Supporting Information

Lanthanide hybrids of covalently-coordination cooperative post-functionalized metal-organic frameworks for luminescence tuning and highly-selectively sensing of tetrahydrofuran

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Fig. S1 The crystal structure of UMCM-NH$_2$ along c axis.
**Fig. S2** $^1$H NMR spectra of digested UMCM-AM (ca. 41% modified). Modified NH$_2$-BDC and unmodified NH$_2$-BDC are indicated by red circles and black squares respectively.

**Fig. S3** X-ray photoelectron spectra (XPS) of UMCM-AM (black) and Eu-MOF (red) for N 1s (a), O 1s (b).
**Fig. S4** Thermal gravimetric analysis (TGA) curves of UMCM-NH$_2$ and Eu-MOF.

**Fig. S5** Excitation and emission spectra of UMCM-AM; the inset is the corresponding CIE digram of UMCM-AM ($x = 0.1573$, $y = 0.0931$).
**Fig. S6** The emission spectra of UMCM-AM that was modified with different concentration of 2,3-pyrazinedicarboxylic anhydride.

**Fig. S7** Emission spectra of Eu-MOF when UMCM-AM was immersed in the different concentration (mol L\(^{-1}\)) of Eu(acac)\(_3\)·3H\(_2\)O.
Fig. S8 Emission spectra of Tb-MOF when UMCM-AM was immersed in the different concentration (mol L\(^{-1}\)) of Tb(acac)\(_3\)·3H\(_2\)O.

Fig. S9 The values of \(I_{Eu}/I_L\) (Ln = Eu, Tb) that were obtained at the same condition.
Fig. S10 Excitation (black line) and emission spectra of Sm-MOF.

Fig. S11 Emission spectra of Eu-MOF obtained at different excitation wavelength. The insets are corresponding photographs.
Fig. S12 CIE diagrams of emission spectra of Eu-MOF obtained at different excitation wavelength (nm).

Fig. S13 The linear relationship of the chromaticity coordinates (x, y) of Tb-MOF luminescence spectra obtained at different excitation wavelength between 320 and 355 nm (5 nm increment).
**Fig. S14** Luminescence intensity ($I_L$ and $I_{Eu}$) of Eu-MOF dispersed into different organic molecules.

**Fig. S15** The CIE diagrams of Eu-MOF dispersed into different organic molecules.
**Fig. S16** Emission spectra of Eu-MOF immersed in THF at various time intervals ($\lambda_{ex}=328$ nm).

**Fig. S17** The values of $I_L/I_{Eu}$ of Eu-MOF dispersed in THF as a function of immersed time.
Fig. S18 The photographs of DMF suspensions under UV-light irradiation with different THF content: 0% (left), (50%) right.

Fig. S19 Emission spectra of Eu-MOF when it was immersed in H$_2$O and 33%THF.
**Fig. S20** The PXRD patterns of Eu-MOF after being immersed in THF and washed with CHCl$_3$.

**Fig. S21** One kind of possible hydrogen-bond types between ligands and THF.
Fig. S22 UV-Vis adsorption spectra of suspended Eu-MOF (black) in DMF, Eu-MOF (red) in THF/DMF and Eu-MOF (blue) in Pyridine/DMF solution (DMF as reference solvent).

<table>
<thead>
<tr>
<th>MOF</th>
<th>Eu (ppm)</th>
<th>Tb (ppm)</th>
<th>Zn (ppm)</th>
<th>Zn/Eu ratio&lt;sup&gt;a&lt;/sup&gt;</th>
<th>Zn/Tb ratio&lt;sup&gt;b&lt;/sup&gt;</th>
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<tbody>
<tr>
<td>Eu-MOF</td>
<td>1.638</td>
<td>--</td>
<td>11.07</td>
<td>15.8 : 1</td>
<td>--</td>
</tr>
<tr>
<td>Tb-MOF</td>
<td>--</td>
<td>2.013</td>
<td>11.65</td>
<td>--</td>
<td>14.2 : 1</td>
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<tr>
<td>Eu/Tb-MOF</td>
<td>1.224</td>
<td>1.156</td>
<td>12.53</td>
<td>23.9 : 1</td>
<td>26.5 : 1</td>
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<sup>a</sup>: Zn/Eu molar ratio that calculated based on the ICP-MS results.

<sup>b</sup>: Zn/Tb molar ratio that calculated based on the ICP-MS results.

<table>
<thead>
<tr>
<th>MOF</th>
<th>DMF</th>
<th>DMF/THF</th>
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<tr>
<td>Eu&lt;sup&gt;3+&lt;/sup&gt; (us)</td>
<td>876</td>
<td>943</td>
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<td>Ligands (us)</td>
<td>16</td>
<td>360</td>
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**Table S2** The lifetimes of Eu-MOF immersed in DMF and DMF/THF.