SUPPORTING INFORMATION

Structure Control and Crystal-to-Crystal Transformation for Two Series of Lanthanide-Organic Coordination Polymers

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S1. Detail experiment for certificating the role of 2,2'-bipyridine

A mixture of H_2CPOB (0.0775g, 0.2mmol), 0.2mmol of $Ln(NO_3)_3 \cdot 6H_2O$ [Ln=Eu (0.0892 d); Gd (0.0902 g); Tb (0.0906 g); Dy (0.0913 g); Ho (0.916 g); Er (0.0887g)], and 8 mL of distilled water were sealed in a Teflon-lined stainless vessel (25 mL) then added 5-10 drops of ammonia (0.1M) and heated at 130 ℃ or 180 ℃ for 72 h under autogenous pressure. The vessel was then cooled slowly down to room temperature at 2 ℃/h. Block crystals were obtained and the PXRD patterns indicate that these crystals have same structure as they were synthesized using 2,2'-bipyridine.

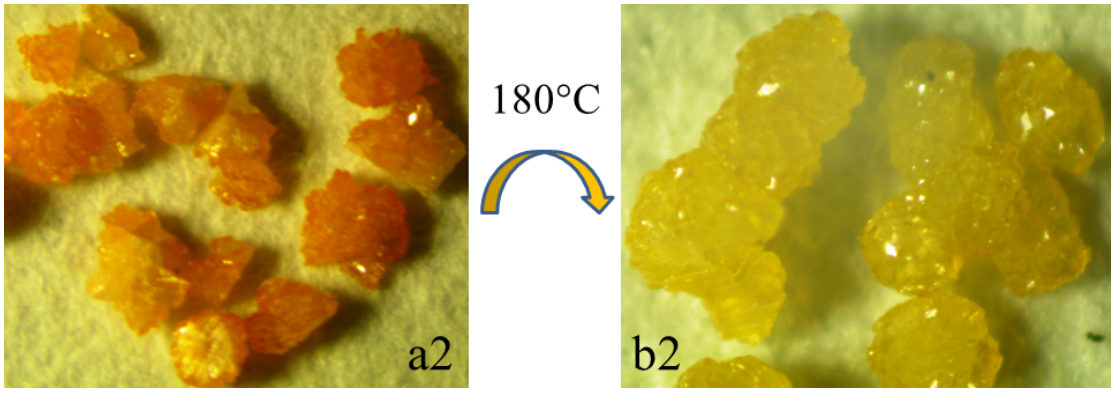

Figure S1 Morphology of crystal-to-crystal transformation

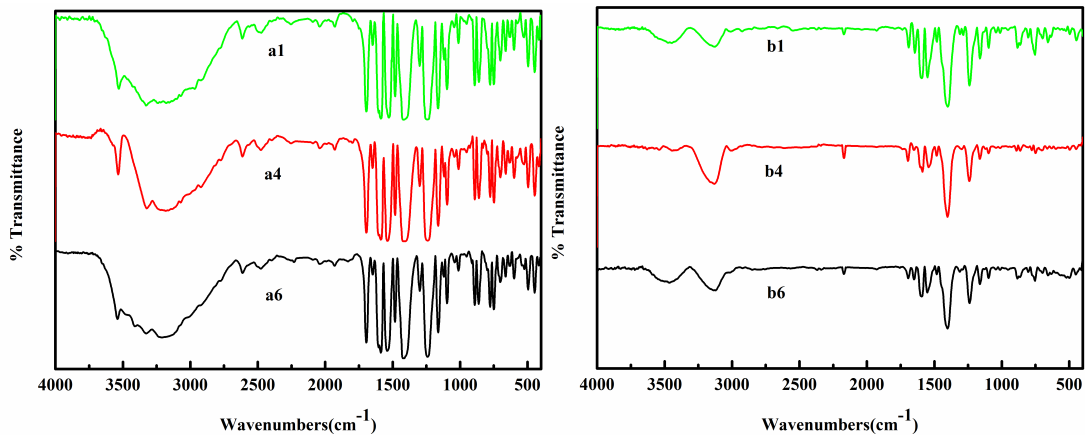

Figure S2. IR spectra of *Series* ***a*** and *Series* ***b***

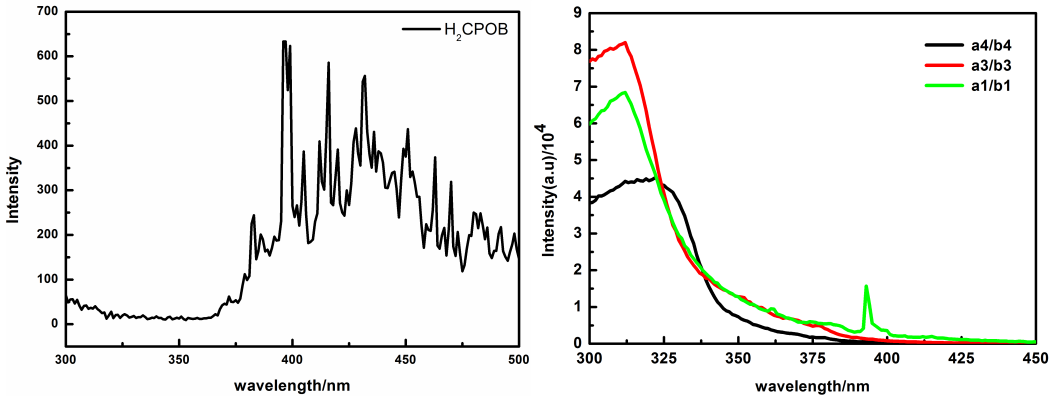

Figure S3.Solid-state excitation spectrum of H_2CPOB (left) and Samples (right)

Table S1. Average bond length of Ln-O for **a**2-**a**6 and **b**1-**b**6

Compounds	bond length/(Å)	Compounds	bond length(Å)
a2	2.417	**b1**	2.354
a3	2.400	**b2**	2.348
a4	2.403	**b3**	2.330
a5	2.375	**b4**	2.312
a6	2.365	**b5**	2.302
		b6	2.289

