Synthesis, structure and photoluminescence of color-tunable and white-light-emitting lanthanide metal-organic open frameworks composed of $AlMo_6(OH)_6O_{18}^{3-}$ polyanion and nicotinate

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Table S1. Elemental analysis and ICP for Compounds **3 - 8**

Element \ Compd (Calcd(Found))	**3**	**4**	**5**	**6**	**7**	**8**
C	5.88 (5.66)	5.88 (5.66)	5.88 (5.68)	5.88 (5.67)	5.88 (5.67)	5.88 (5.68)
H	2.84 (2.81)	2.84 (2.81)	2.83 (2.79)	2.84 (2.79)	2.84 (2.79)	2.83 (2.79)
N	0.86 (0.82)	0.86 (0.82)	0.86 (0.83)	0.86 (0.83)	0.86 (0.83)	0.86 (0.83)
Na	1.40 (1.50)	1.41 (1.51)	1.41 (1.50)	1.41 (1.50)	1.40 (1.49)	1.41 (1.50)

Al	1.65 (1.55)	1.65 (1.55)	1.65 (1.55)	1.65 (1.56)	1.65 (1.56)	1.65 (1.55)
Mo	35.22 (35.25)	35.20 (35.23)	35.20 (35.22)	35.23 (35.25)	35.22 (35.24)	35.21 (35.23)
Eu	1.97 (2.09)	2.08 (2.20)	2.16 (2.28)	2.51 (2.63)	3.35 (3.47)	3.48 (3.60)

Table S2. Selected Bond Lengths [Å] and Angles [°] for Compound **1**

Bond lengths and bond angles of **1**			
Eu(1)-O(2)#1	2.362(10)	Eu(1)-O(2W)	2.474(13)
Eu(1)-O(1)	2.375(11)	Eu(1)-O(1W)	2.536(11)
Eu(1)-O(5)	2.428(11)	Eu(1)-O(3)#1	2.539(11)
Eu(1)-O(3W)	2.448(14)	Mo(1)-O(9)	1.941(11)
Mo(1)-O(10)	1.697(11)	Mo(1)-O(8)	2.229(10)
Mo(1)-O(5)	1.734(11)	Mo(1)-O(6)	2.293(10)
Mo(1)-O(7)	1.918(10)	Mo(2)-O(7)	1.914(11)
Mo(2)-O(14)	1.701(11)	Mo(2)-O(11)	2.269(10)
Mo(2)-O(13)	1.731(11)	Mo(2)-O(6)	2.303(11)
Mo(2)-O(12)	1.896(11)	Mo(3)-O(12)	1.952(11)
Mo(3)-O(15)	1.693(12)	Mo(3)-O(11)	2.250(11)
Mo(3)-O(16)	1.696(11)	Mo(3)-O(8)#2	2.302(11)
Mo(3)-O(9)#2	1.926(11)	Mo(4)-O(19)	1.935(12)
Mo(4)-O(22)	1.701(12)	Mo(4)-O(17)	2.252(11)
Mo(4)-O(20)	1.712(12)	Mo(4)-O(18)	2.280(11)
Mo(4)-O(21)	1.925(13)	Mo(5)-O(19)	1.937(12)
Mo(5)-O(25)	1.724(11)	Mo(5)-O(18)	2.280(11)
Mo(5)-O(26)	1.726(13)	Mo(5)-O(23)	2.286(11)

