Electronic Supplementary Material (ESI) for Journal of Materials Chemistry

Tunable Emission based on Lanthanide (III) Metal-Organic Frameworks: An Alternative Approach to White Lights

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Table of Contents

1. Crystal data for Y(Er)L

Table S1. Bond lengths [A] and angles [deg] for Y**L**.

Y(1)-O(4)#1	2.314(5)	Y(1)-O(6)#5	2.436(3)
Y(1)-O(5)#2	2.340(3)	Y(1)-O(5)#4	2.449(3)
Y(1)-O(5)#3	2.340(3)	Y(1)-O(5)#5	2.449(3)
Y(1)-O(3)	2.373(5)	Y(1)-O(4)	2.414(5)
Y(1)-O(6)#4	2.436(3)	O(4)#1-Y(1)-O(5)#2	84.82(14)
O(4)#1-Y(1)-O(5)#3	84.82(14)	O(5)#2-Y(1)-O(5)#3	65.75(16)
O(4)#1-Y(1)-O(3)	152.24(17)	O(5)#2-Y(1)-O(3)	117.96(12)
O(5)#3-Y(1)-O(3)	117.96(12)	O(4)#1-Y(1)-O(4)	152.67(16)
O(5)#2-Y(1)-O(4)	72.36(13)		

Symmetry transformations used to generate equivalent atoms:

#1 -x+1,-y+1,z+1/2 #2 x-1/2,y-1/2,z+1 #3 -x+3/2,y-1/2,z+1

#4 -x+3/2,-y+3/2,z+3/2 #5 x-1/2,-y+3/2,z+3/2

Table S2. Bond lengths [A] and angles [deg] for Er**L**.

Er(1)-O(1)	2.310(5)	Er(1)-O(3)	2.432(3)
Er(1)-O(2)#1	2.345(3)	Er(1)-O(2)#3	2.457(4)
Er(1)-O(2)#2	2.345(3)	Er(1)-O(2)	2.457(4)
Er(1)-O(6)#2	2.356(5)	Er(1)-C(11)#2	2.767(7)
Er(1)-O(1)#2	2.411(5)	Er(1)-C(12)#3	2.831(5)
Er(1)-O(3)#3	2.432(3)	Er(1)-C(12)	2.831(5)
O(1)-Er(1)-O(2)#1	84.41(14)	O(1)-Er(1)-O(2)#2	84.41(14)
O(2)#1-Er(1)-O(2)#2	66.04(16)	O(1)-Er(1)-O(6)#2	152.34(16)
O(2)#1-Er(1)-O(6)#2	118.22(12)	O(2)#2-Er(1)-O(6)#2	118.22(12)
O(1)-Er(1)-O(1)#2	152.24(16)	O(2)#1-Er(1)-O(1)#2	72.45(13)
O(2)#2-Er(1)-O(1)#2	72.45(13)	O(6)#2-Er(1)-O(1)#2	55.42(15)
O(1)-Er(1)-O(3)#3	101.65(14)	O(2)#1-Er(1)-O(3)#3	136.65(19)
O(2)#2-Er(1)-O(3)#3	71.85(17)	O(6)#2-Er(1)-O(3)#3	73.51(10)

Symmetry transformations used to generate equivalent atoms:

#1 x,-y,z+1/2 #2 -x+2,-y,z+1/2 #3 -x+2,y,z

Table S3. Cell parameters of all **LnL**.

