

Supporting Information

Composite Materials Combining Multiple Luminescent MOFs and Superparamagnetic Microparticles for Ratiometric Water Detection

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Powder X-ray diffraction

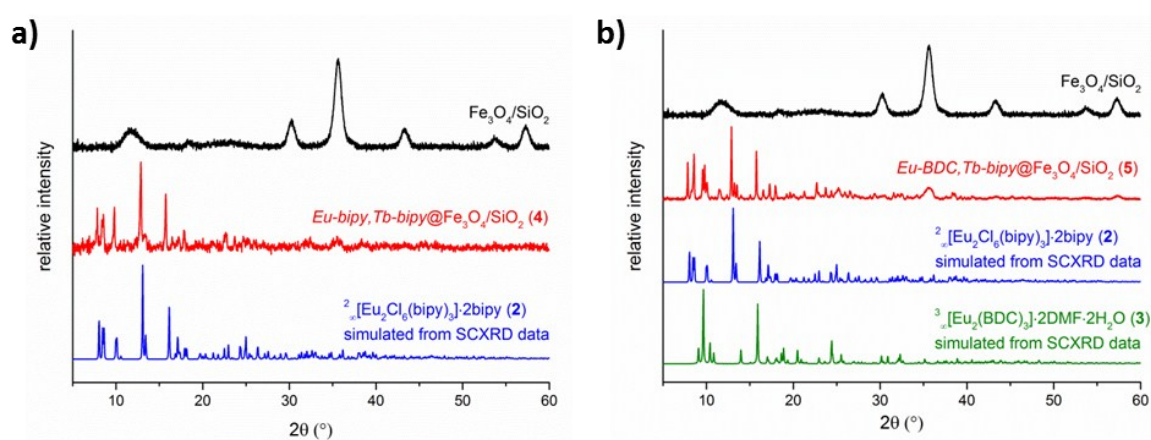


Fig. S1. Powder diffraction patterns of the composite systems *Eu-bipy, Tb-bipy*@Fe₃O₄/SiO₂ (4) (a) and *Eu-BDC, Tb-bipy*@Fe₃O₄/SiO₂ (5) (b) in comparison with the particular MOFs and Fe₃O₄/SiO₂.

IR spectroscopy

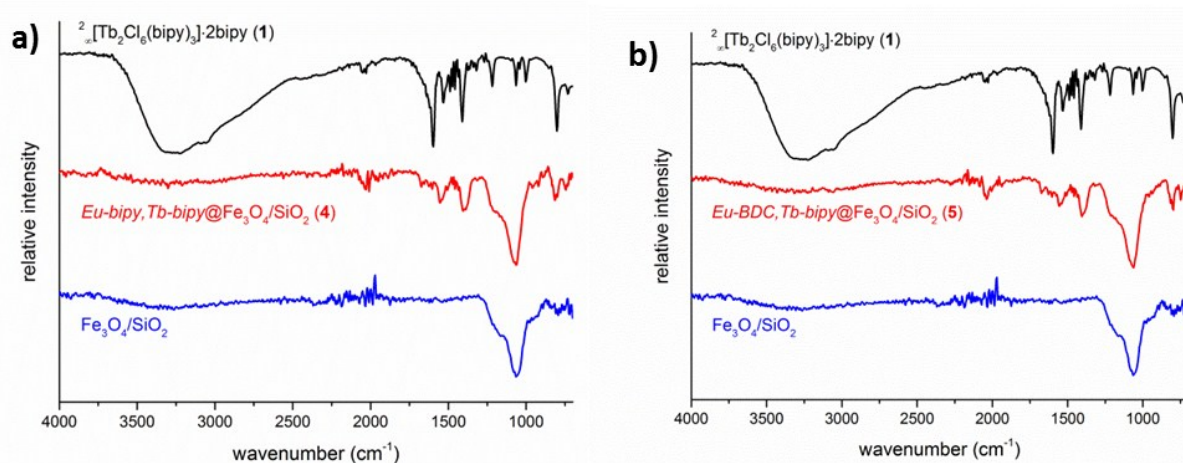


Fig. S2. IR spectra of the composite systems *Eu-bipy, Tb-bipy*@Fe₃O₄/SiO₂ (4) (a) and *Eu-BDC, Tb-bipy*@Fe₃O₄/SiO₂ (5) (b) in comparison with the particular MOFs and Fe₃O₄/SiO₂.

EDX analysis

Table S1. EDX studies of the composite systems *Eu-bipy,Tb-bipy*@Fe₃O₄/SiO₂ (**4**) and *Eu-BDC,Tb-bipy*@Fe₃O₄/SiO₂ (**5**).