Mo(5)-O(24)	1.888(11)	Mo(6)-O(21)#3	1.938(11)
Mo(6)-O(27)	1.699(14)	Mo(6)-O(23)	2.269(11)
Mo(6)-O(28)	1.717(14)	Mo(6)-O(17)#3	2.278(12)
Mo(6)-O(24)	1.917(11)	Al(1)-O(6)	1.888(10)
Al(1)-O(8)#2	1.886(10)	Al(1)-O(11)#2	1.907(11)
Al(1)-O(8)	1.886(10)	Al(1)-O(11)	1.907(11)
Al(1)-O(6)#2	1.888(10)	Al(2)-O(17)	1.889(11)
Al(2)-O(23)#3	1.883(11)	Al(2)-O(18)#3	1.900(10)
Al(2)-O(23)	1.883(11)	Al(2)-O(18)	1.900(10)
Al(2)-O(17)#3	1.889(11)	Na(1)-O(6W)	2.409(16)
Na(1)-O(22)	2.375(14)	Na(1)-O(1W)	2.532(13)
Na(1)-O(4W)	2.400(15)	Na(1)-O(5W)	2.403(16)
O(8)-Mo(3)#2	2.302(11)	O(9)-Mo(3)#2	1.926(11)
O(17)-Mo(6)#3	2.278(12)	O(21)-Mo(6)#3	1.938(11)
O(3)-Eu(1)#1	2.539(11)	O(4)-Eu(1)#1	2.468(12)
O(4W)-Na(1)#4	2.401(15)		
O(3)-Eu(1)-O(2)#1	74.9(4)	O(5)-Eu(1)-O(2W)	112.1(4)
O(3)-Eu(1)-O(1)	76.2(4)	O(3W)-Eu(1)-O(2W)	71.8(5)
O(2)#1-Eu(1)-O(1)	135.2(4)	O(4)#1-Eu(1)-O(2W)	72.5(4)
O(3)-Eu(1)-O(5)	75.8(4)	O(3)-Eu(1)-O(1W)	138.8(4)
O(2)#1-Eu(1)-O(5)	71.0(4)	O(2)#1-Eu(1)-O(1W)	74.2(4)
O(1)-Eu(1)-O(5)	132.2(4)	O(1)-Eu(1)-O(1W)	144.4(4)
O(3)-Eu(1)-O(3W)	82.9(5)	O(5)-Eu(1)-O(1W)	68.8(4)
O(2)#1-Eu(1)-O(3W)	135.7(4)	O(3W)-Eu(1)-O(1W)	101.1(5)
O(1)-Eu(1)-O(3W)	72.2(4)	O(4)#1-Eu(1)-O(1W)	79.0(4)
O(5)-Eu(1)-O(3W)	66.5(4)	O(2W)-Eu(1)-O(1W)	69.7(4)
O(3)-Eu(1)-O(4)#1	122.3(4)	O(3)-Eu(1)-O(3)#1	71.5(4)

O(2)#1-Eu(1)-O(4)#1	81.8(4)	O(2)#1-Eu(1)-O(3)#1	69.5(4)
O(1)-Eu(1)-O(4)#1	85.6(4)	O(1)-Eu(1)-O(3)#1	69.2(4)
O(5)-Eu(1)-O(4)#1	142.2(4)	O(5)-Eu(1)-O(3)#1	133.7(4)
O(3W)-Eu(1)-O(4)#1	141.7(4)	O(3W)-Eu(1)-O(3)#1	137.6(5)
O(3)-Eu(1)-O(2W)	146.3(4)	O(4)#1-Eu(1)-O(3)#1	50.9(4)
O(2)#1-Eu(1)-O(2W)	138.8(4)	O(2W)-Eu(1)-O(3)#1	113.5(4)
O(1)-Eu(1)-O(2W)	75.2(4)	O(1W)-Eu(1)-O(3)#1	120.5(4)
O(10)-Mo(1)-O(5)	106.7(5)	O(7)-Mo(1)-O(8)	82.3(4)
O(10)-Mo(1)-O(7)	98.0(5)	O(9)-Mo(1)-O(8)	73.6(4)
O(5)-Mo(1)-O(7)	100.2(5)	O(10)-Mo(1)-O(6)	160.9(4)
O(10)-Mo(1)-O(9)	100.4(5)	O(5)-Mo(1)-O(6)	91.6(4)
O(5)-Mo(1)-O(9)	96.3(5)	O(7)-Mo(1)-O(6)	72.9(4)
O(7)-Mo(1)-O(9)	150.5(5)	O(9)-Mo(1)-O(6)	82.5(4)
O(10)-Mo(1)-O(8)	94.2(4)	O(8)-Mo(1)-O(6)	68.4(4)
O(5)-Mo(1)-O(8)	158.3(4)	O(13)-Mo(2)-O(11)	160.3(5)
O(14)-Mo(2)-O(13)	104.9(6)	O(12)-Mo(2)-O(11)	72.4(4)
O(14)-Mo(2)-O(12)	99.5(5)	O(7)-Mo(2)-O(11)	81.9(4)
O(13)-Mo(2)-O(12)	99.2(5)	O(14)-Mo(2)-O(6)	160.0(5)
O(14)-Mo(2)-O(7)	96.9(5)	O(13)-Mo(2)-O(6)	93.9(5)
O(13)-Mo(2)-O(7)	100.2(5)	O(12)-Mo(2)-O(6)	83.8(4)
O(12)-Mo(2)-O(7)	150.3(5)	O(7)-Mo(2)-O(6)	72.7(4)
O(14)-Mo(2)-O(11)	94.2(5)	O(11)-Mo(2)-O(6)	67.8(4)
O(15)-Mo(3)-O(16)	106.2(6)	O(9)#2-Mo(3)-O(11)	83.6(4)
O(15)-Mo(3)-O(9)#2	95.9(5)	O(12)-Mo(3)-O(11)	71.9(4)
O(16)-Mo(3)-O(9)#2	99.7(5)	O(15)-Mo(3)-O(8)#2	162.1(5)
O(15)-Mo(3)-O(12)	101.2(5)	O(16)-Mo(3)-O(8)#2	89.3(5)
O(16)-Mo(3)-O(12)	97.1(5)	O(9)#2-Mo(3)-O(8)#2	72.1(4)

