

Supporting Information for

**Synthesized of luminescent thorium-based metal-organic frameworks with 1,2,4,5- tetrakis (4- carboxyphenyl) benzene**

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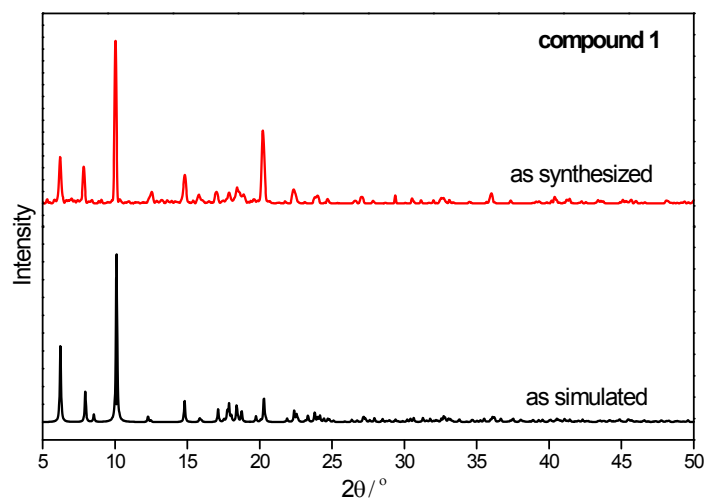
**Tables and Figures**

Table S1. Crystallographic Data for Compound 1-3.

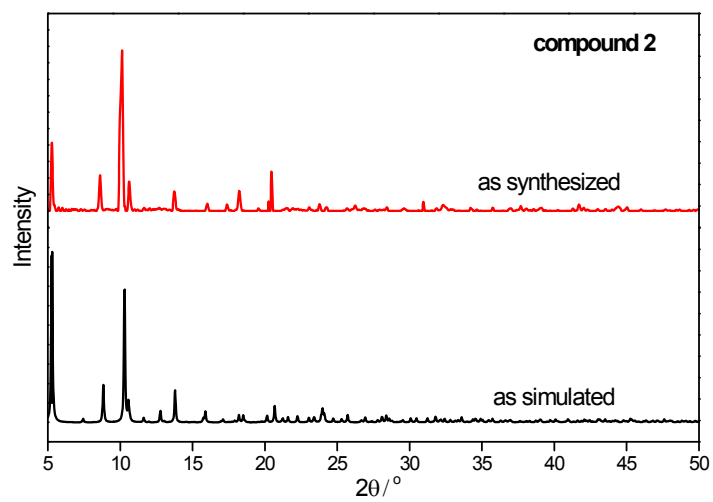
Compound	1	2	3
Empirical formula	C <sub>34</sub> H <sub>18</sub> O <sub>8</sub> Th	C <sub>34</sub> H <sub>18</sub> O <sub>15</sub> Th <sub>2</sub>	C <sub>37</sub> H <sub>27</sub> NO <sub>10</sub> Th
Formula weight	786.52	1130.56	877.63
Temperature/K	293(2)	170.0	189.7
Crystal system	monoclinic	orthorhombic	monoclinic
Space group	P2/n	Cmca	P2 <sub>1</sub> /n
a /Å	5.640(3)	33.443(2)	12.0770(15)
b /Å	11.024(6)	16.4404(9)	31.421(4)
c /Å	28.315(15)	20.0127(12)	14.830(2)
α /°	90	90	90
β /°	92.102(12)	90	112.117(4)
γ /°	90	90	90
Volume /Å <sup>3</sup>	1759.3(16)	11003.4(11)	5213.5(12)
Z	2	8	4
ρ <sub>calc</sub> g/cm <sup>3</sup>	1.485	1.365	1.118
μ /mm <sup>-1</sup>	9.221	11.747	6.275
F(000)	752.0	4176.0	1704.0
Crystal size /mm <sup>3</sup>	0.006×0.005×0.003	0.05×0.03×0.02	0.006×0.005×0.003
Radiation	GaKα (λ = 1.34139)	GaKα (λ = 1.34139)	GaKα (λ = 1.34139)
2θ range for data collection/°	15.674 to 110.372	6.476 to 109.892	6.108 to 109.996
Index ranges	-6 ≤ h ≤ 6, 0 ≤ k ≤ 13, 0 ≤ l ≤ 34	-40 ≤ h ≤ 39, -16 ≤ k ≤ 24	-14 ≤ h ≤ 14, -38 ≤ k ≤ 18
Reflections collected	3260	30910	44198
Data/restraints/parameters	3260/109/172	5329/357/234	9616/0/445
Goodness-of-fit on F <sup>2</sup>	1.064	1.061	1.042
Final R indexes [I ≥ 2σ (I)]	R <sub>1</sub> = 0.0970, wR <sub>2</sub> = 0.2586	R <sub>1</sub> = 0.0808, wR <sub>2</sub> = 0.2164	R <sub>1</sub> = 0.0949, wR <sub>2</sub> = 0.2562
Final R indexes [all data]	R <sub>1</sub> = 0.1190, wR <sub>2</sub> = 0.2768	R <sub>1</sub> = 0.0997, wR <sub>2</sub> = 0.2356	R <sub>1</sub> = 0.1238, wR <sub>2</sub> = 0.2882
Largest diff. peak/hole /e Å <sup>-3</sup>	4.03/-3.27	14.78/-3.03	3.89/-2.29

