A Dual-function $[Ru(bpy)_3]^{2+}$ Encapsulated Metal−Organic Framework for Ratiometric Al^{3+} detection and anticounterfeiting application

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Materials Characterization Section

Table S1. Crystal data for **HPU-24**.

Complex	**HPU-24**
Formula	$C_{33}H_{29}Cd_2NO_{12}$
formula weight, fw	856.37
Temperature, *T* [K]	193.00
crystal system	*monoclinic*
space group	*P 2₁/c*
a [Å]	14.0828(16)
b [Å]	10.9927(12)
c [Å]	23.566(3)
α [°]	90
β [°]	98.544(5)
γ [°]	90
V [Å^3]	3607.7(7)
Z	4
ρ [g cm^{-3}]	1.577
μ [mm^{-1}]	6.769
θ range	3.300- 61.010
F(000)	1704
goodness-of-fit, GOF	1.067
R_1[a] [I > 2σ (I)]	0.0708
wR_2[b] (all data)	0.1762

$^{a}R_1 = \left|\,|F_o| - |F_c|\,\right| / |F_o|$. $^{b}wR_2 = [w(|F_o^2| - |F_c^2|)^2 / w|F_o^2|^2]^{1/2}$.

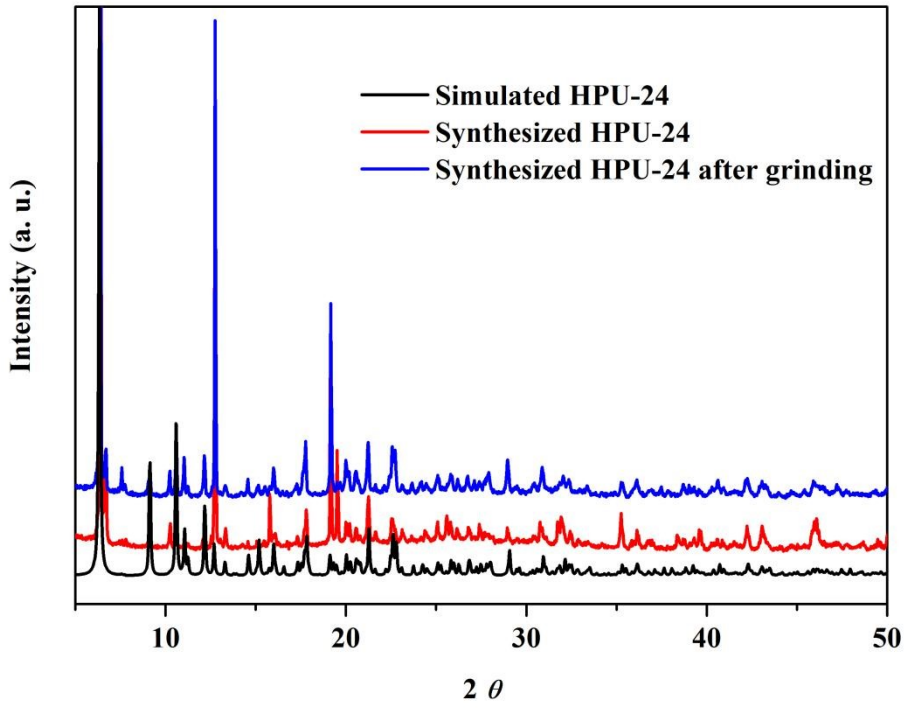

Figure S1 PXRD patterns of simulated **HPU-24**, synthesized **HPU-24** and synthesized **HPU-24** after grinding.