$C_{108}H_{28}Ln_4O_{44}$ (Ln = Y, La, Pr, Nd, Eu, Gd, Tb, Dy, Ho, Er , Tm, Yb), Space group, *Cmc2₁*, $\alpha = \beta = \gamma = 90^o$

Ln	*a*/ Å	*b*/ Å	*c*/ Å	V / $Å^3$
Y	18.036(6)	24.175(5)	6.986(6)	3046.464
La	17.97	23.82	7.521	3219.329
Pr	17.92	23.85	7.26	3102.866
Nd	18.07	24.16	7.273	3175.182
Eu	18.29	24.49	7.24	3242.956
Gd	17.90	23.85	7.06	3014.020
Tb	18.16	24.41	7.10	3147.328
Dy	18.03	24.23	7.02	3066.806
Ho	18.66	24.74	7.24	3342.334
Er	18.037(2)	24.308(3)	6.9817(9)	3061.154
Tm	18.03	22.90	7.02	2898.467
Yb	18.30	23.41	7.24	3083.184

2. PXRD Analysis

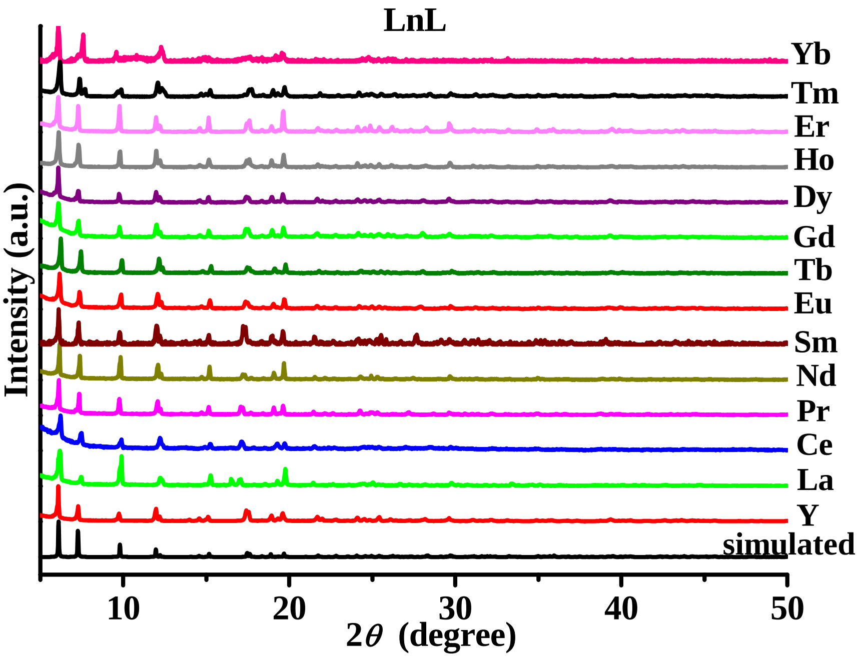

Fig. S1 Powder XRD patterns of compounds in the range from 5 to 50 degrees.

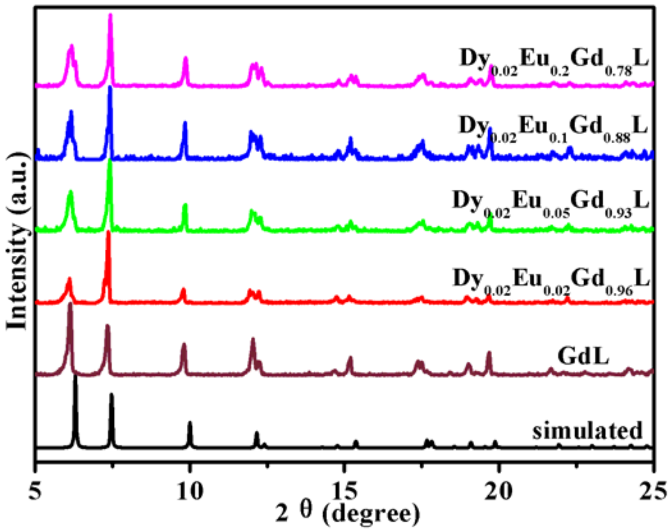

Fig. S2 Powder XRD patterns of Dy and Eu codoped compounds.