Table S2. Selected bond distances [ $\text{\AA}$ ] for Compound 1-3.

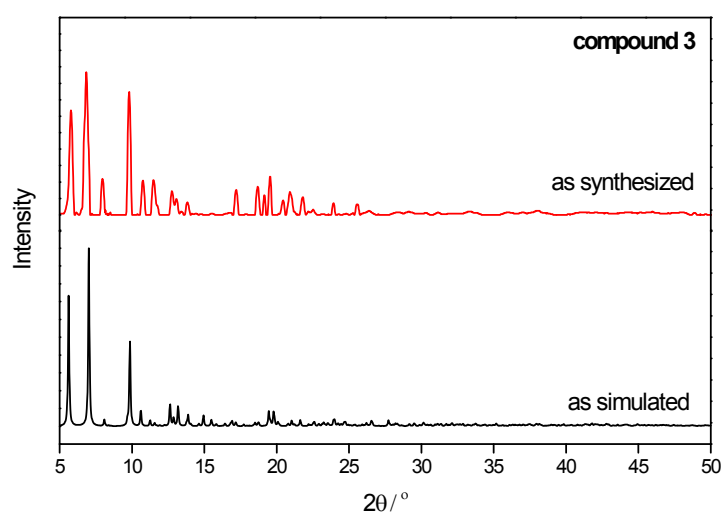
Assignment	Bond Distances	Compound 1	Bond Distances	Compound 2	Bond Distances	Compound 3
Th-Th			Th(1)-Th(1A)	3.9322(9)		
Th-O <sup>2-</sup>			Th(1)-O(1)	2.332(3)		
			Th(1)-O(2 )	2.389(7)		
			Th(1)-O(2A)	2.327(7)		
Th-O <sub>CO-</sub>	Th(1)-O(1)	2.524(14)	Th(1)-O(3A)	2.418(9)	Th(1)-O(1)	2.452(8)
	Th(1)-O(1A)	2.524(15)	Th(1)-O(4 )	2.470(9)	Th(1)-O(2A)	2.393(9)
	Th(1)-O(2)	2.451(13)	Th(1)-O(5B)	2.370(10)	Th(1)-O(3B)	2.578(10)
	Th(1)-O(2A)	2.451(13)	Th(1)-O(8C)	2.444(10)	Th(1)-O(4B)	2.481(10)
	Th(1)-O(3D)	2.443(14)			Th(1)-O(5C)	2.458(9)
	Th(1)-O(3E)	2.443(14)			Th(1)-O(6D)	2.405(12)
	Th(1)-O(4B)	2.390(15)			Th(1)-O(8E)	2.379(10)
	Th(1)-O(4C)	2.390(15)			Th(1)-O(10)	2.483(11)
Th-O <sub>w</sub>			Th(1)-O(6 )	2.541(10)	Th(1)-O(9)	2.485(12)
			Th(1)-O(7 )	2.361(18)		



(a)