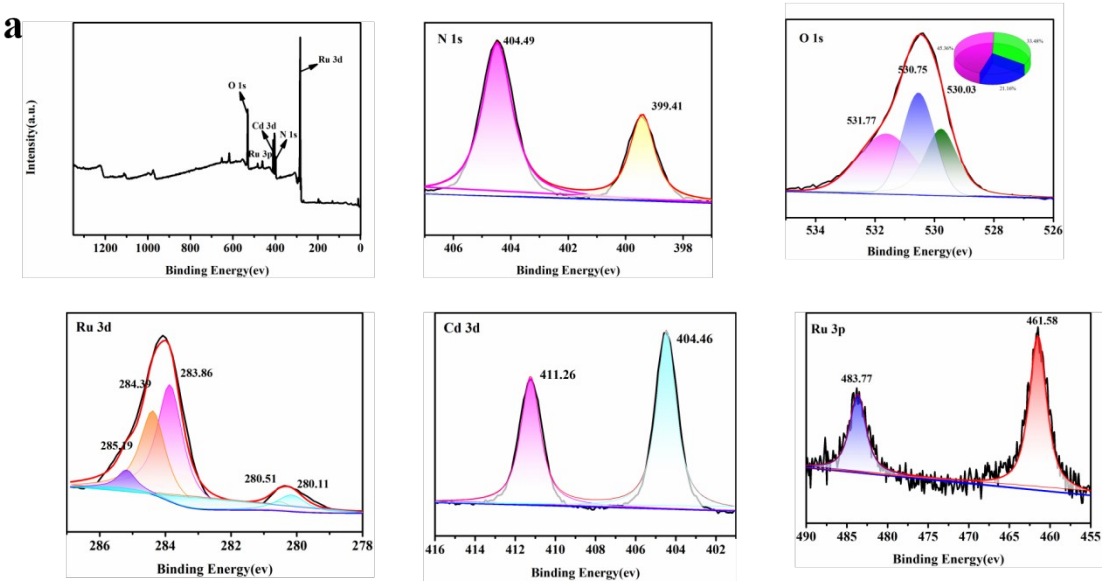

Figure S2 XPS results of **HPU-24@Ru**.

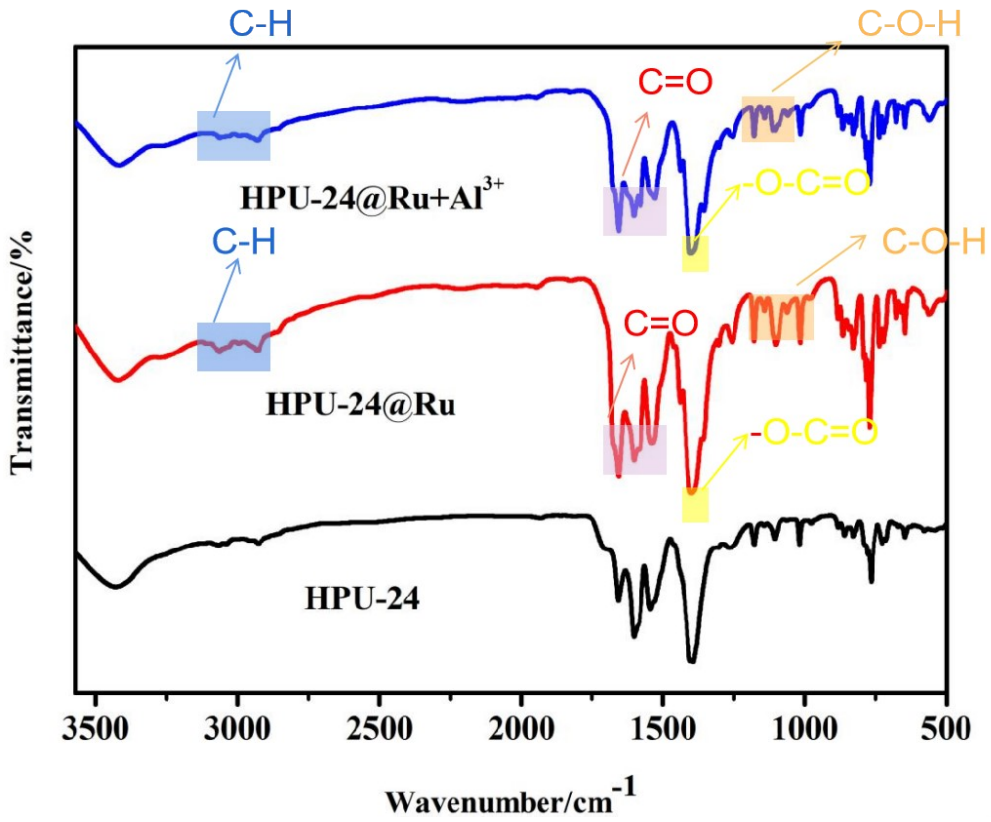

Figure S3 The IR spectra of different products.

