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Supporting Information

Chemical stability and tunable luminescence of Ln(III)-K(I) coordination polymers featuring a tracery-like architecture

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Table S1 Selected bond lengths and angles for compounds **1–3.**

Compound 1			
Eu1—O6^{i}	2.339 (5)	O3—K1^{viii}	2.773 (5)
Eu1—O8^{ii}	2.353 (5)	O4—Eu1^{ix}	2.428 (4)
Eu1—O5	2.360 (5)	O4—K1^{viii}	3.065 (5)
Eu1—O9	2.419 (5)	O4—K1^{vii}	3.102 (5)
Eu1—O4^{iii}	2.428 (5)	O1—K1^{x}	2.933 (5)
Eu1—O1	2.449 (4)	O2—Eu1^{ix}	2.453 (4)
Eu1—O2^{iii}	2.453 (4)	O2—K1^{v}	2.930 (5)
Eu1—O3	2.461 (4)	O2—K1^{x}	3.053 (5)
K1—O7	2.752 (5)	O6—Eu1^{i}	2.339 (5)
K1—O3^{iv}	2.773 (5)	O6—K1^{i}	3.031 (5)
K1—O2^{v}	2.930 (5)	O8—Eu1^{xi}	2.353 (5)
K1—O1^{vi}	2.933 (5)	K1—O2^{vi}	3.053 (5)
K1—O9	2.956 (5)	K1—O4^{iv}	3.065 (5)
K1—O6^{i}	3.031 (5)	K1—O4^{vii}	3.102 (5)
O6^{i}—Eu1—O8^{ii}	75.95 (16)	O7—S1—K1	36.3 (2)
O6^{i}—Eu1—O5	79.64 (16)	O5—S1—K1	82.3 (2)
O8^{ii}—Eu1—O5	133.56 (19)	O8—S1—K1	143.6 (2)
O6^{i}—Eu1—O9	95.53 (17)	O6—S1—K1	98.5 (2)
O8^{ii}—Eu1—O9	70.82 (16)	Eu1—O9—K1	96.31 (16)
O5—Eu1—O9	72.99 (17)	C2—O3—Eu1	118.7 (4)
O6^{i}—Eu1—O4^{iii}	87.53 (17)	C2—O3—K1^{viii}	97.1 (4)
O8^{ii}—Eu1—O4^{iii}	78.77 (16)	Eu1—O3—K1^{viii}	115.14 (17)
O5—Eu1—O4^{iii}	138.92 (16)	C2—O4—Eu1^{ix}	118.1 (4)
O9—Eu1—O4^{iii}	147.61 (15)	C2—O4—K1^{viii}	84.0 (4)
O6^{i}—Eu1—O1	147.12 (15)	Eu1^{ix}—O4—K1^{viii}	138.75 (19)
O8^{ii}—Eu1—O1	73.63 (16)	C2—O4—K1^{vii}	105.6 (4)
O5—Eu1—O1	131.41 (15)	Eu1^{ix}—O4—K1^{vii}	110.84 (16)
O9—Eu1—O1	86.08 (16)	K1^{viii}—O4—K1^{vii}	93.67 (12)
O4^{iii}—Eu1—O1	74.65 (15)	C1—O1—Eu1	119.6 (4)
O6^{i}—Eu1—O2^{iii}	92.58 (17)	C1—O1—K1^{x}	89.4 (4)
O8^{ii}—Eu1—O2^{iii}	144.66 (16)	Eu1—O1—K1^{x}	115.90 (17)
O5—Eu1—O2^{iii}	74.46 (17)	C1—O2—Eu1^{ix}	117.3 (4)
O9—Eu1—O2^{iii}	144.34 (15)	C1—O2—K1^{v}	123.0 (4)
O4^{iii}—Eu1—O2^{iii}	67.27 (15)	Eu1^{ix}—O2—K1^{v}	110.14 (16)
O1—Eu1—O2^{iii}	105.13 (16)	C1—O2—K1^{x}	84.2 (4)
O6^{i}—Eu1—O3	147.81 (15)	Eu1^{ix}—O2—K1^{x}	120.89 (18)
O8^{ii}—Eu1—O3	132.75 (15)	K1^{v}—O2—K1^{x}	97.49 (13)
O5—Eu1—O3	69.44 (16)	S1—O7—K1	125.4 (3)
O9—Eu1—O3	84.09 (16)	S1—O5—Eu1	145.4 (3)
O4^{iii}—Eu1—O3	109.81 (15)	S1—O6—Eu1^{i}	136.8 (3)
O1—Eu1—O3	65.07 (14)	S1—O6—K1^{i}	126.8 (3)