Table S2 Selected bond lengths(Å) and angles(°) for compounds in Series ***a*** and Series ***b***

a2			
Gd1-O1	2.519(4)	Gd1-O9	2.409(4)
Gd1-O2	2.396(4)	Gd1-O10	2.487(4)
Gd1-O6	2.332(4)	Gd1-O11	2.419(4)
Gd1-O7	2.342(4)	Gd1-O12	2.431(4)
O6-Gd1-O7	115.00(17)	O9-Gd1-O12	75.72(14)
O6-Gd1-O2	95.49(16)	O6-Gd1-O10	76.92(14)
O6-Gd1-O9	79.74(15)	O7-Gd1-O10	92.75(15)
O2-Gd1-O9	71.80(15)	O2-Gd1-O10	124.80(14)
O6-Gd1-O11	71.96(14)	O9-Gd1-O10	53.01(14)
O7-Gd1-O11	79.53(15)	O12-Gd1-O10	76.30(14)
O2-Gd1-O11	82.14(15)	O6-Gd1-O1	131.62(15)
O6-Gd1-O12	151.16(14)	O7-Gd1-O1	84.25(16)
O7-Gd1-O12	76.86(15)	O2-Gd1-O1	52.67(13)
O2-Gd1-O12	91.08(15)	O9-Gd1-O1	114.31(15)
O6-Gd1-O7	115.00(17)	O11-Gd1-O1	68.64(15)
O10-Gd1-O1	149.51(14)	O12-Gd1-O1	73.47(14)
O6-Gd1-O6	67.90(15)	O11-Gd1-O6	76.17(13)
O7-Gd1-O6	48.82(15)	O12-Gd1-O6	112.00(13)
O9-Gd1-O6	119.44(14)	O10-Gd1-O6	70.15(13)

a3			
Tb1-O1	2.418(5)	Tb1-O5	2.503(5)
Tb1-O2	2.404(5)	Tb1-O6	2.377(5)
Tb1-O3	2.313(5)	Tb1-O7	2.399(5)
Tb1- O4	2.317(5)	Tb1-O8	2.466(5)
O6-Tb1-O8	125.25(16)	O6-Tb1-O2	83.05(18)
O7-Tb1-O8	53.25(16)	O4-Tb1-O1	77.29(17)
O1-Tb1-O8	76.36(16)	O6-Tb1-O1	91.51(19)
O4-Tb1-O5	85.78(17)	O7-Tb1-O1	75.41(17)
O6-Tb1-O5	52.73(16)	O3-Tb1-O8	76.87(18)
O7-Tb1-O5	114.62(15)	O4-Tb1-O8	91.21(18)
O2-Tb1-O5	68.68(15)	O6-Tb1-O7	71.99(17)
O1-Tb1-O5	74.24(17)	O3-Tb1-O2	71.77(17)
O3-Tb1-O4	113.95(17)	O4-Tb1-O2	79.08(19)
O3-Tb1-O6	95.15(19)	O3-Tb1-O7	80.01(17)