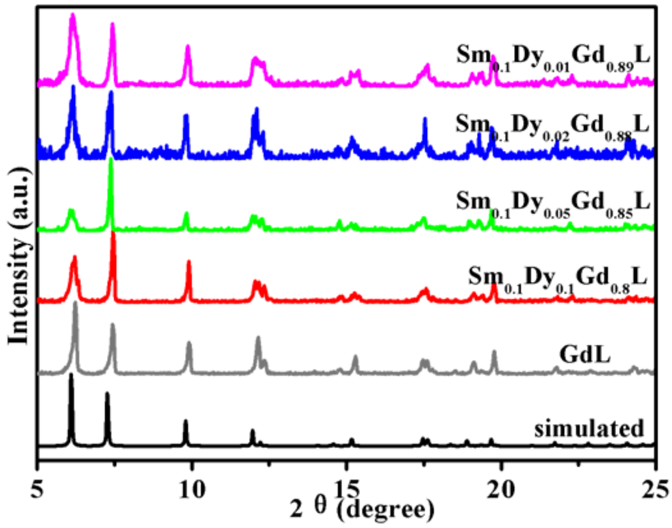

Fig. S3 Powder XRD patterns of Dy and Sm codoped compounds.

3. Luminescent Measurements

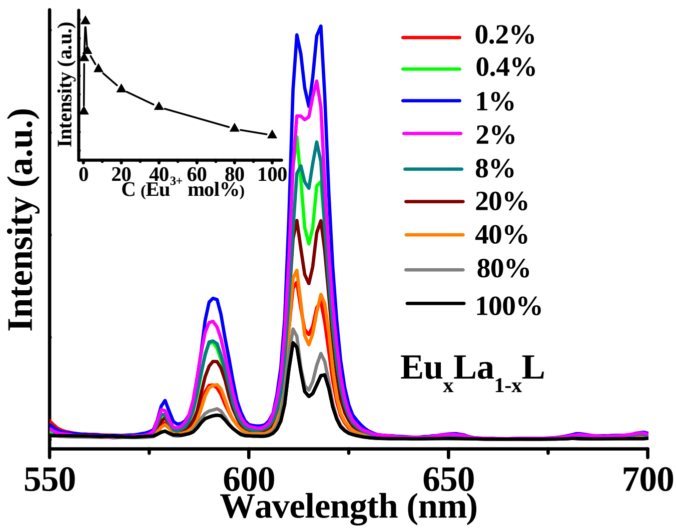

Fig. S4 PL emission spectra of Eu_xLa_{1-x}**L**, solid samples. The inset figures indicate corresponding transition intensities of doped Eu_xLa_{1-x}**L** as a factor of doping concentration x.

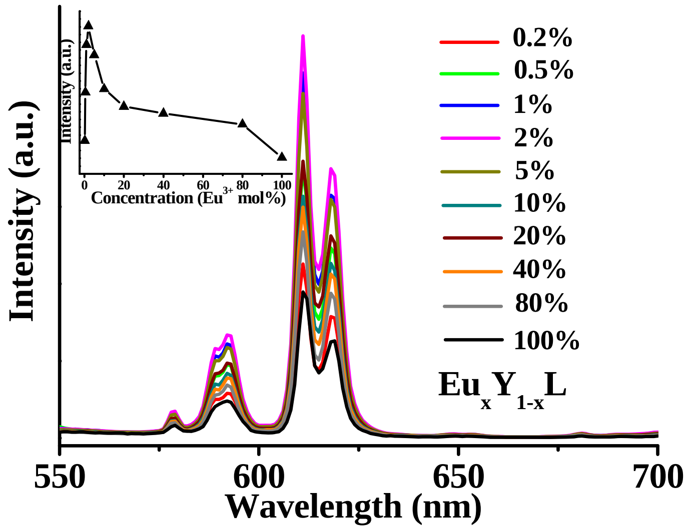

Fig. S5 PL emission spectra of Eu_xY_{1-x}**L**, solid samples. The inset figures indicate corresponding transition intensities of doped Eu_xY_{1-x}**L** as a factor of doping concentration x.