Element	<i>Eu-bipy,Tb-bipy</i> @Fe ₃ O ₄ /SiO ₂ (4)	<i>Eu-BDC,Tb-bipy</i> @Fe ₃ O ₄ /SiO ₂ (5)
	At%	At%
C K	77.31	68.87
O K	20.30	23.36
Si K	0.85	1.41
Cl K	0.65	1.24
Fe K	0.53	0.99
Eu L	0.12	0.14
Tb L	0.15	0.57

Magnetic measurements

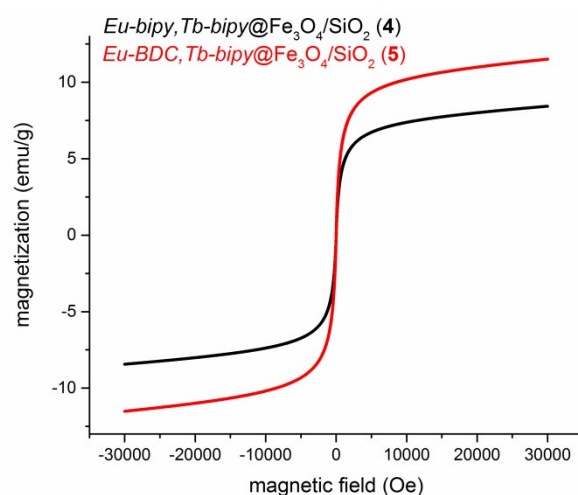


Fig. S3. Magnetization curves of the composite systems *Eu-bipy,Tb-bipy*@Fe₃O₄/SiO₂ (**4**) and *Eu-BDC,Tb-bipy*@Fe₃O₄/SiO₂ (**5**).

Photoluminescence lifetimes

Table S2. Photoluminescence lifetimes of the composite materials *Eu-bipy,Tb-bipy*@Fe₃O₄/SiO₂ (**4**) and *Eu-BDC,Tb-bipy*@Fe₃O₄/SiO₂ (**5**) excited at 300 nm.

Ln ion	λ_{Em} (nm)	B ₁ (%)	τ_1 (μ s)	B ₂ (%)	τ_2 (μ s)	χ^2
<i>Eu-bipy,Tb-bipy</i> @Fe ₃ O ₄ /SiO ₂ (4)						
Tb ³⁺	545	76.1	1836 $\pm$ 32	23.9	2591 $\pm$ 142	1.16
Eu ³⁺	700	50.4	1232 $\pm$ 30	49.6	1693 $\pm$ 37	1.13
<i>Eu-BDC,Tb-bipy</i> @Fe ₃ O ₄ /SiO ₂ (5)						
Tb ³⁺	545	81.9	1936 $\pm$ 7	18.1	4084 $\pm$ 42	1.06
Eu ³⁺	613	67.6	1238 $\pm$ 17	32.4	1774 $\pm$ 43	1.12

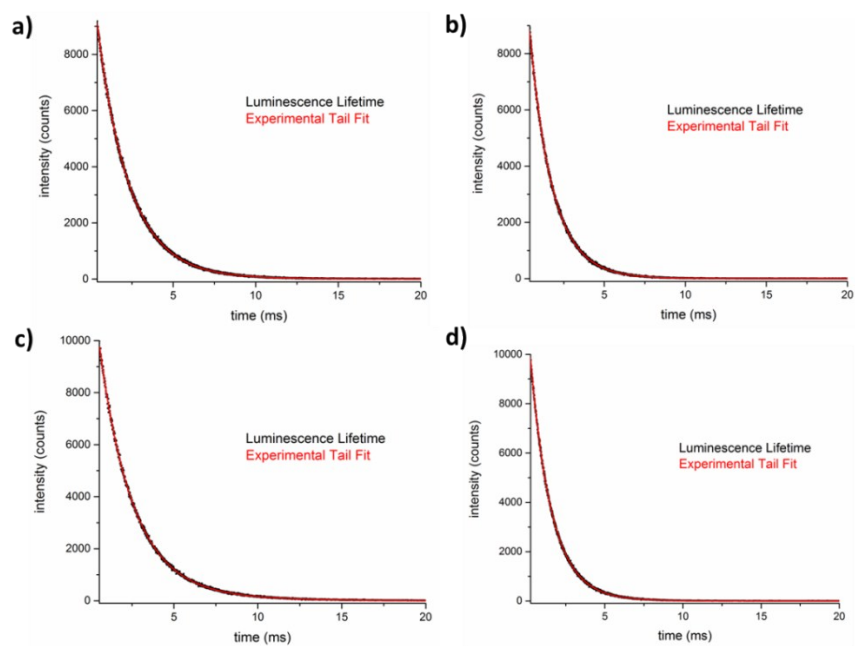


Fig. S4. Photoluminescence lifetime decay curves and experimental tail fit of the composite system *Eu-bipy, Tb-bipy*@Fe₃O₄/SiO₂ (4) excited at 300 nm with $\lambda_{em} = 545$ nm (a) and $\lambda_{em} = 700$ nm (b) and of the composite system *Eu-BDC, Tb-bipy*@Fe₃O₄/SiO₂ (5) excited at 300 nm with $\lambda_{em} = 545$ nm (c) and $\lambda_{em} = 613$ nm (d)