O(9)#2-Mo(3)-O(12)	151.6(5)	O(12)-Mo(3)-O(8)#2	85.4(4)
O(15)-Mo(3)-O(11)	97.6(5)	O(11)-Mo(3)-O(8)#2	68.3(4)
O(16)-Mo(3)-O(11)	155.4(5)	O(20)-Mo(4)-O(17)	158.8(5)
O(22)-Mo(4)-O(20)	104.8(6)	O(21)-Mo(4)-O(17)	73.3(4)
O(22)-Mo(4)-O(21)	99.9(6)	O(19)-Mo(4)-O(17)	81.9(5)
O(20)-Mo(4)-O(21)	98.4(6)	O(22)-Mo(4)-O(18)	162.1(6)
O(22)-Mo(4)-O(19)	98.4(6)	O(20)-Mo(4)-O(18)	91.7(5)
O(20)-Mo(4)-O(19)	99.2(6)	O(21)-Mo(4)-O(18)	84.0(5)
O(21)-Mo(4)-O(19)	150.5(5)	O(19)-Mo(4)-O(18)	71.9(4)
O(22)-Mo(4)-O(17)	95.9(5)	O(17)-Mo(4)-O(18)	68.3(4)
O(25)-Mo(5)-O(26)	106.1(6)	O(24)-Mo(5)-O(18)	81.8(5)
O(25)-Mo(5)-O(24)	98.4(5)	O(19)-Mo(5)-O(18)	71.9(4)
O(26)-Mo(5)-O(24)	101.8(6)	O(25)-Mo(5)-O(23)	160.6(5)
O(25)-Mo(5)-O(19)	99.0(5)	O(26)-Mo(5)-O(23)	92.7(5)
O(26)-Mo(5)-O(19)	97.6(6)	O(24)-Mo(5)-O(23)	72.7(4)
O(24)-Mo(5)-O(19)	149.1(5)	O(19)-Mo(5)-O(23)	82.7(4)
O(25)-Mo(5)-O(18)	93.6(5)	O(18)-Mo(5)-O(23)	68.4(4)
O(26)-Mo(5)-O(18)	159.0(5)	O(28)-Mo(6)-O(23)	94.7(6)
O(27)-Mo(6)-O(28)	106.6(7)	O(24)-Mo(6)-O(23)	72.6(4)
O(27)-Mo(6)-O(24)	100.4(6)	O(21)#3-Mo(6)-O(23)	82.1(5)
O(28)-Mo(6)-O(24)	100.5(6)	O(27)-Mo(6)-O(17)#3	91.6(5)
O(27)-Mo(6)-O(21)#3	97.3(6)	O(28)-Mo(6)-O(17)#3	160.5(6)
O(28)-Mo(6)-O(21)#3	97.6(6)	O(24)-Mo(6)-O(17)#3	82.7(5)
O(24)-Mo(6)-O(21)#3	149.8(5)	O(21)#3-Mo(6)-O(17)#3	72.5(5)
O(27)-Mo(6)-O(23)	158.5(5)	O(23)-Mo(6)-O(17)#3	67.7(4)
O(8)#2-Al(1)-O(8)	180.0(7)	O(6)#2-Al(1)-O(11)#2	84.3(4)
O(8)#2-Al(1)-O(6)#2	84.7(4)	O(6)-Al(1)-O(11)#2	95.7(4)