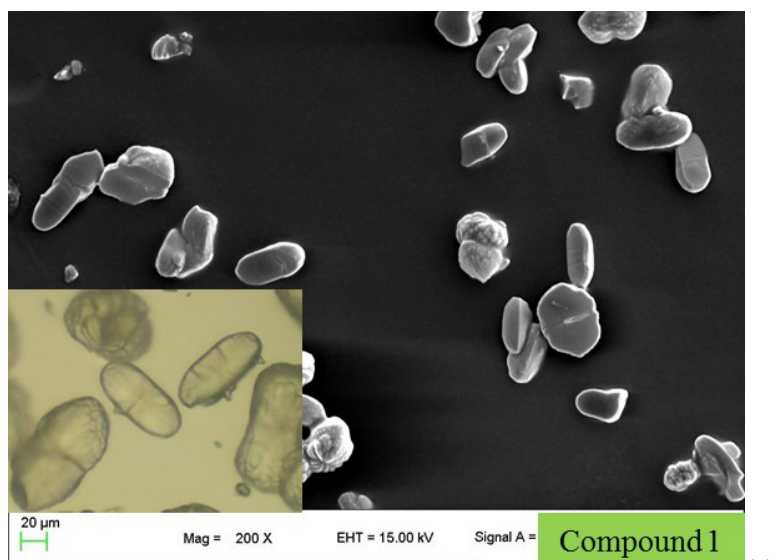


(b)

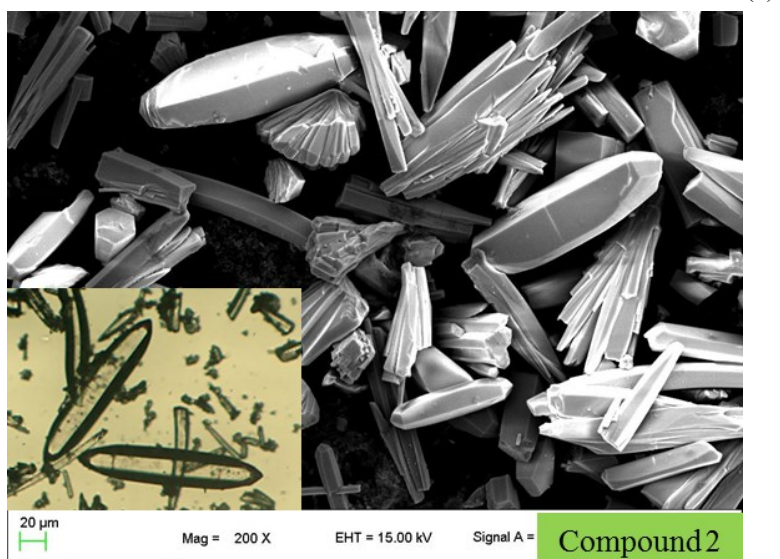


(c)

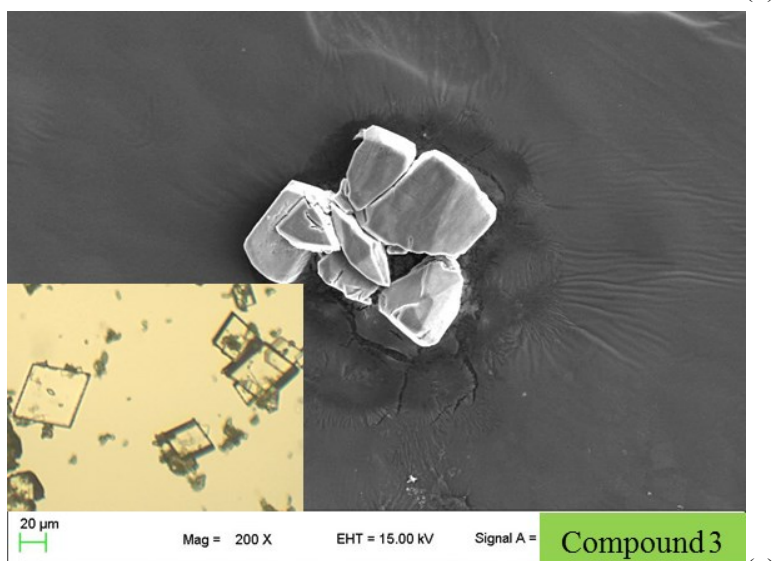
Fig. S1 PXRD patterns of as-synthesized and as-simulated compound 1, 2, and 3



(a)

