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Supporting information

Ln^{3+} post-functionalized metal-organic framework for color tunable emission and highly-sensitivity sensing of toxic anions and small molecules

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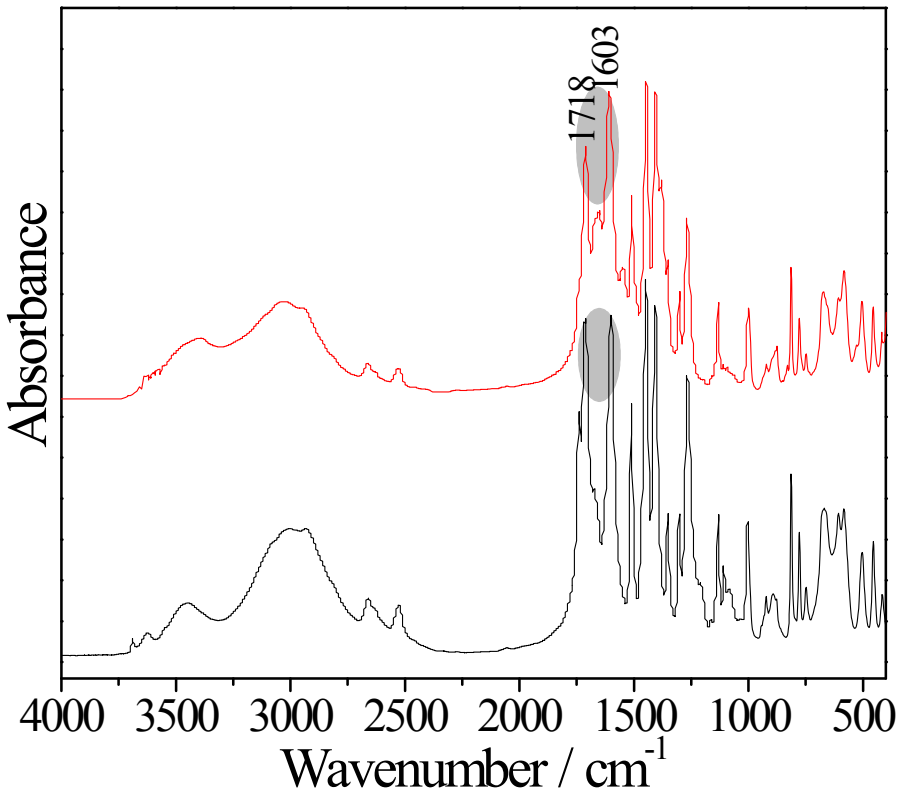

Figure S1. FTIR spectra of MIL-121 (black line) and Eu^{3+}@MIL-121 (red line), the peaks at 1718 cm^{-1} and 1603 cm^{-1} are ascribed to the stretching vibration of C=O from the free and coordinated carboxyl, respectively.