O(8)-Al(1)-O(6)#2	95.3(4)	O(8)#2-Al(1)-O(11)	84.7(4)
O(8)#2-Al(1)-O(6)	95.3(4)	O(8)-Al(1)-O(11)	95.3(4)
O(8)-Al(1)-O(6)	84.7(4)	O(6)#2-Al(1)-O(11)	95.7(4)
O(6)#2-Al(1)-O(6)	180.000(1)	O(6)-Al(1)-O(11)	84.3(4)
O(8)#2-Al(1)-O(11)#2	95.3(4)	O(11)#2-Al(1)-O(11)	180.000(2)
O(8)-Al(1)-O(11)#2	84.7(4)	O(23)#3-Al(2)-O(23)	180.000(4)
O(23)#3-Al(2)-O(17)#3	95.7(5)	O(23)#3-Al(2)-O(17)	84.3(5)
O(23)-Al(2)-O(17)#3	84.3(5)	O(23)-Al(2)-O(17)	95.7(5)
O(17)#3-Al(2)-O(17)	180.000(3)	O(23)-Al(2)-O(18)#3	94.6(5)
O(23)#3-Al(2)-O(18)#3	85.4(5)	O(17)#3-Al(2)-O(18)#3	84.4(5)
O(17)-Al(2)-O(18)#3	95.6(5)	O(17)#3-Al(2)-O(18)	95.6(5)
O(23)#3-Al(2)-O(18)	94.6(5)	O(17)-Al(2)-O(18)	84.4(5)
O(23)-Al(2)-O(18)	85.4(5)	O(18)#3-Al(2)-O(18)	180.000(3)
O(22)-Na(1)-O(4W)	93.1(5)	O(4W)#4-Na(1)-O(6W)	81.7(5)
O(22)-Na(1)-O(4W)#4	95.9(5)	O(5W)-Na(1)-O(6W)	90.4(6)
O(4W)-Na(1)-O(4W)#4	84.6(5)	O(22)-Na(1)-O(1W)	82.1(4)
O(22)-Na(1)-O(5W)	81.4(6)	O(4W)-Na(1)-O(1W)	88.7(5)
O(4W)-Na(1)-O(5W)	172.8(6)	O(4W)#4-Na(1)-O(1W)	172.9(5)
O(4W)#4-Na(1)-O(5W)	100.6(6)	O(5W)-Na(1)-O(1W)	85.8(5)
O(22)-Na(1)-O(6W)	171.0(6)	O(6W)-Na(1)-O(1W)	101.3(5)
O(4W)-Na(1)-O(6W)	95.3(5)		

Symmetry transformations used to generate equivalent atoms: #1 -x+1, -y+2, -z+1; #2 -x, -y+1, -z+1; #3 -x+1, -y+1, -z+2; #4 -x+1, -y+2, -z+2; #5 -x+1, -y+1, -z+1.

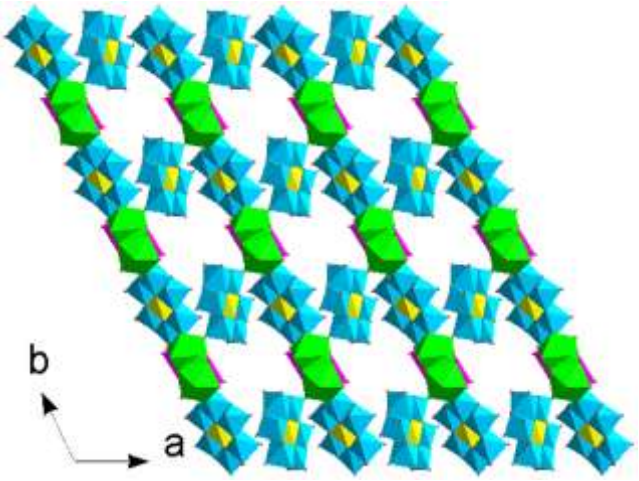

Figure S1. View of the 3-D structure of compound **1** along *b* direction. All hydrogen atoms, lattice waters and organic ligands were deleted for clarity. (Color code: Eu, green; Al, Yellow; Mo, blue; Na, Pink.)