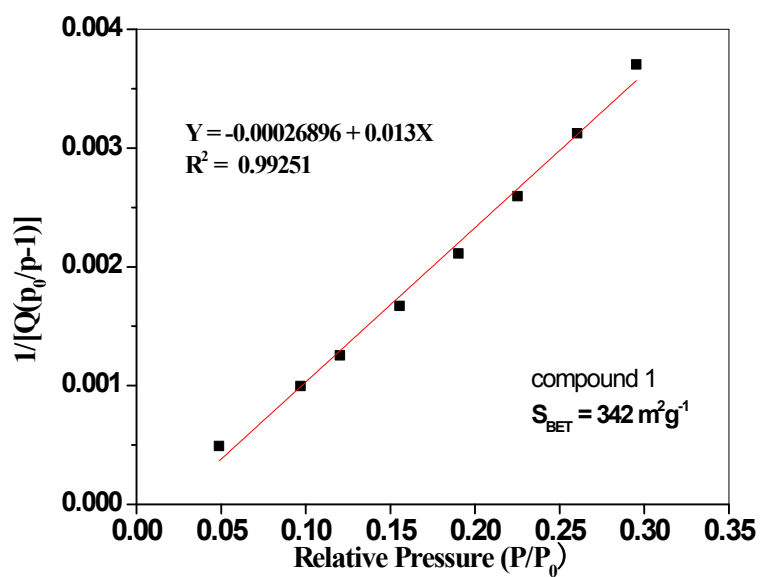


(b)

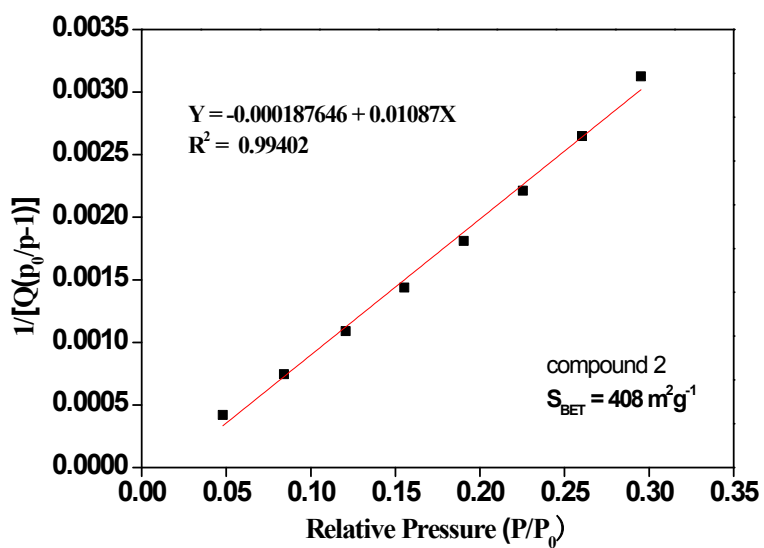


(c)

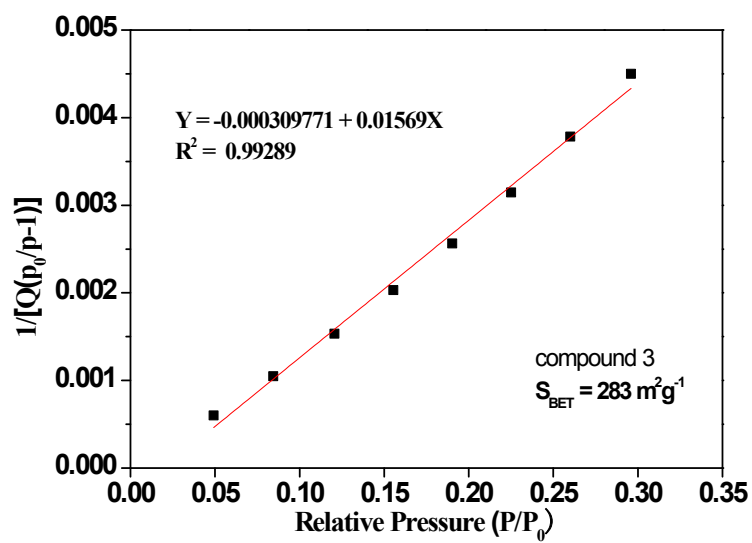
Fig. S2 SEM images of compound 1, 2, and 3



(a)