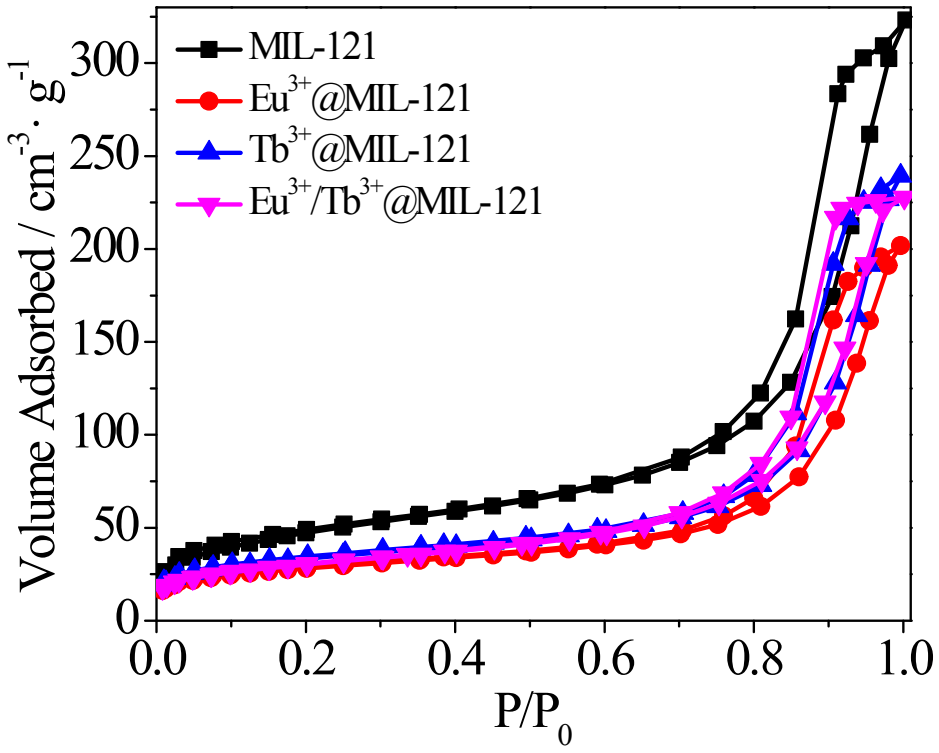

Figure S2. N_2 adsorption−desorption isotherms of MIL-121 and Ln^{3+}@MIL-121 (Ln = Eu, Tb, Eu/Tb)

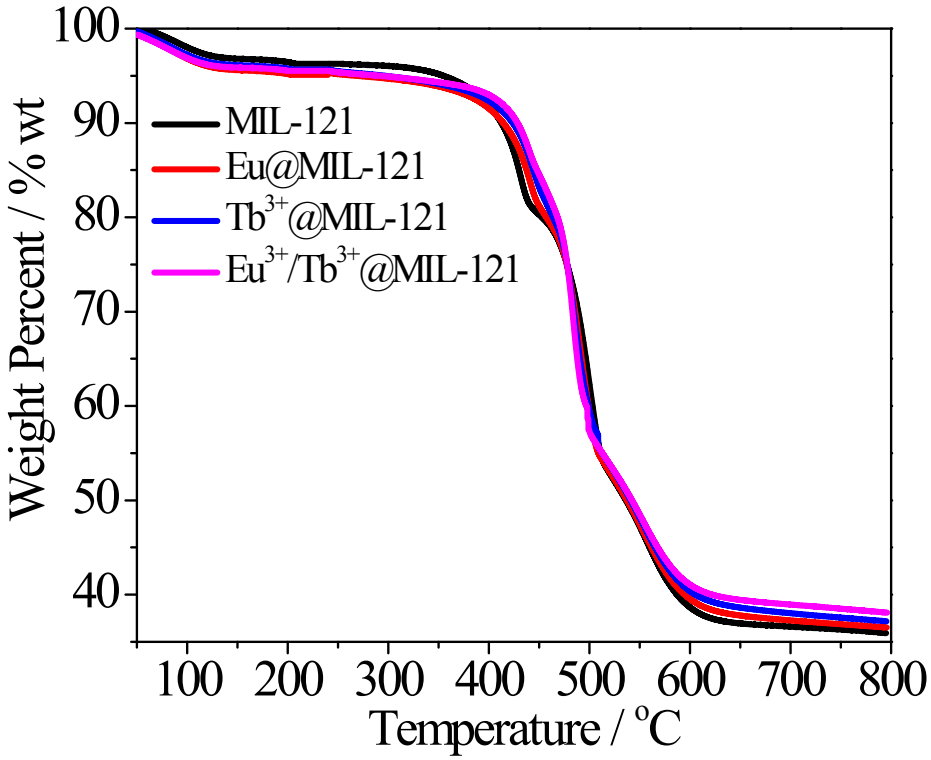

Figure S3. TGA curves of MIL-121 and Ln^{3+}@MIL-121. Thermogravimetric analysis (TGA) reveals that MIL-121 can be stable up to 400 °C. The TG curve of MIL-121 presents two events. The first one is the elimination of the trapped solvent in the pores (~2 wt%). After a plateau up to 400 °C, the decomposition of the organic ligand occurs (obs. 63 wt%; calc. 68.6 wt%).