O2^{iii}—Eu1—O3	71.11 (15)	Eu1^{i}—O6—K1^{i}	96.06 (16)
O7—K1—O3^{iv}	157.29 (16)	O1^{vi}—K1—O4^{iv}	104.33 (14)
O7—K1—O2^{v}	134.11 (16)	O9—K1—O4^{iv}	120.23 (14)
O3^{iv}—K1—O2^{v}	60.06 (13)	O6^{i}—K1—O4^{iv}	67.92 (13)
O7—K1—O1^{vi}	69.68 (15)	O2^{vi}—K1—O4^{iv}	80.31 (13)
O3^{iv}—K1—O1^{vi}	88.30 (14)	O7—K1—O4^{vii}	61.99 (15)
O2^{v}—K1—O1^{vi}	115.47 (14)	O3^{iv}—K1—O4^{vii}	111.68 (14)
O7—K1—O9	73.84 (16)	O2^{v}—K1—O4^{vii}	81.65 (14)
O3^{iv}—K1—O9	128.24 (14)	O1^{vi}—K1—O4^{vii}	58.60 (13)
O2^{v}—K1—O9	73.73 (13)	O9—K1—O4^{vii}	81.17 (13)
O1^{vi}—K1—O9	134.81 (14)	O6^{i}—K1—O4^{vii}	136.83 (13)
O7—K1—O6^{i}	78.09 (15)	O2^{vi}—K1—O4^{vii}	95.23 (13)
O3^{iv}—K1—O6^{i}	111.49 (14)	O4^{iv}—K1—O4^{vii}	154.18 (7)
O2^{v}—K1—O6^{i}	120.47 (14)	O7—K1—C1^{vi}	57.40 (17)
O1^{vi}—K1—O6^{i}	123.33 (13)	O3^{iv}—K1—C1^{vi}	100.05 (15)
O9—K1—O6^{i}	72.09 (13)	O2^{v}—K1—C1^{vi}	138.73 (16)
O7—K1—O2^{vi}	64.21 (15)	O1^{vi}—K1—C1^{vi}	23.33 (14)
O3^{iv}—K1—O2^{vi}	96.23 (14)	O9—K1—C1^{vi}	131.02 (15)
O2^{v}—K1—O2^{vi}	151.92 (9)	O7—K1—O4^{iv}	134.22 (16)
O1^{vi}—K1—O2^{vi}	43.76 (12)	O3^{iv}—K1—O4^{iv}	44.59 (12)
O9—K1—O2^{vi}	133.64 (14)	O2^{v}—K1—O4^{iv}	90.42 (13)
O6^{i}—K1—O2^{vi}	80.55 (13)		

Symmetry codes: (i) −*x*−1, −*y*, −*z*−1; (ii) *x*+1, *y*, *z*; (iii) −*x*, *y*+1/2, −*z*−1/2; (iv) *x*, −*y*−1/2, *z*−1/2; (v) −*x*, −*y*−1, −*z*−1; (vi) *x*−1, −*y*−1/2, *z*−1/2; (vii) −*x*−1, −*y*−1, −*z*−1; (viii) *x*, −*y*−1/2, *z*+1/2; (ix) −*x*, *y*−1/2, −*z*−1/2; (x) *x*+1, −*y*−1/2, *z*+1/2; (xi) *x*−1, *y*, z