a4			
Dy1-O1	2.421(5)	Dy1-O5	2.487(6)
Dy1-O2	2.404(5)	Dy1-O6	2.392(5)
Dy1-O3	2.382(5)	Dy1-O7	2.318(5)
Dy1-O4	2.497(5)	Dy1-O12	2.324(5)
O7-Dy1-O12	114.06(18)	O1-Dy1-O5	75.47(17)
O7-Dy1-O3	95.25(18)	O12-Dy1-O4	85.37(18)
O7-Dy1-O6	79.56(17)	O3-Dy1-O4	52.83(16)
O3-Dy1-O6	72.21(19)	O6-Dy1-O4	114.75(16)
O7-Dy1-O2	72.37(18)	O2-Dy1-O4	68.58(17)
O12-Dy1-O2	78.97(19)	O1-Dy1-O4	74.72(18)
O3-Dy1-O2	82.59(19)	O7-Dy1-O5	76.61(18)
O12-Dy1-O1	77.74(17)	O12-Dy1-O5	91.43(19)
O3-Dy1-O1	91.83(17)	O3-Dy1-O5	125.42(18)
O6-Dy1-O1	74.86(17)	O6-Dy1-O5	53.21(16)

a5			
Ho1-O1	2.361(3)	Ho1-O9	2.368(3)
Ho1-O2	2.487(3)	Ho1-O10	2.445(4)
Ho1-O6	2.271(4)	Ho1-O11	2.379(3)
Ho1-O7	2.300(3)	Ho1-O12	2.387(3)
O12-Ho1-O10	77.33(11)	O7-Ho1-O12	77.87(12)
O6-Ho1-O2	130.61(13)	O1-Ho1-O12	92.36(13)
O7-Ho1-O2	87.75(12)	O9-Ho1-O12	76.07(12)
O1-Ho1-O2	53.48(11)	O6-Ho1-O10	76.82(13)
O9-Ho1-O2	115.37(11)	O7-Ho1-O10	88.48(12)
O11-Ho1-O2	68.98(11)	O1-Ho1-O10	126.42(11)
O12-Ho1-O2	73.91(12)	O9-Ho1-O10	53.99(11)
O6-Ho1-O7	112.56(13)	O1-Ho1-O9	72.45(12)
O6-Ho1-O1	93.84(14)	O6-Ho1-O11	71.67(12)
O6-Ho1-O9	79.61(12)	O7-Ho1-O11	78.77(13)
O1-Ho1-O11	83.48(12)		

a6			
Er1-O1	2.380(6)	Er1-O5	2.472(5)
Er1-O2	2.378(6)	Er1-O6	2.339(5)
Er1-O3	2.263(6)	Er1-O9	2.439(5)
Er1-O4	2.288(5)	Er1-O10	2.365(5)
O6-Er1-O2	93.6(2)	O1-Er1-O5	68.95(19)
O6-Er1-O5	54.03(17)	O4-Er1-O2	78.3(2)
O6-Er1-O9	126.66(18)	O4-Er1-O5	89.28(18)
O6-Er1-O10	72.66(19)	O4-Er1-O9	86.93(19)
O10-Er1-O2	75.85(19)	O4-Er1-O10	136.9(2)

O10-Er1-O5	115.74(18)	O6-Er1-O1	83.6(2)
O10-Er1-O9	54.06(17)	O3-Er1-O5	130.4(2)
O2-Er1-O5	74.66(19)	O3-Er1-O6	92.9(2)
O2-Er1-O9	77.07(19)	O3-Er1-O9	76.6(2)
O3-Er1-O1	71.8(2)	O3-Er1-O10	79.5(2)
O3-Er1-O4	111.6(2)	O4-Er1-O1	78.7(2)

b1

Eu1-O1	2.485(4)	Eu1-O7	2.303(4)
Eu1-O4	2.331(4)	Eu1-O9	2.365(4)
Eu1-O5	2.252(4)	Eu1-O10	2.397(4)
Eu1-O6	2.346(4)		
O6-Eu1-O9	75.41(14)	O5-Eu1-O6	96.70(14)
O6-Eu1-O9	72.91(13)	O5-Eu1-O7	112.65(15)
O6-Eu1-O10	82.09(14)	O5-Eu1-O9	82.26(13)
O7-Eu1-O4	73.78(14)	O5-Eu1-O9	161.05(12)
O7-Eu1-O6	131.92(13)		
O7-Eu1-O9	67.27(14)	O6-Eu1-O1	75.04(13)
O7-Eu1-O9	72.08(15)	O1-Eu1-O9	114.70(12)
O7-Eu1-O10	89.56(16)	O4 Eu1 O1	74.86(14)
O9-Eu1-O1	140.87(14)	O4-Eu1-O9	136.53(15)
O9-Eu1-O9	79.81(14)	O4-Eu1-O9	110.47(12)
O9-Eu1-O10	126.34(14)	O4-Eu1-O10	78.96(14)
O10-Eu1-O1	73.62(14)	O5-Eu1-O1	76.34(14)
O10-Eu1-O9	46.92(12)	O5-Eu1-O4	86.86(13)