Table S1. The ICPMS results of Ln^{3+}@MIL-121 (Ln = Eu, Tb, Eu/Tb)

compounds	Al^{3+}(ppm)	Eu^{3+}(ppm)	Tb^{3+}(ppm)	Al^{3+} : Ln^{3+}
Eu^{3+}@MIL-121	6.98	3.50	--	2:1
Tb^{3+}@MIL-121	12.71	--	6.51	1.95:1
Eu^{3+}/Tb^{3+}@MIL-121	10.62	2.21	3.46	4.8:1:1.56

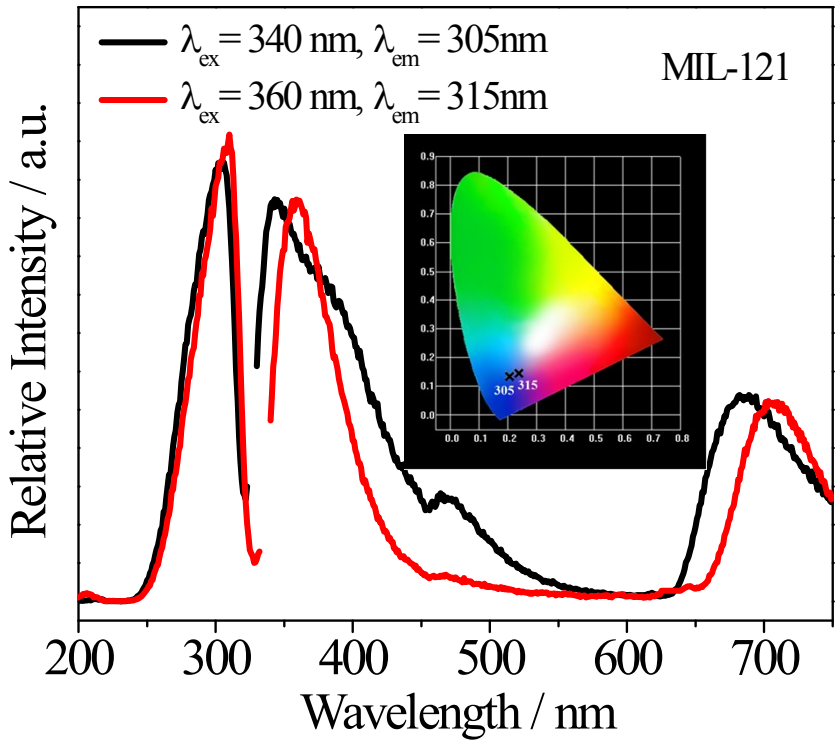

Figure S4. Excitation and emission spectra of MIL-121. The inset shows its corresponding CIE chromaticity diagram (λ_{ex}= 305 nm, CIE x: 0.204; CIE y: 0.139; λ_{ex}= 315 nm, CIE x: 0.2371; CIE y: 0.1502).

Table S2. Luminescence Lifetimes (τ) and Absolute Quantum Yields (φ) of Ln^{3+}@MIL-121 (Ln = Eu, Tb, Eu/Tb).

Ln^{3+}	τ (μs)	Φ(%)	λ_{ex}(nm)	λ_{em}(nm)
Eu^{3+}	307	6	315	615
Tb^{3+}	538	11	318	545
Eu^{3+}/Tb^{3+}	280	8	317	615
Eu^{3+}/Tb^{3+}	399		317	545