Compound 2			
Tb1—O6^{i}	2.325 (7)	O8—K1^{i}	2.759 (8)
Tb1—O5	2.333 (9)	O1—K1^{iv}	2.769 (7)
Tb1—O7^{ii}	2.345 (8)	O3—K1^{viii}	2.923 (8)
Tb1—O9	2.401 (7)	O7—Tb1^{ix}	2.345 (8)
Tb1—O2^{iii}	2.409 (7)	O2—Tb1^{viii}	2.409 (7)
Tb1—O3	2.436 (7)	O2—K1^{iv}	3.054 (7)
Tb1—O4^{iii}	2.442 (7)	O2—K1^{x}	3.106 (8)
Tb1—O1	2.448 (6)	O6—Tb1^{i}	2.325 (7)
K1—O8^{i}	2.759 (8)	O4—Tb1^{viii}	2.442 (7)
K1—O1^{v}	2.769 (7)	O4—K1^{xi}	2.924 (7)
K1—O3^{iii}	2.923 (8)	O4—K1^{viii}	3.038 (8)
K1—O4^{vi}	2.924 (7)	O9—K1^{i}	2.951 (8)
K1—O9^{i}	2.951 (8)	K1—O6	3.043 (8)
K1—O4^{iii}	3.038 (8)	K1—O2^{v}	3.054 (7)
O6^{i}—Tb1—O5	80.0 (2)	Tb1—O1—K1^{iv}	115.5 (3)
O6^{i}—Tb1—O7^{ii}	75.9 (2)	Tb1—O3—K1^{viii}	116.1 (3)
O5—Tb1—O7^{ii}	133.0 (3)	S1—O5—Tb1	145.6 (5)
O6^{i}—Tb1—O9	97.1 (2)	S1—O7—Tb1^{ix}	149.7 (4)
O5—Tb1—O9	72.9 (2)	Tb1^{viii}—O2—K1^{iv}	139.4 (3)
O7^{ii}—Tb1—O9	70.9 (2)	Tb1^{viii}—O2—K1^{x}	110.7 (2)
O6^{i}—Tb1—O2^{iii}	85.9 (2)	K1^{iv}—O2—K1^{x}	94.0 (2)
O5—Tb1—O2^{iii}	139.1 (2)	Tb1^{i}—O6—K1	94.9 (2)
O7^{ii}—Tb1—O2^{iii}	78.4 (3)	Tb1^{viii}—O4—K1^{xi}	110.5 (2)
O9—Tb1—O2^{iii}	147.3 (2)	Tb1^{viii}—O4—K1^{viii}	121.8 (3)
O6^{i}—Tb1—O3	146.5 (2)	K1^{xi}—O4—K1^{viii}	98.2 (2)
O5—Tb1—O3	131.9 (2)	Tb1—O9—K1^{i}	95.6 (3)
O7^{ii}—Tb1—O3	73.7 (2)	O1^{v}—K1—O2^{vii}	110.6 (2)
O9—Tb1—O3	85.8 (2)	O3^{iii}—K1—O2^{vii}	58.3 (2)
O2^{iii}—Tb1—O3	74.8 (2)	O4^{vi}—K1—O2^{vii}	80.6 (2)
O6^{i}—Tb1—O4^{iii}	91.1 (2)	O9^{i}—K1—O2^{vii}	81.6 (2)
O5—Tb1—O4^{iii}	74.0 (3)	O4^{iii}—K1—O2^{vii}	95.4 (2)
O7^{ii}—Tb1—O4^{iii}	144.9 (2)	O6—K1—O2^{vii}	137.55 (19)
O9—Tb1—O4^{iii}	143.9 (2)	O2^{v}—K1—O2^{vii}	153.17 (11)
O2^{iii}—Tb1—O4^{iii}	68.1 (2)	O8^{i}—K1—O2^{vii}	61.8 (2)
O3—Tb1—O4^{iii}	106.1 (2)	O9^{i}—K1—O4^{iii}	133.5 (2)
O6^{i}—Tb1—O1	147.7 (2)	O8^{i}—K1—O6	78.9 (2)
O5—Tb1—O1	69.4 (2)	O1^{v}—K1—O6	111.9 (2)
O7^{ii}—Tb1—O1	133.4 (2)	O3^{iii}—K1—O6	123.0 (2)
O9—Tb1—O1	84.0 (2)	O4^{vi}—K1—O6	122.1 (2)
O2^{iii}—Tb1—O1	110.5 (2)	O9^{i}—K1—O6	72.4 (2)