b2

Gd1-O1	2.260(8)	Gd1-O7	2.395(7)
Gd1-O2	2.309(8)	Gd1-O9	2.340(8)
Gd1-O5	2.481(8)	Gd1-O10	2.289(9)
Gd1-O6	2.361(8)		
O1-Gd1-O10	113.3(3)	O1-Gd1-O5	76.2(3)
O1-Gd1-O2	86.4(3)	O7-Gd1-O5	74.2(3)
O10-Gd1-O2	74.1(3)	O2-Gd1-O5	74.6(3)
O1-Gd1-O9	97.3(3)	O9-Gd1-O5	75.3(3)
O10-Gd1-O9	131.3(3)	O10-Gd1-O7	88.5(3)
O1-Gd1-O6	81.7(3)	O2-Gd1-O7	79.5(3)
O10-Gd1-O6	72.3(3)	O9-Gd1-O7	81.6(3)
O2-Gd1-O6	136.0(3)	O9-Gd-O6	76.0(3)

b3

Tb1-O1	2.456(8)	Tb1-O7	2.365(8)
Tb1-O4	2.318(7)	Tb1-O9	2.321(7)

Tb1-O5	2.231(7)	Tb1-O10	2.281(8)
Tb1-O6	2.329(8)		
O4-Tb1-O1	75.4(3)	O9-Tb1-O6	75.6(3)
O4-Tb1-O7	80.1(3)	O9-Tb1-O7	81.3(3)
O5-Tb1-O1	76.6(3)	O10-Tb1-O4	73.7(3)
O5-Tb1-O4	86.7(3)	O10-Tb1-O6	72.6(3)
O5-Tb1-O6	81.3(3)	O10-Tb1-O7	87.6(3)
O5-Tb1-O9	97.6(3)	O6-Tb1-O7	125.7(3)
O5-Tb1-O10	113.6(3)	O7-Tb1-O1	75.0(3)
O9-Tb1-O1	75.3(3)		

b4			
Dy1-O1	2.426(8)	Dy1-O7	2.289(8)
Dy1-O4	2.311(7)	Dy1-O9	2.343(9)
Dy1-O5	2.199(8)	Dy1-O10	2.335(9)
Dy1-O6	2.280(8)		
O5-Dy1-O6	112.9(3)	O10-Dy1-O9	125.9(3)
O5-Dy1-O7	99.6(3)	O5-Dy1-O1	76.2(3)
O5-Dy1-O4	87.0(3)	O7-Dy1-O1	75.8(3)
O6-Dy1-O4	73.8(3)	O4-Dy1-O1	74.6(3)
O7-Dy1-O4	147.1(3)	O10-Dy1-O9	125.9(3)
O5-Dy1-O10	82.0(3)	O5-Dy1- O1	76.2(3)
O6-Dy1-O10	72.3(3)	O6-Dy1-O9	87.9(3)
O7-Dy1-O10	76.2(3)	O7-Dy1-O9	80.3(3)
O4-Dy1-O10	136.7(3)	O4-Dy1-O9	78.4(3)

b5			
Ho1-O1	2.420(6)	Ho1-O7	2.304(6)
Ho1-O4	2.289(5)	Ho1-O9	2.293(6)
Ho1-O5	2.216(5)	Ho1-O10	2.258(6)
Ho1-O6	2.333(6)		
O5-Ho1-O10	113.7(2)	O5-Ho1-O1	77.0(2)
O5-Ho1-O4	86.91(18)	O4-Ho1-O1	75.3(2)
O10-Ho1-O4	74.0(2)	O9-Ho1-O1	75.3(2)
O5-Ho1-O9	98.61(19)	O6-Ho1-O1	75.5(2)
O10-Ho1-O9	129.90(19)	O10-Ho1-O6	86.6(2)
O4-Ho1-O9	147.9(2)	O4-Ho1-O6	79.7(2)
O5-Ho1-O7	80.6(2)	O9-Ho1-O6	80.8(2)
O10-Ho1-O7	72.4(2)	O9-Ho1-O7	76.6(2)

b6			
Er1-O1	2.199(4)	Er1-O7	2.327(5)
Er1-O2	2.281(4)	Er1-O9	2.284(4)

Er1-O5	2.414(5)	Er1-O10	2.237(4)
Er1-O6	2.282(5)		
O1-Er1-O2	86.57(15)	O9-Er1-O5	75.09(16)
O1-Er1-O5	76.97(18)	O9-Er1-O7	80.95(17)
O1-Er1-O6	80.37(17)	O10-Er1-O2	74.08(16)
O1-Er1-O9	98.75(16)	O10-Er1-O6	73.35(19)
O1-Er1-O10	114.37(19)	O10-Er1-O7	85.49(19)
O2-Er1-O5	75.38(17)	O10-Er1-O9	129.59(15)
O2-Er1-O6	135.67(19)	O6-Er1-O7	125.98(16)
O2-Er1-O7	79.93(17)	O6-Er1-O9	76.28(18)
O7-Er1-O5	75.87(16)		