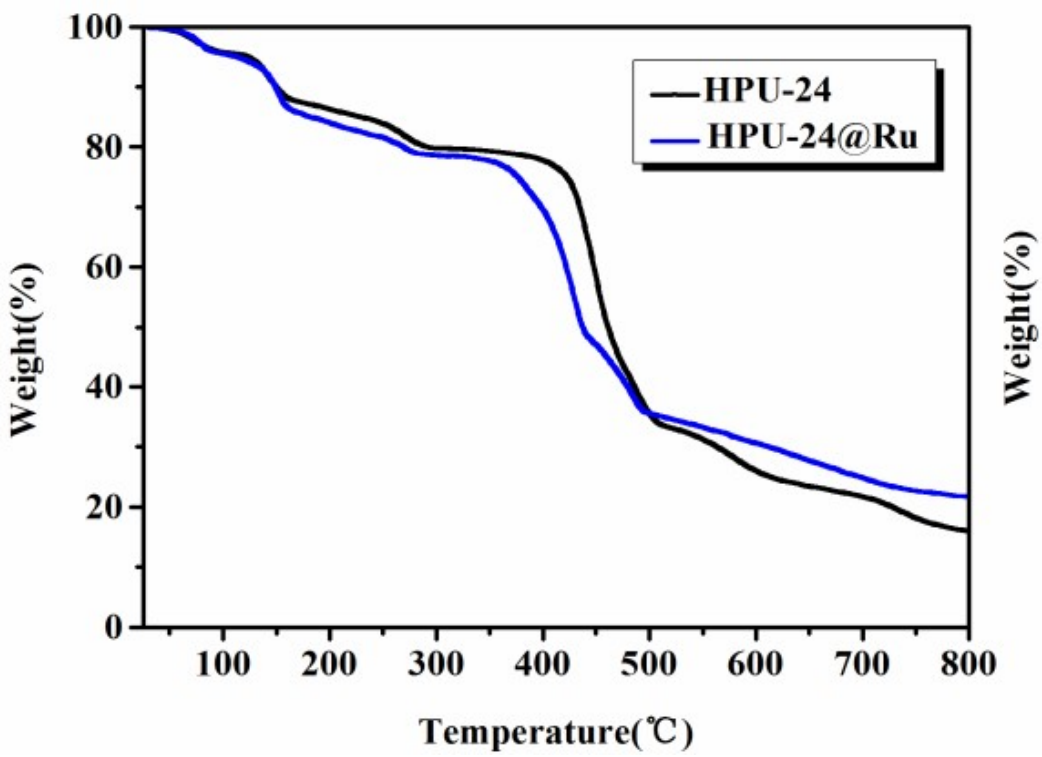

Figure S4 TGA analysis of **HPU-24** and **HPU-24@Ru**.