O3—Tb1—O1	65.7 (2)	O4^{iii}—K1—O6	80.04 (19)
O4^{iii}—Tb1—O1	71.1 (2)	O8^{i}—K1—O2^{v}	134.5 (2)
O6^{i}—Tb1—K1^{i}	49.56 (17)	O1^{v}—K1—O2^{v}	44.79 (18)
O5—Tb1—K1^{i}	69.4 (2)	O3^{iii}—K1—O2^{v}	103.7 (2)
O7^{ii}—Tb1—K1^{i}	64.2 (2)	O4^{vi}—K1—O2^{v}	91.0 (2)
O9—Tb1—K1^{i}	47.51 (19)	O9^{i}—K1—O2^{v}	120.9 (2)
O2^{iii}—Tb1—K1^{i}	126.16 (17)	O6—K1—O2^{v}	68.01 (19)
O3—Tb1—K1^{i}	124.20 (16)	O3^{iii}—K1—O4^{iii}	43.94 (18)
O4^{iii}—Tb1—K1^{i}	129.47 (18)	O4^{vi}—K1—O4^{iii}	150.85 (13)
O1—Tb1—K1^{i}	123.29 (16)	O7^{ii}—Tb1—K1^{iv}	164.43 (17)
O6^{i}—Tb1—K1^{iv}	118.92 (17)	O9—Tb1—K1^{iv}	109.64 (18)
O5—Tb1—K1^{iv}	58.9 (2)	O2^{iii}—Tb1—K1^{iv}	96.93 (19)
O8^{i}—K1—O3^{iii}	69.1 (2)	O3—Tb1—K1^{iv}	90.78 (17)
O1^{v}—K1—O3^{iii}	87.5 (2)	O4^{iii}—Tb1—K1^{iv}	38.34 (16)
O8^{i}—K1—O4^{vi}	133.8 (2)	O1—Tb1—K1^{iv}	34.45 (16)
O1^{v}—K1—O4^{vi}	59.9 (2)	K1^{i}—Tb1—K1^{iv}	128.29 (11)
O3^{iii}—K1—O4^{vi}	114.1 (2)	O8^{i}—K1—O1^{v}	156.1 (2)
O8^{i}—K1—O9^{i}	74.0 (2)	O4^{iii}—K1—O2^{v}	79.7 (2)
O1^{v}—K1—O9^{i}	129.0 (2)	O8^{i}—K1—O4^{iii}	64.2 (2)
O3^{iii}—K1—O9^{i}	134.7 (2)	O1^{v}—K1—O4^{iii}	95.7 (2)

Symmetry codes: (i) −*x*, −*y*+2, −*z*; (ii) *x*+1, *y*, *z*; (iii) −*x*+1, *y*+1/2, −*z*+1/2; (iv) −*x*, *y*−1/2, −*z*+1/2; (v) −*x*, *y*+1/2, −*z*+1/2; (vi) *x*−1, *y*+1, *z*; (vii) *x*, *y*+1, *z*; (viii) −*x*+1, *y*−1/2, −*z*+1/2; (ix) *x*−1, *y*, *z*; (x) *x*, *y*−1, *z*; (xi) *x*+1, *y*−1, *z*.