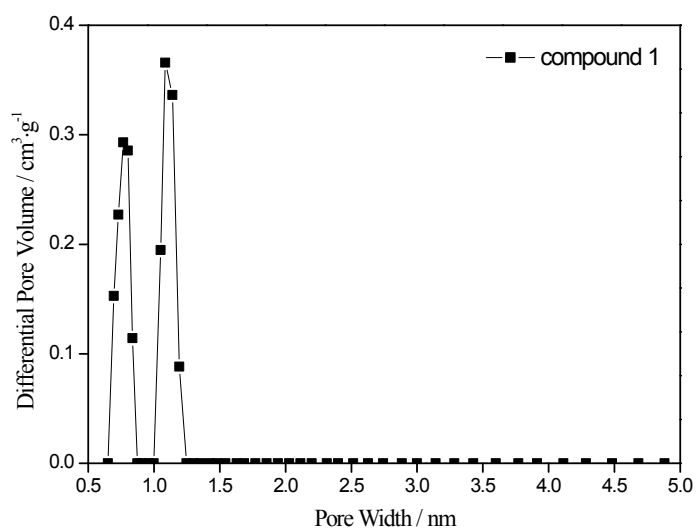


(b)

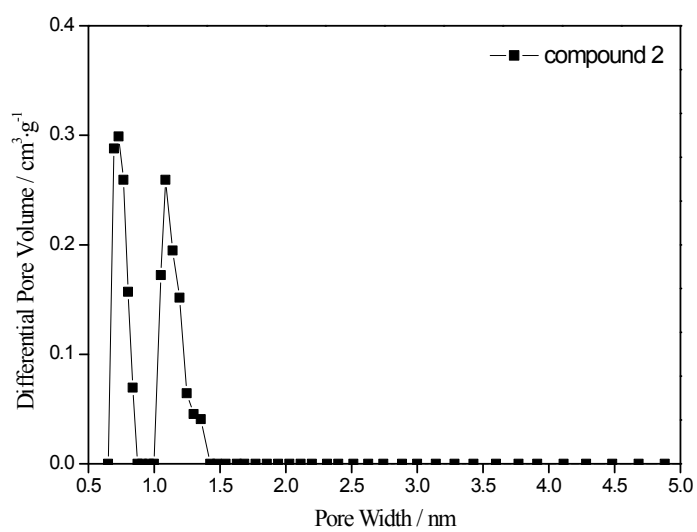


(c)

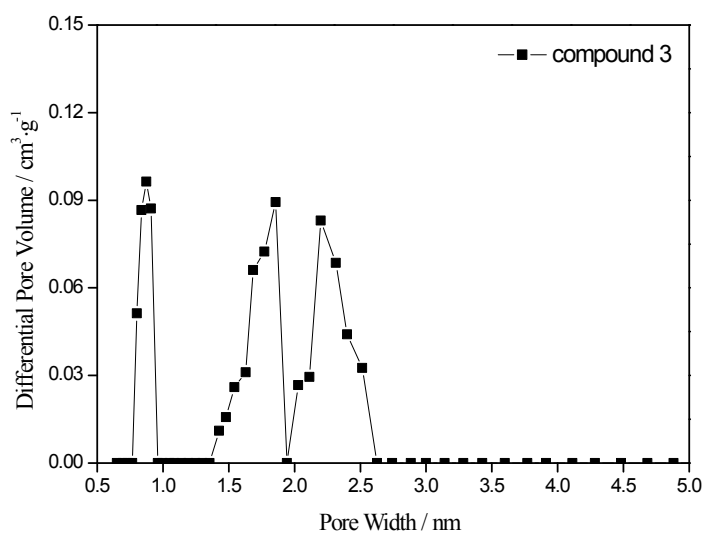
Fig. S3 BET Surface area plots of compound 1, 2, and 3.



