Supplementary material

A portable self-calibrating logic detector for gradient detecting formaldehyde based on luminescent metal organic frameworks hybrids

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**Scheme S1** The crystal structure of Bio-MOF-1.

**Figure S1** The FT-IR images of Bio-MOF-1 and Eu$^{3+}@$Bio-MOF-1.
Figure S2 Eu 4d XPS spectra of Eu$^{3+}$@Bio-MOF-1 and Eu(NO$_3$)$_3$·6H$_2$O; N 1s and O 1s XPS spectra of Bio-MOF-1 and Eu$^{3+}$@Bio-MOF-1.

Figure S3 The UV-vis spectra of Bio-MOF-1 and Eu$^{3+}$@Bio-MOF-1.
**Figure S4** Thermal gravimetric analysis curves for Bio-MOF-1 and Eu$^{3+}$@Bio-MOF-1.

**Figure S5** The excitation (black line) and emission (red line) spectra of Bio-MOF-1.
Figure S6 The corresponding CIE chromaticity diagram of (a) Bio-MOF-1 and (b) Eu^{3+}@Bio-MOF-1.

Figure S7 The luminescent spectra of Bio-MOF-1 and Bio-MOF-1 dispersed in FA.
**Figure S8** The line chart of luminescent intensity of Eu$^{3+}$@Bio-MOF-1 with different immersion time in FA.

**Figure S9** Linear curve of the luminescent intensity of Eu$^{3+}$@Bio-MOF-1 toward different concentrations of FA.
Figure S10 (a) The fluorescence stability of Eu$^{3+}$@Bio-MOF-1 in H$_2$O of different PH; (b) Day to day fluorescence stability of Eu$^{3+}$@Bio-MOF-1.

Figure S11 (a) The structure stability of Eu$^{3+}$@Bio-MOF-1 in H$_2$O of different PH; (b) Day to day structure stability of Eu$^{3+}$@Bio-MOF-1 in water.
Figure S12 The UV-vis spectra of Eu$^{3+}$@Bio-MOF-1 and FA.

Figure S13 Eu 4d XPS spectra of Eu$^{3+}$@Bio-MOF-1 and FA- Eu$^{3+}$@Bio-MOF-1