Compound 3			
Dy1—O8^{i}	2.302 (3)	O9—K1^{iv}	2.942 (3)
Dy1—O5	2.329 (3)	O3—K1^{ii}	2.759 (3)
Dy1—O7^{ii}	2.330 (3)	O4—Dy1^{xi}	2.390 (3)
Dy1—O9	2.376 (3)	O4—K1^{ii}	3.050 (3)
Dy1—O4^{iii}	2.390 (3)	O4—K1^{xi}	3.095 (3)
Dy1—O2	2.412 (3)	O6—K1^{x}	2.756 (3)
Dy1—O1^{iii}	2.422 (3)	O7—Dy1^{vi}	2.330 (3)
Dy1—O3	2.425 (2)	O1—Dy1^{xi}	2.422 (3)
Dy1—K1^{iv}	3.9729 (15)	O1—K1^{ix}	2.914 (3)
Dy1—K1^{ii}	4.3952 (13)	O8—Dy1^{i}	2.302 (3)
K1—O6^{v}	2.756 (3)	O8—K1^{vii}	3.024 (3)
K1—O3^{vi}	2.759 (3)	K1—O8^{ix}	3.024 (3)
K1—O1^{vii}	2.914 (3)	K1—O4^{vi}	3.050 (3)
K1—O2	2.923 (3)	K1—O4^{iii}	3.095 (3)
K1—O9^{viii}	2.942 (3)	K1—O1	3.027 (3)
O8^{i}—Dy1—O5	75.83 (9)	Dy1—O9—K1^{iv}	96.08 (9)
O8^{i}—Dy1—O7^{ii}	79.55 (9)	Dy1—O2—K1	116.25 (10)
O5—Dy1—O7^{ii}	132.99 (12)	Dy1—O3—K1^{ii}	115.82 (10)
O8^{i}—Dy1—O9	96.69 (10)	Dy1^{xi}—O4—K1^{ii}	139.44 (11)
O5—Dy1—O9	70.72 (9)	Dy1^{xi}—O4—K1^{xi}	111.05 (9)
O7^{ii}—Dy1—O9	73.21 (10)	K1^{ii}—O4—K1^{xi}	93.71 (7)
O8^{i}—Dy1—O4^{iii}	86.40 (9)	Dy1^{xi}—O1—K1^{ix}	110.58 (9)
O5—Dy1—O4^{iii}	78.33 (10)	Dy1^{xi}—O1—K1	121.90 (11)
O7^{ii}—Dy1—O4^{iii}	139.19 (10)	K1^{ix}—O1—K1	97.98 (7)
O9—Dy1—O4^{iii}	146.99 (8)	S1—O8—Dy1^{i}	138.46 (17)
O8^{i}—Dy1—O2	146.69 (8)	S1—O8—K1^{vii}	125.79 (15)
O5—Dy1—O2	73.61 (9)	Dy1^{i}—O8—K1^{vii}	95.52 (9)
O7^{ii}—Dy1—O2	132.03 (9)	O2—K1—O4^{iii}	57.89 (8)
O9—Dy1—O2	85.53 (9)	O9^{viii}—K1—O4^{iii}	82.40 (7)
O4^{iii}—Dy1—O2	74.80 (9)	O1—K1—O4^{iii}	95.04 (7)
O8^{i}—Dy1—O1^{iii}	91.27 (9)	O8^{ix}—K1—O4^{iii}	137.41 (7)
O7^{ii}—Dy1—O1^{iii}	74.04 (10)	O4^{vi}—K1—O4^{iii}	153.07 (4)
O9—Dy1—O1^{iii}	144.18 (8)	O1^{vii}—K1—O9^{viii}	75.13 (7)
O4^{iii}—Dy1—O1^{iii}	68.14 (8)	O2—K1—O9^{viii}	135.12 (8)
O2—Dy1—O1^{iii}	106.27 (9)	O6^{v}—K1—O1	64.13 (8)
O8^{i}—Dy1—O3	147.29 (8)	O3^{vi}—K1—O1	95.88 (8)
O5—Dy1—O3	133.61 (8)	O1^{vii}—K1—O1	150.75 (5)
O7^{ii}—Dy1—O3	69.31 (9)	O2—K1—O1	44.08 (7)
O9—Dy1—O3	83.99 (9)	O9^{viii}—K1—O1	133.37 (8)
O4^{iii}—Dy1—O3	110.62 (9)	O6^{v}—K1—O8^{ix}	78.79 (8)

O2—Dy1—O3	66.01 (8)	O3^{vi}—K1—O8^{ix}	112.23 (8)
O1^{iii}—Dy1—O3	71.16 (8)	O1^{vii}—K1—O8^{ix}	122.06 (8)
O8^{i}—Dy1—K1^{iv}	49.26 (7)	O2—K1—O8^{ix}	123.23 (8)
O5—Dy1—K1^{iv}	64.25 (8)	O9^{viii}—K1—O8^{ix}	71.71 (8)
O7^{ii}—Dy1—K1^{iv}	69.27 (9)	O1—K1—O8^{ix}	80.15 (7)
O9—Dy1—K1^{iv}	47.43 (7)	O6^{v}—K1—O4^{vi}	134.61 (9)
O4^{iii}—Dy1—K1^{iv}	126.34 (6)	O3^{vi}—K1—O4^{vi}	44.99 (7)
O2—Dy1—K1^{iv}	124.03 (6)	O1^{vii}—K1—O4^{vi}	90.78 (8)
O1^{iii}—Dy1—K1^{iv}	129.46 (7)	O2—K1—O4^{vi}	103.90 (8)
O3—Dy1—K1^{iv}	123.01 (6)	O9^{viii}—K1—O4^{vi}	120.30 (8)
O8^{i}—Dy1—K1^{ii}	118.89 (6)	O1—K1—O4^{vi}	79.83 (7)
O5—Dy1—K1^{ii}	164.51 (7)	O8^{ix}—K1—O4^{vi}	68.20 (7)
O7^{ii}—Dy1—K1^{ii}	59.01 (9)	O6^{v}—K1—O4^{iii}	61.64 (8)
O9—Dy1—K1^{ii}	109.85 (6)	O3^{vi}—K1—O4^{iii}	110.36 (8)
O4^{iii}—Dy1—K1^{ii}	96.93 (6)	O1^{vii}—K1—O4^{iii}	80.86 (8)
O2—Dy1—K1^{ii}	90.93 (6)	O3^{vi}—K1—O2	87.48 (8)
O1^{iii}—Dy1—K1^{ii}	38.37 (6)	O1^{vii}—K1—O2	113.92 (8)
O3—Dy1—K1^{ii}	34.40 (6)	O6^{v}—K1—O9^{viii}	74.27 (8)
K1^{iv}—Dy1—K1^{ii}	128.18 (3)	O3^{vi}—K1—O9^{viii}	128.81 (8)
O6^{v}—K1—O3^{vi}	156.04 (9)	O3^{vi}—K1—O1^{vii}	59.55 (8)
O6^{v}—K1—O1^{vii}	133.90 (9)	O6^{v}—K1—O2	69.04 (9)