(a)

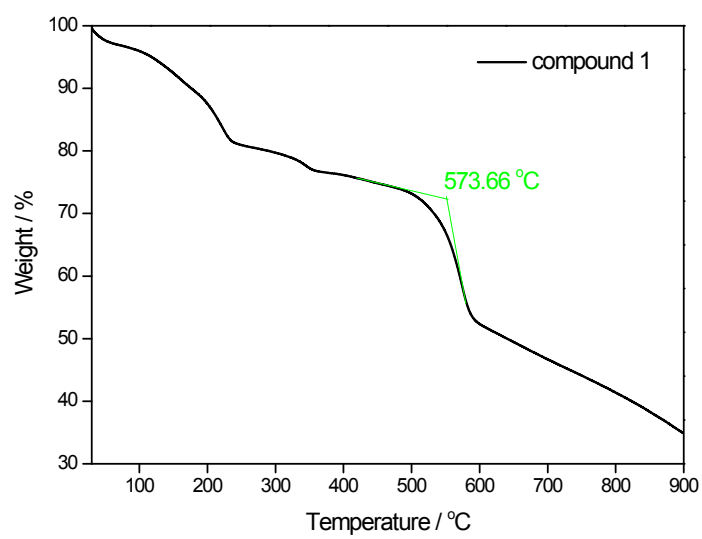


(b)

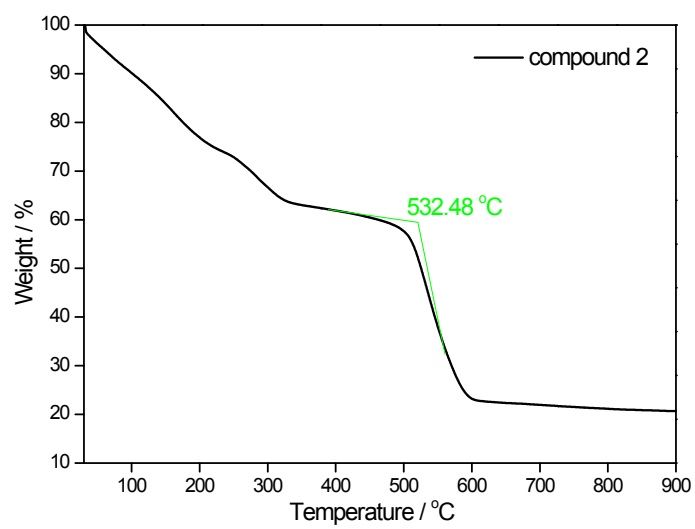


(c)

Fig. S4 Pore-size distribution of compound 1, 2, and 3

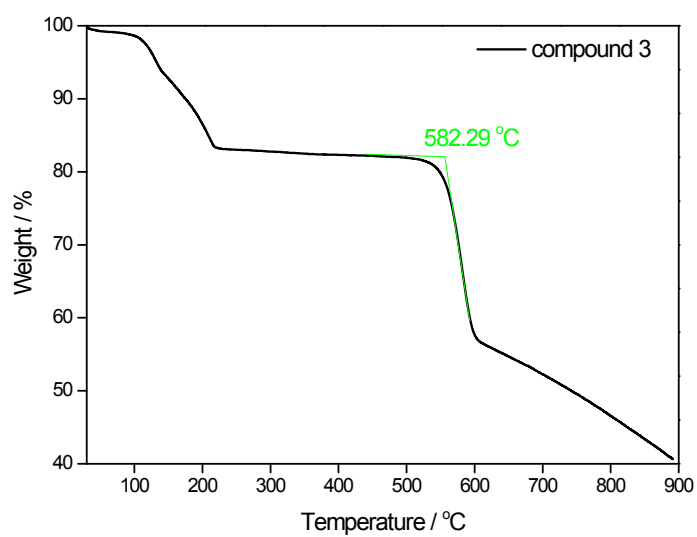


(a)



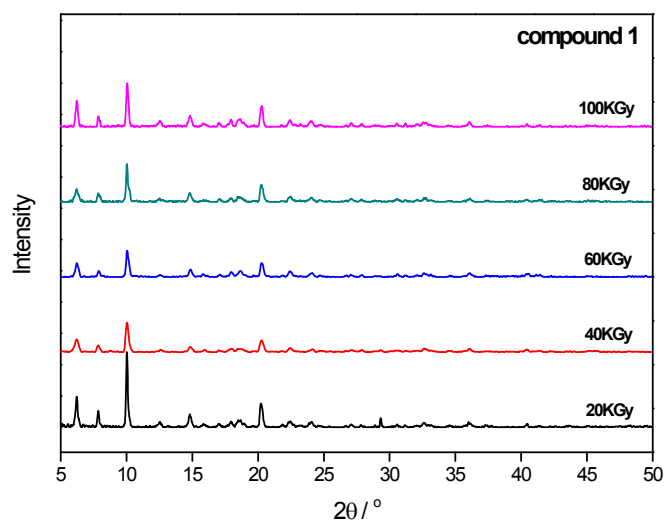
(b)