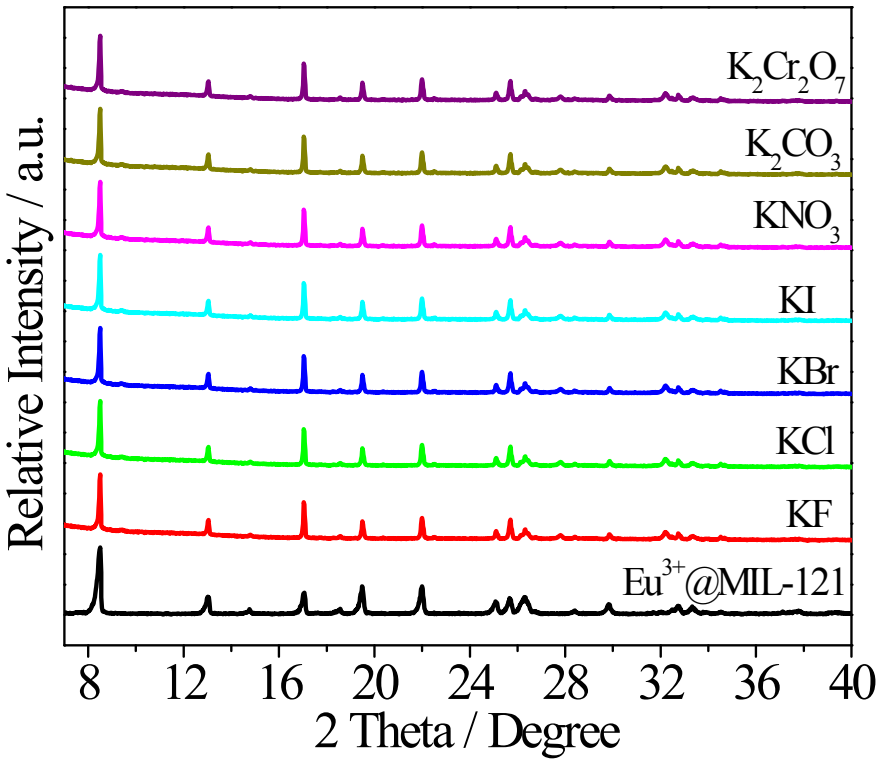

Figure S5. The PXRD patterns of the Eu^{3+}@MIL-121 treated by various anion aqueous solutions.

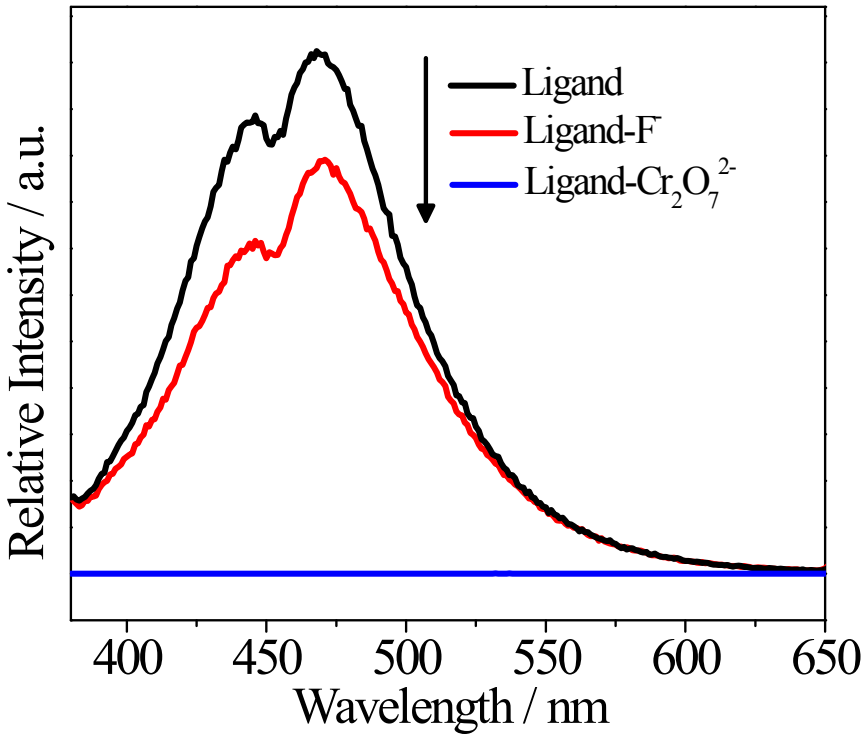

Figure S6. Responses of the fluorescence of pure ligand (H_4btec) towards aqueous solutions of F^- and $Cr_2O_7^{2-}$, respectively.

Table S3. The luminescence lifetimes for the $^5D_0 \rightarrow {}^7F_2$ (615 nm) emission of Eu^{3+}@MIL-121 after immersing in the aqueous solutions of various anions (λ_{ex}=315 nm).

Materials	τ (μs)
K_2CO_3	311
H_2O	237.6
KCl	184.5
KI	188.6
KNO_3	186.0
KBr	183.2
KF	50.9
$K_2Cr_2O_7$	undetectable