Symmetry codes: (i) −*x*+2, −*y*, −*z*; (ii) *x*+1, *y*, *z*; (iii) −*x*+2, *y*+1/2, −*z*−1/2; (iv) *x*+1, −*y*−1/2, *z*+1/2; (v) *x*, −*y*−1/2, *z*−1/2; (vi) *x*−1, *y*, *z*; (vii) −*x*+1, *y*+1/2, −*z*−1/2; (viii) *x*−1, −*y*−1/2, *z*−1/2; (ix) −*x*+1, *y*−1/2, −*z*−1/2; (x) *x*, −*y*−1/2, *z*+1/2; (xi) −*x*+2, *y*−1/2, −*z*−1/2

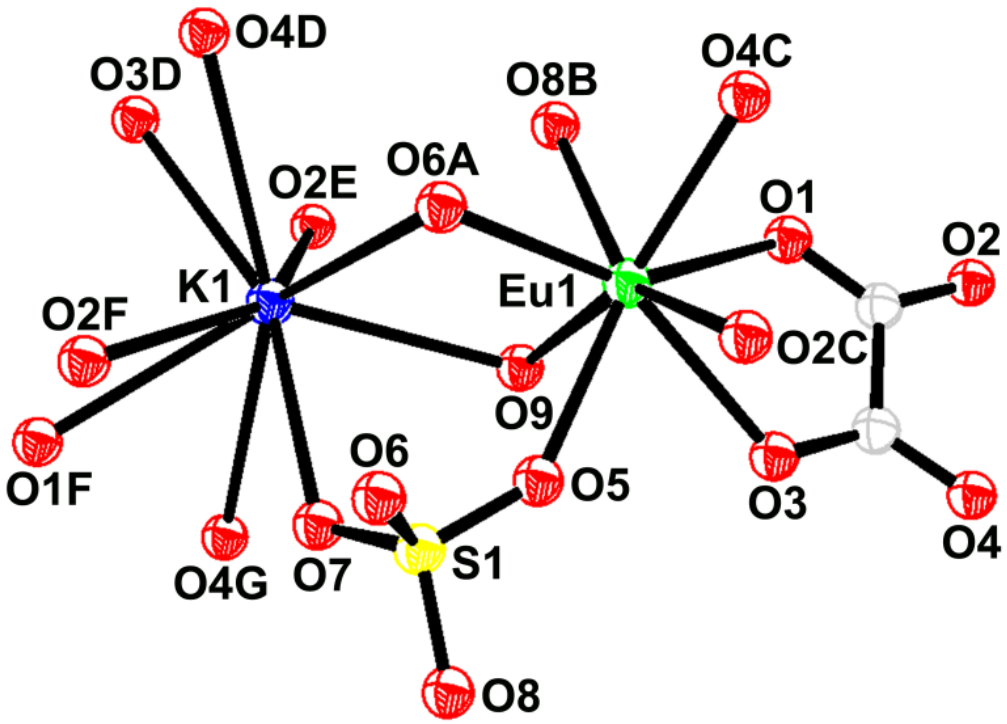

Fig S1 Coordination environments of the Eu(III) and K(I) ions in **1**. Hydrogen atoms are omitted for clarity. Symmetry codes: A −x−1, −y, −z−1; B x+1, y, z; C –x, y+1/2, −z−1/2; D x, −y−1/2, z−1/2; E –x, −y−1, −z−1; F x−1, −y−1/2, z−1/2; G −x−1, −y−1, −z−1.