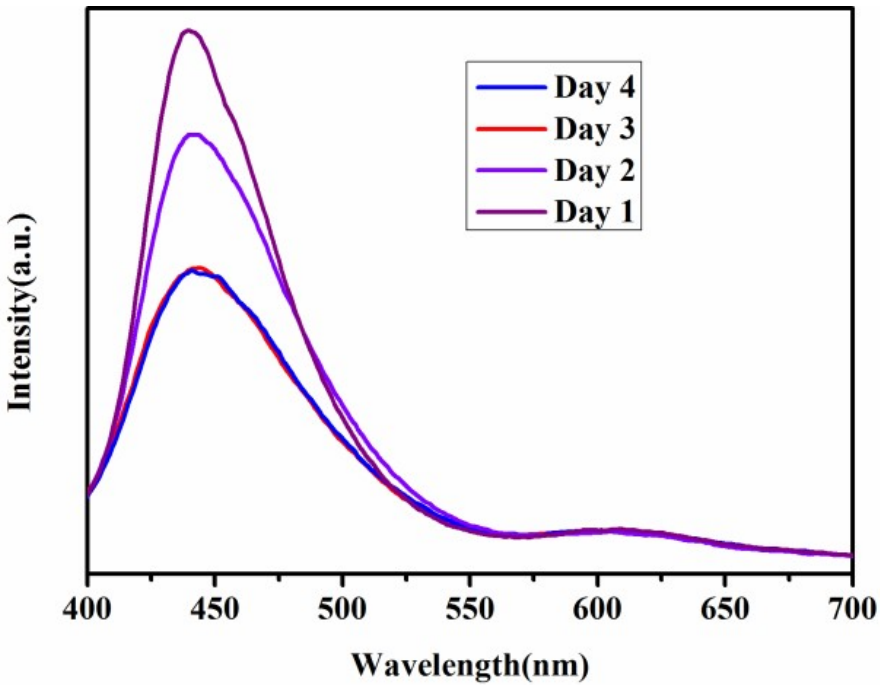

Figure S5 Fluorescence spectra of **HPU-24@Ru** in the water over four days under the excitation of 365 nm.

Table S2. Loading capacity of $Ru(bpy)_3^{2+}$ in **HPU-24@Ru** .

Inductively Coupled Plasma-Atomic Emission Spectrometry	Ru weight amount measure by ICP-AES (mg)	$[Ru(bpy)_3]^{2+}$ weight amount (mg)	Loading capacity (wt%)
Ru	0.011	0.0697	6.51

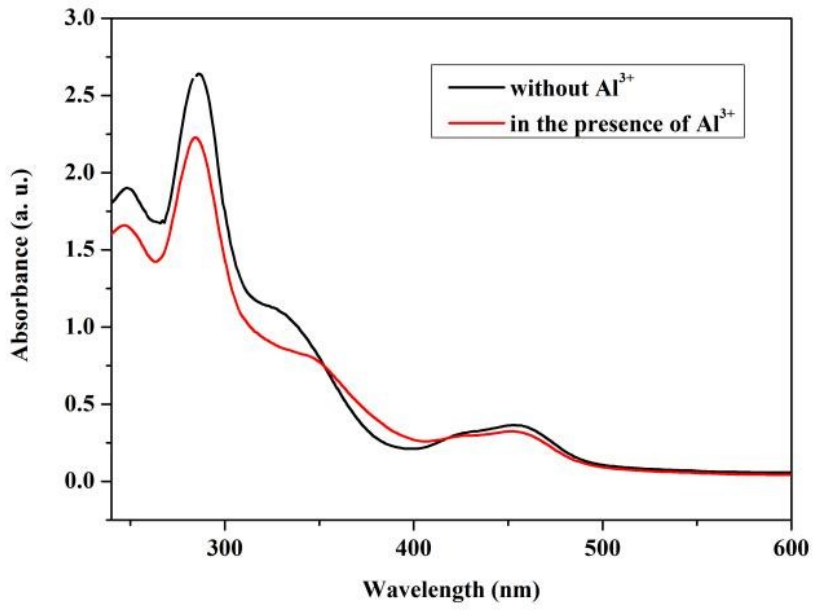

Figure S6 UV-vis spectra of **HPU-24@Ru** in the absence or presence of Al^{3+} ions.