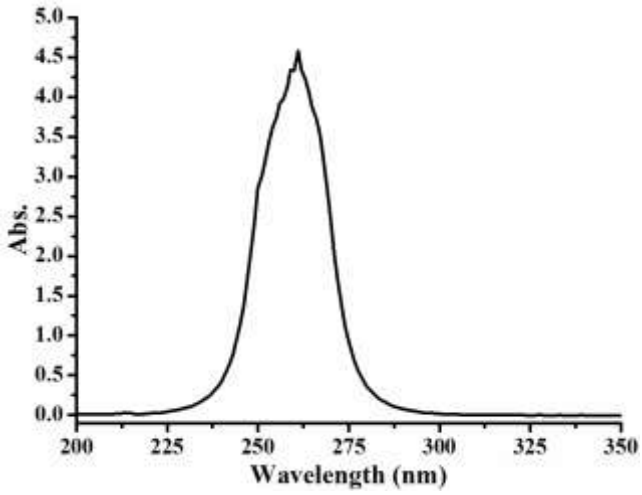

Figure S2. The UV-vis spectrum of nicotinic acid in aqueous ethanol. (Concentration: 1×10^{-3}M).

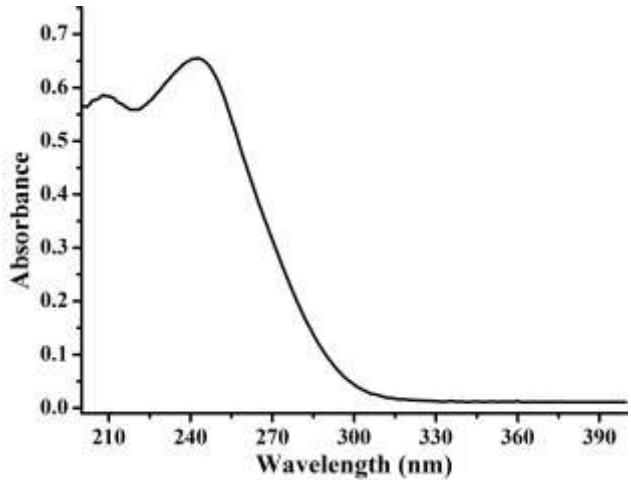

Figure S3. The UV-vis spectrum of aqueous $(NH_4)_3AlMo_6O_{24}H_6 \cdot 7H_2O$. (Concentration: 2×10^{-5}M).

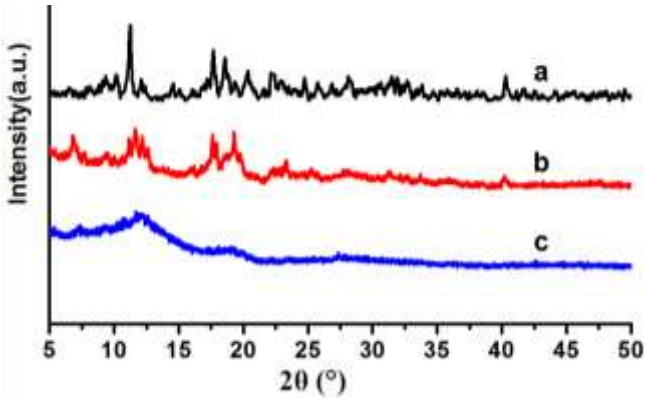

Figure S4. The powder XRD patterns of compound **1** after treatment under different temperatures; as-prepared compound **1** (line a), 100 °C (line b) and 120 °C (line c).

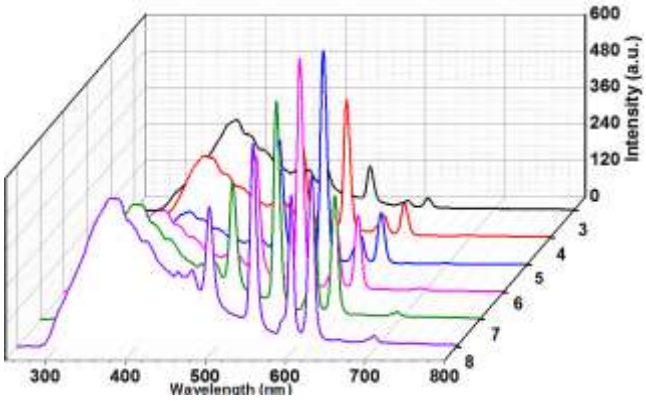

Figure S5. Photoluminescence spectra of compounds **3 - 8** excited at 264 nm.