5

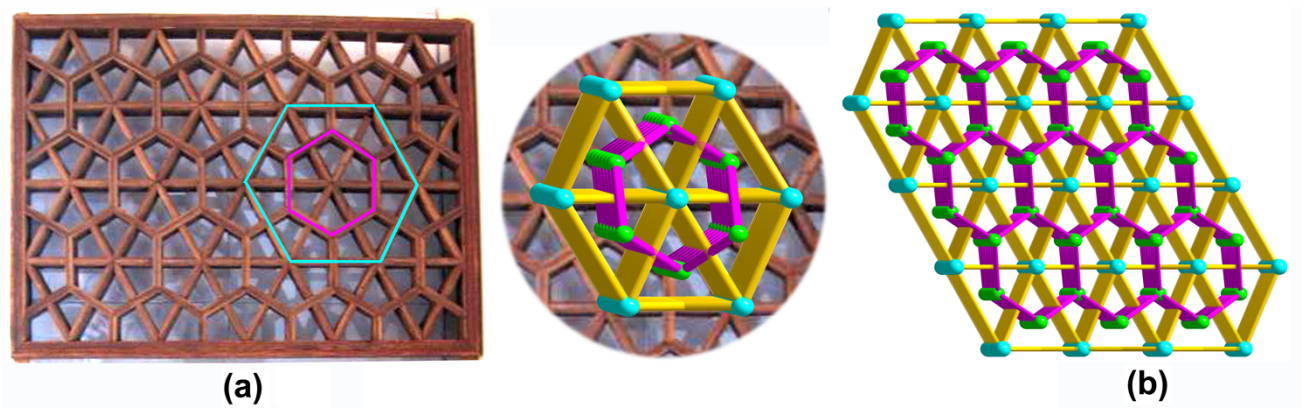

Fig S2 The Chinese traditional tracery inlaid with two different kinds of hexagons and the 3D tracery-like structure inlaid with two different kinds of hexagons in **1**.

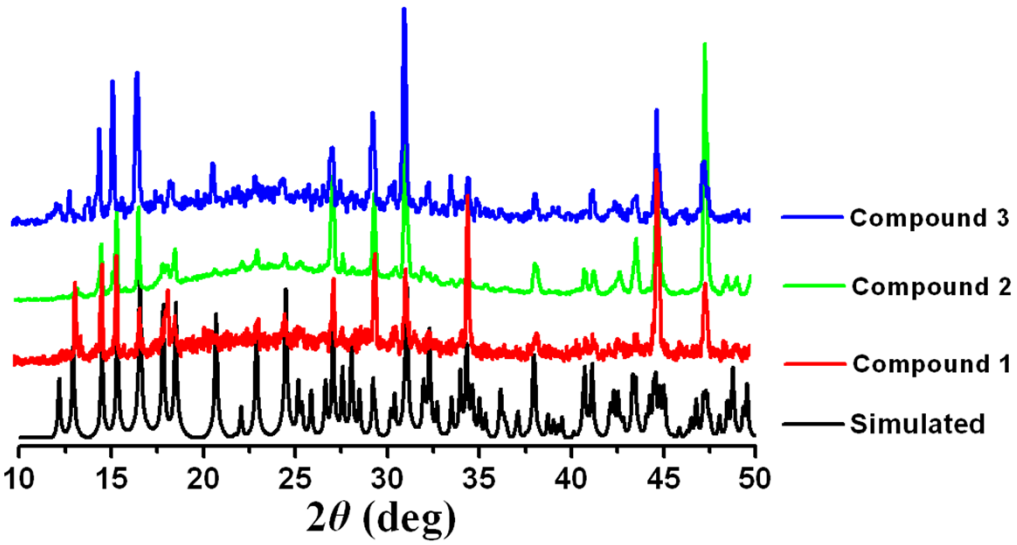

Fig S3 Simulated and experimental XRD powder patterns of compounds **1–3**.