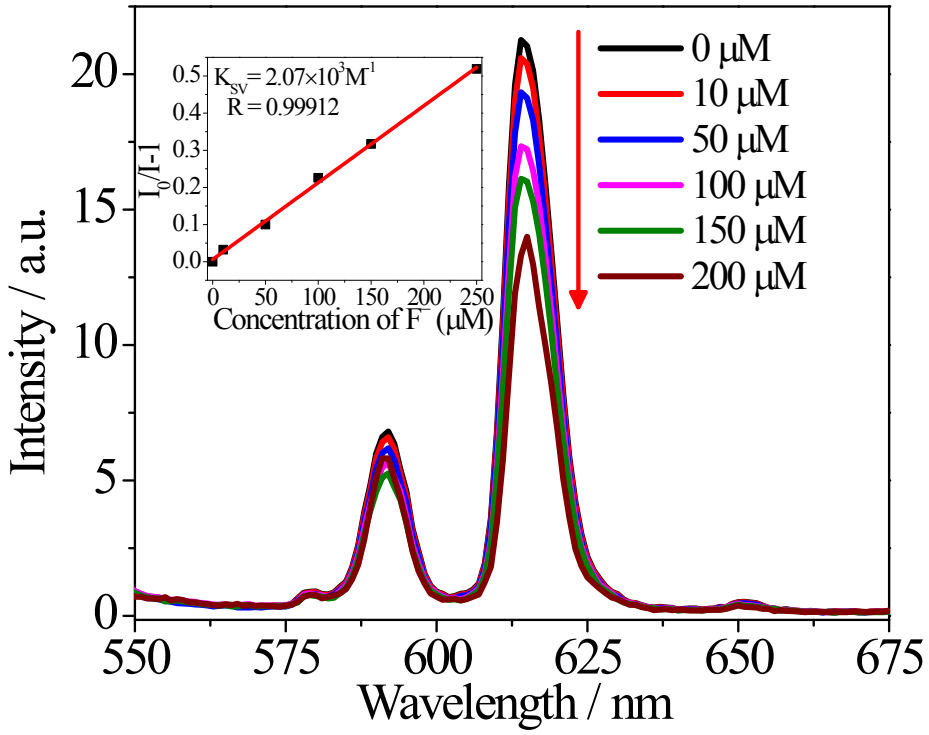

Figure S7. Emission spectra and the K_{sv} curve (inset) of Eu^{3+}@MIL-121 in aqueous solutions in the presence of various concentrations of F^- under excitation at 315 nm.

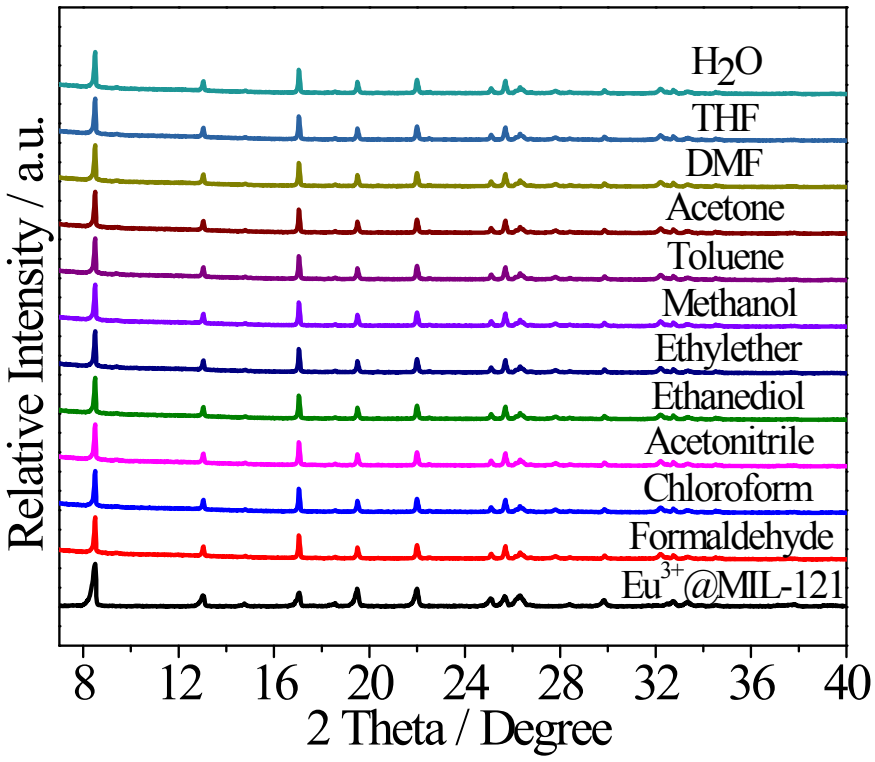

Figure S8. The PXRD patterns of Eu^{3+}@MIL-121 treated by different solvents.