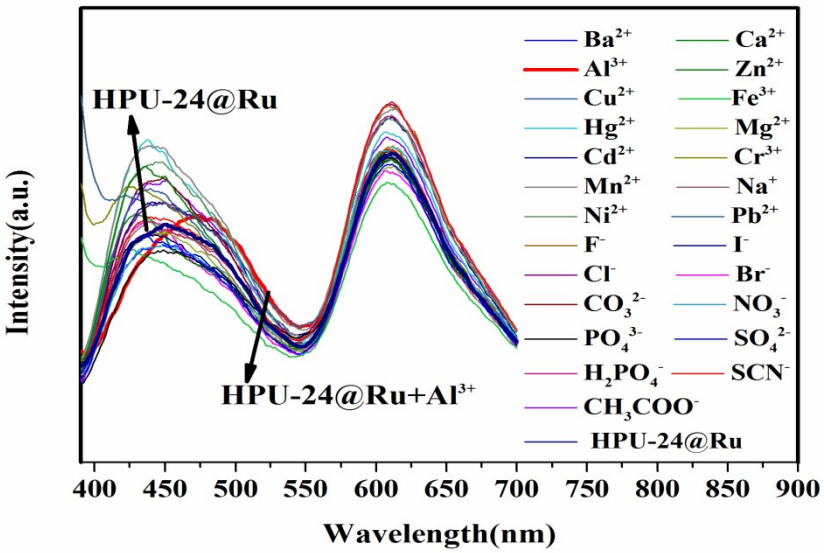

Figure S7 Changes of luminescence intensity at 480 and 610 nm with respect of emission of **HPU-24@Ru** (10 μmol·L^{-1}) with Al^{3+} in aqueous solution with 50 μL of coexistent metal cations (Na^{+}, K^{+}, Mg^{2+}, Ca^{2+}, Ba^{2+}, Sr^{2+}, Zn^{2+}, Co^{2+}, Cu^{2+}, Ni^{2+}, Cd^{2+}, Mn^{2+}, Fe^{3+}, Pb^{2+}, Ag^{+}, Al^{3+}, Cr^{3+} and Fe^{2+}) (Ex = 365 nm).

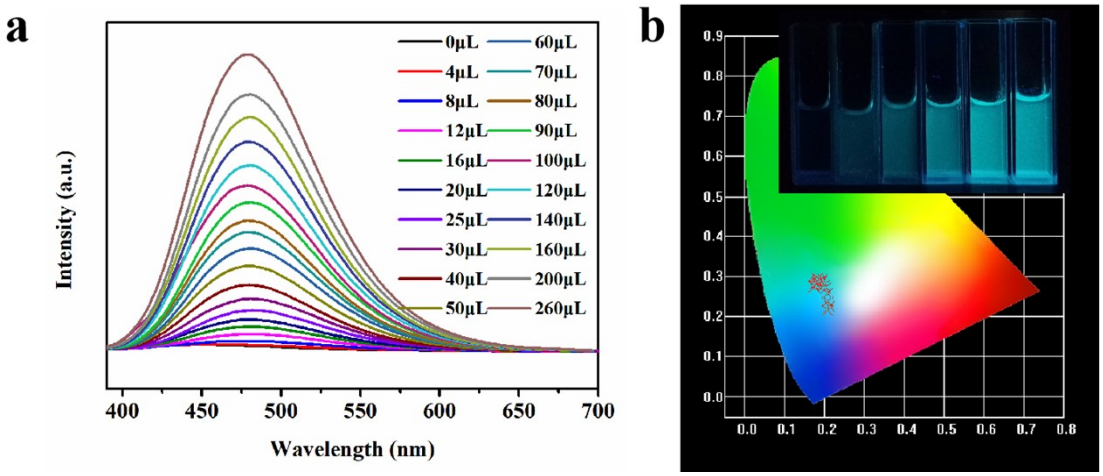

Figure S8 (a) Fluorescence sensing performance of **HPU-24** towards Al^{3+} ions; (b) the CIE chromaticity diagram of **HPU-24** with 0-260 μL Al^{3+} ions under an excitation of 365 nm (inset: the photos showing the corresponding fluorescence color changes triggered by Al^{3+} ions).

Table S3 The performance of different Al^{3+} sensors.

Fluorescent probes	Detection limit	Ref
AX-AuNPs	20 μM	52
$Eu(OAc)_3 \cdot 4H_2O$	10^{-4} M	8
$[Eu_2(ppda)_2(npdc)(H_2O)] \cdot H_2O$	1.09×10^{-4} M	53