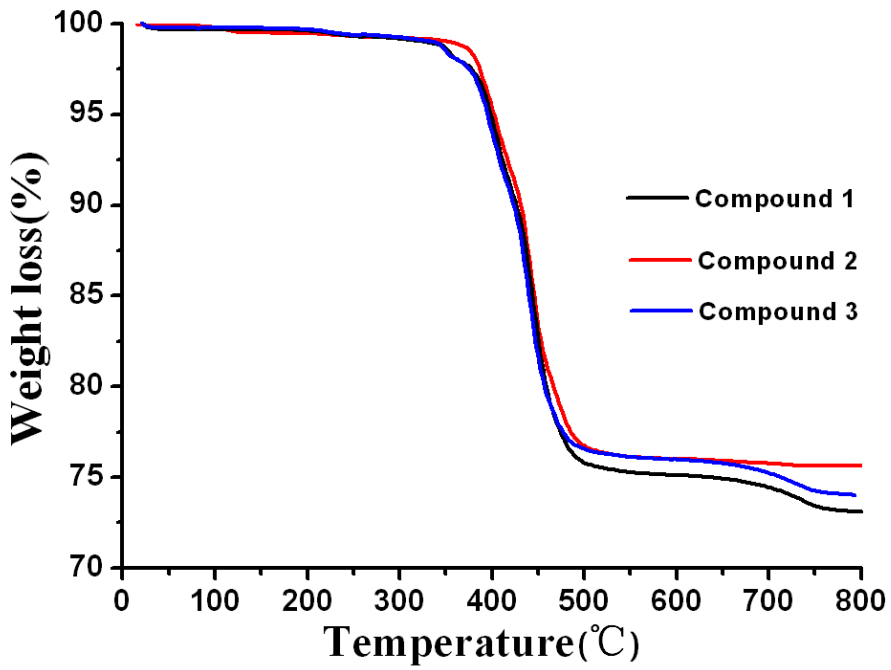

Fig S4 TG curves of compounds **1–3**.

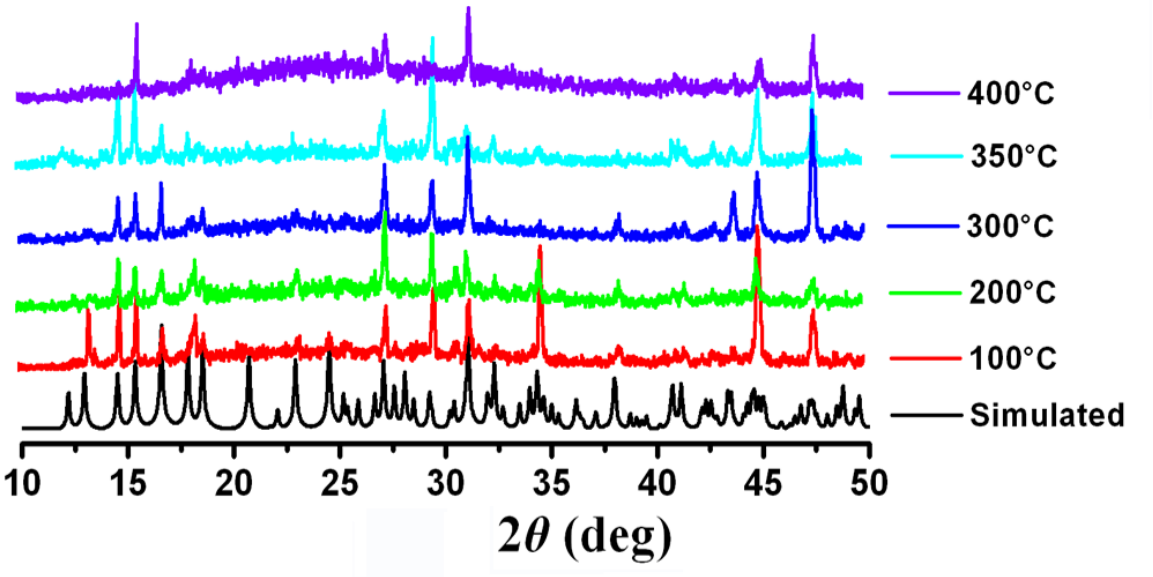

Fig S5 The temperature-dependent PXRD patterns for **2**.