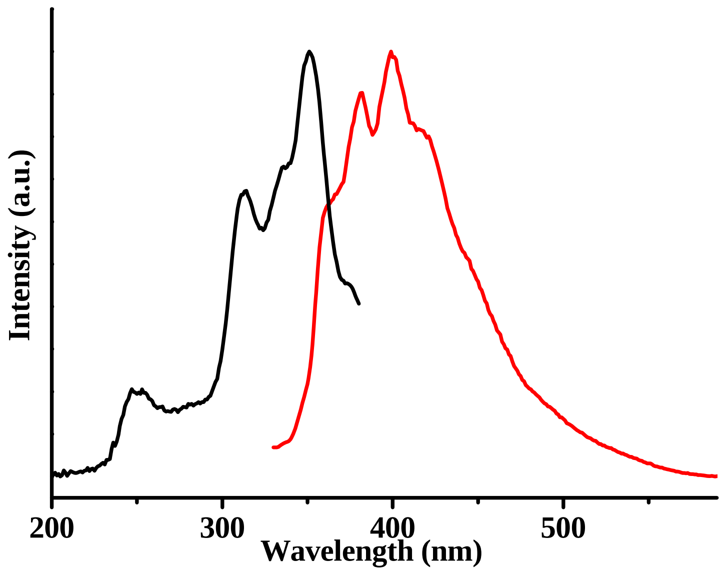

Fig. S6 Excitation (black**,** λ_{em} = 400 nm) and (red**,** λ_{ex} = 310 nm) emission spectra of H_3**L**.

Table S4. CIE coordinates of $Dy_xEu_yGd_{1-x-y}$**L** (λ_{ex} = 290 nm).

$Dy_xEu_yGd_{1-x-y}$**L**	CIE (X, Y)
$Dy_{0.02}Eu_{0.02}Gd_{0.96}$**L**	(0.310, 0.319)
$Dy_{0.02}Eu_{0.05}Gd_{0.93}$**L**	(0.355, 0.313)
$Dy_{0.02}Eu_{0.1}Gd_{0.88}$**L**	(0.373, 0.304)
$Dy_{0.02}Eu_{0.2}Gd_{0.78}$**L**	(0.379, 0.281)

Table S5. CIE coordinates of $Sm_xDy_yGd_{1-x-y}$**L** (λ_{ex} = 290 nm).

$Sm_xDy_yGd_{1-x-y}$**L**	CIE (X, Y)
$Sm_{0.1}Dy_{0.01}Gd_{0.89}$**L**	(0.350, 0.323)
$Sm_{0.1}Dy_{0.02}Gd_{0.88}$**L**	(0.319, 0.321)
$Sm_{0.1}Dy_{0.05}Gd_{0.85}$**L**	(0.306, 0.321)
$Sm_{0.1}Dy_{0.1}Gd_{0.8}$**L**	(0.292, 0.325)

Luminescence Decay measurements on the LnL and Ln^{3+} doped materials

The luminescence lifetimes have been recorded in order to explore the coordination environment around the lanthanide ions. The luminescence decay curves were fit well with monoexponential decays, using the following equation:

$$y = Ae(-x/t) + y_0$$

which confirms that all lanthanide ions occupy the same average local environment with each samples.

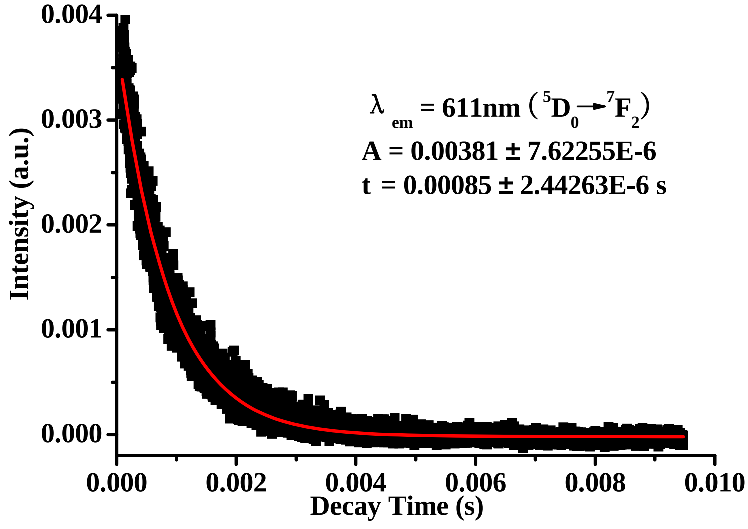

Fig. S7 Luminescence decay curve for the $^5D_0 \rightarrow {}^7F_2$ (611 nm) emission of Eu**L**.