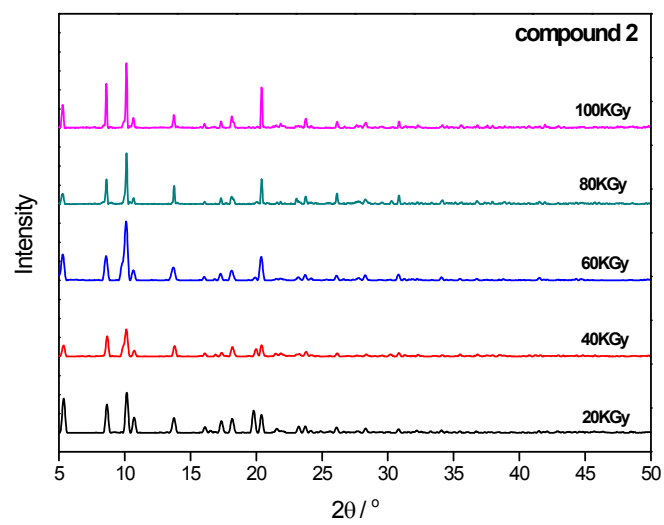


(c)

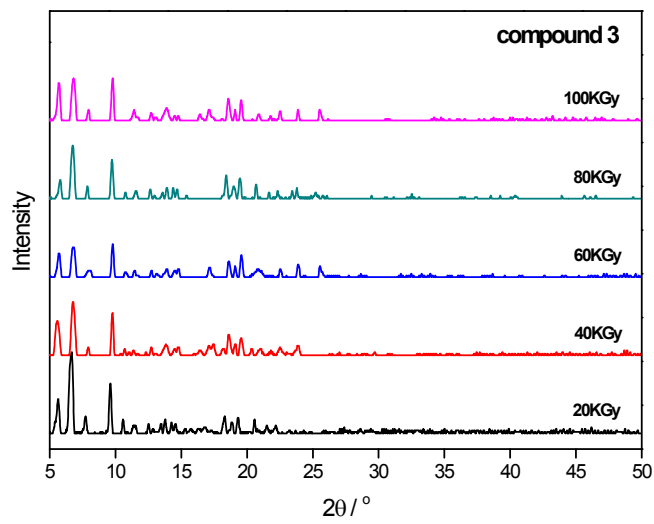
Fig. S5 The TGA plots of compound 1, 2, and 3



(a)



(b)



(c)

Fig. S6 PXRD patterns of compound 1, 2, and 3 under different doses of  $\gamma$  irradiation

