1597.75	-22.765	-78.19	-0.546
287.15	1609.44	-17.954	-61.35	-0.337
290.15	1621.02	-13.108	-44.56	-0.178
293.15	1632.57	-8.228	-27.83	-0.07
296.15	1644.22	-3.313	-11.15	-0.011
299.15	1656.07	1.671	5.59	-0.003
302.15	1668.22	6.657	22.18	-0.044
305.15	1680.73	11.68	38.72	-0.136
308.15	1693.61	16.742	55.23	-0.277
311.15	1706.8	21.842	71.7	-0.467
314.15	1720.18	26.983	88.14	-0.707
317.15	1733.56	32.164	104.55	-0.995
320.15	1746.72	37.384	120.94	-1.334
323.15	1759.4	42.644	137.29	-1.721
326.15	1771.45	47.94	153.6	-2.157
329.15	1782.8	53.272	169.87	-2.642
332.15	1793.68	58.637	186.1	-3.176
335.15	1804.68	64.034	202.28	-3.759

**Table S7** The CIE coordinates of the title complexes.

Complexes	CIE coordinates		
	x	y	z
1	0.664	0.335	0.000
2	0.324	0.592	0.084
3	0.649	0.350	0.000
4	0.331	0.579	0.090