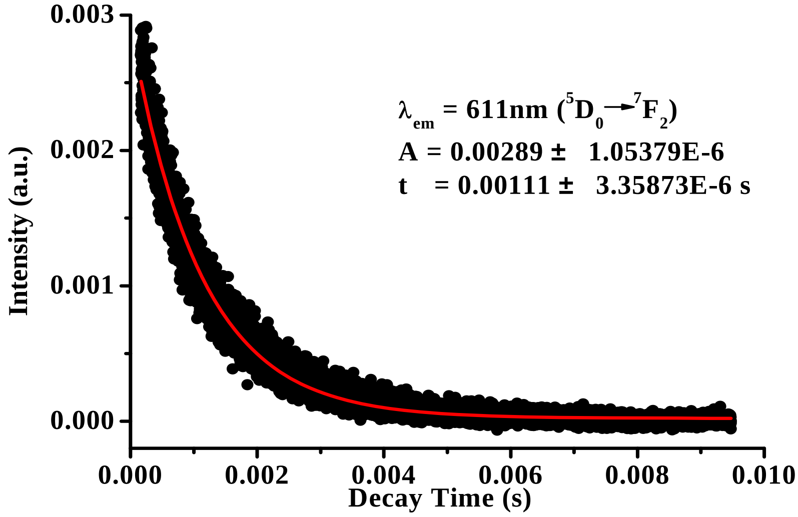

Fig. S8 Luminescence decay curve for the $^5D_0 \rightarrow {}^7F_2$ (611 nm) emission of $Eu_{0.02}Gd_{0.98}$**L**.

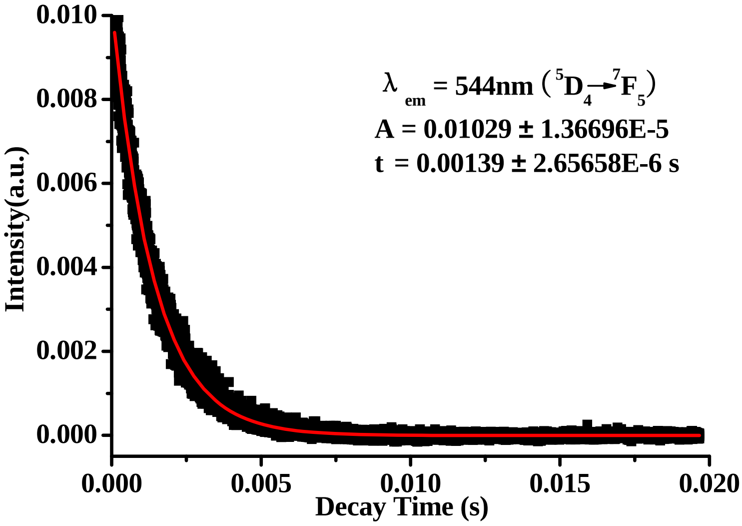

Fig. S9 Luminescence decay curve for the $^5D_4 \rightarrow ^7F_5$ (544 nm) emission of Tb**L**.