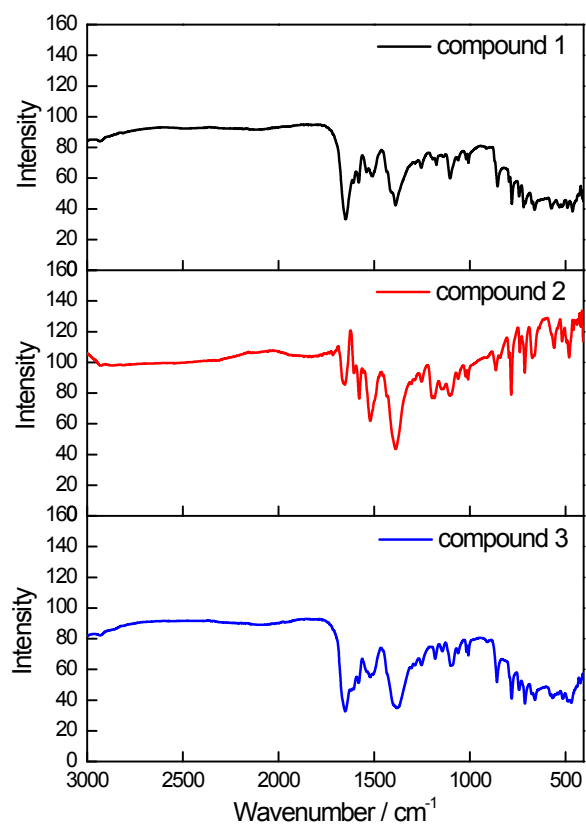
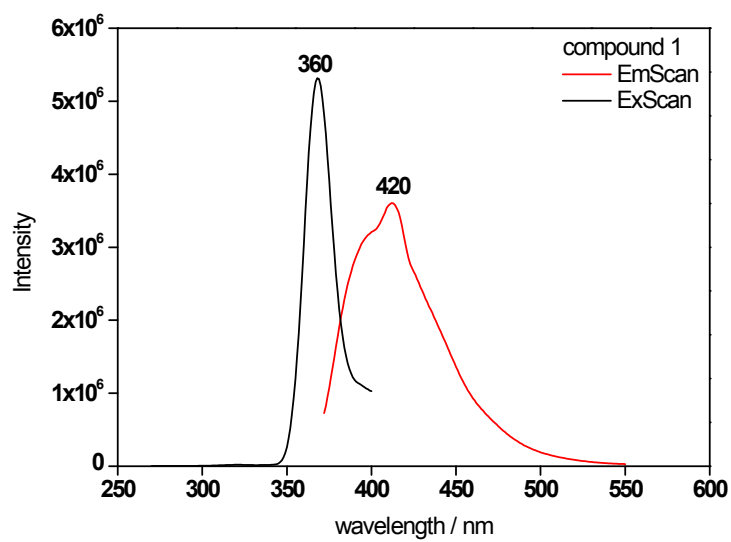
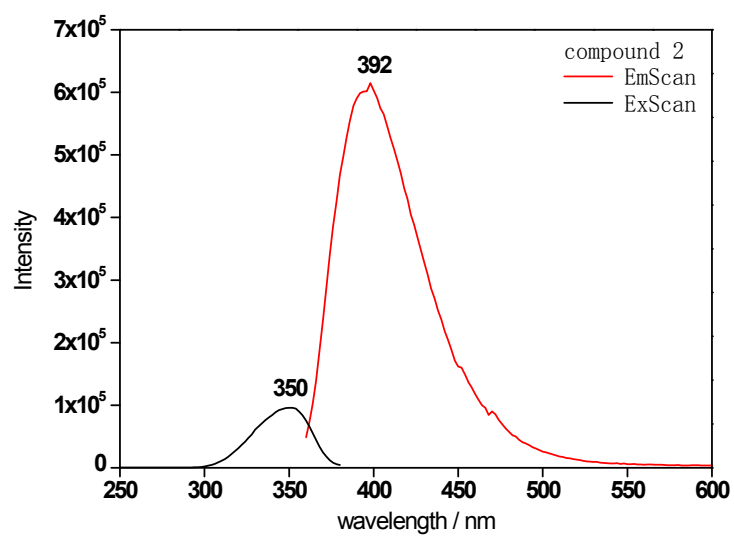


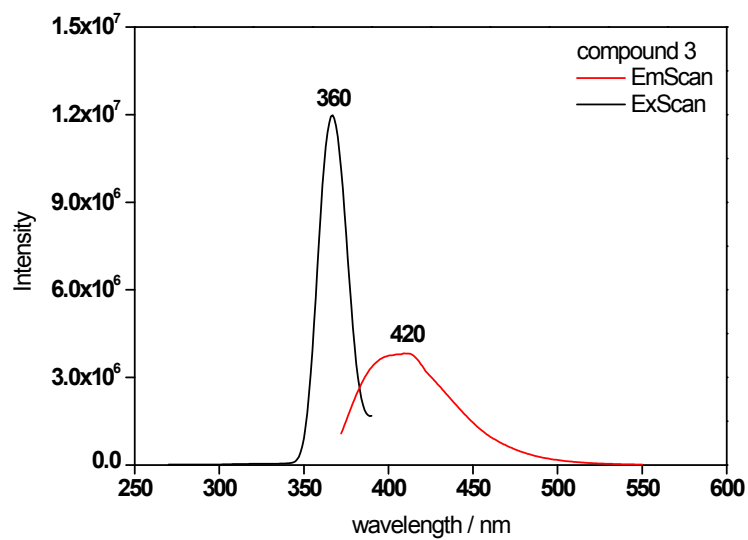
Fig. S7 IR spectra of compound 1, 2, and 3



(a)



(b)



(c)

Fig. S8 Emission spectra and excitation spectra of compound 1, 2, and 3