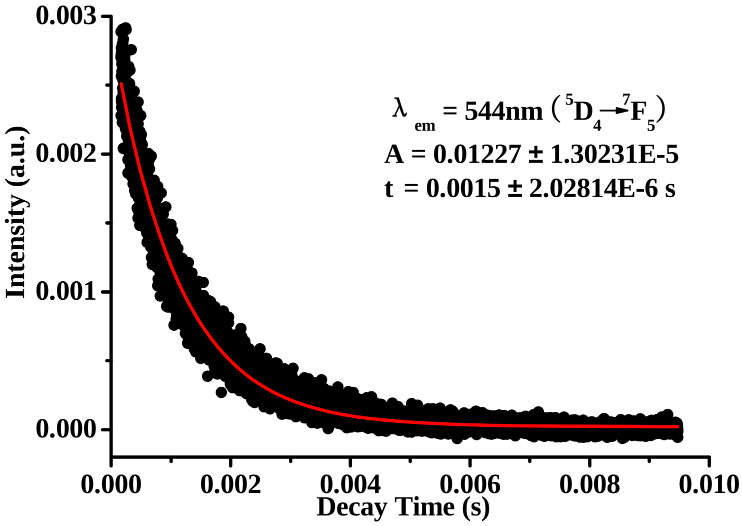

Fig. S10 Luminescence decay curve for the $^5D_4 \rightarrow ^7F_5$ (544 nm) emission of $Tb_{0.08}La_{0.92}$**L**.

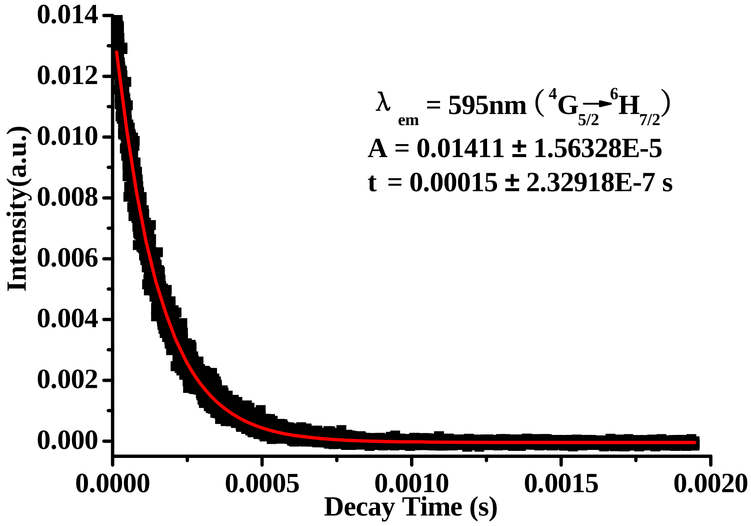

Fig. S11 Luminescence decay curve for the $^4G_{5/2}\rightarrow{}^6H_{7/2}$ (595 nm) emission of $Sm_{0.1}Gd_{0.9}$**L**.

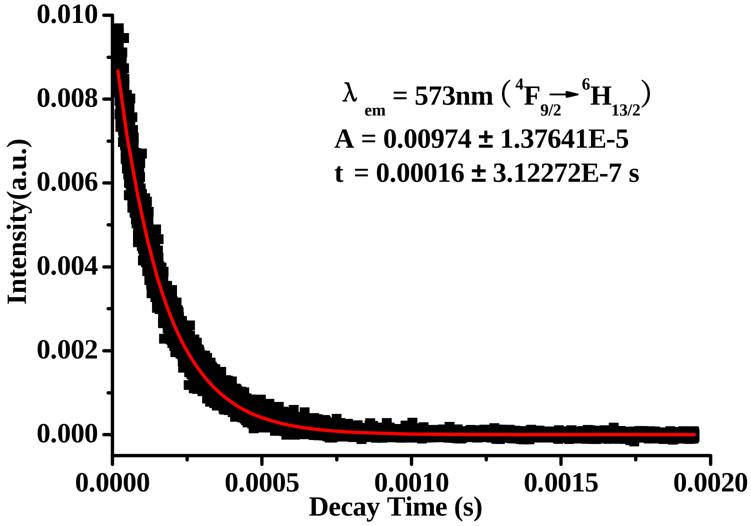

Fig. S12 Luminescence decay curve for the $^4F_{9/2}\rightarrow{}^6H_{13/2}$ (573 nm) emission of $Dy_{0.02}Gd_{0.98}$**L**.