Electronic Supplementary Material (ESI) for Dalton Transactions.

Supporting information

A dual-emission probe to detect moisture and water in organics based on green-Tb^{3+} post-coordinated metal–organic frameworks with red-carbon dots

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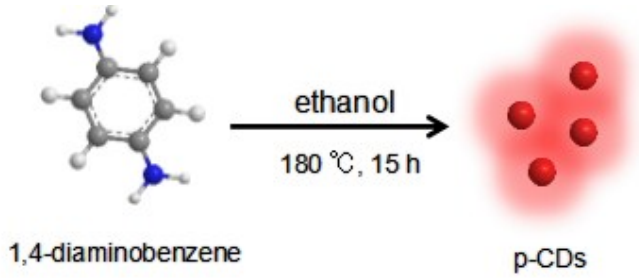


Fig. S1 Hydrothermal synthetic route using 1,4-diaminobenzene and ethanol to from p-CDs.

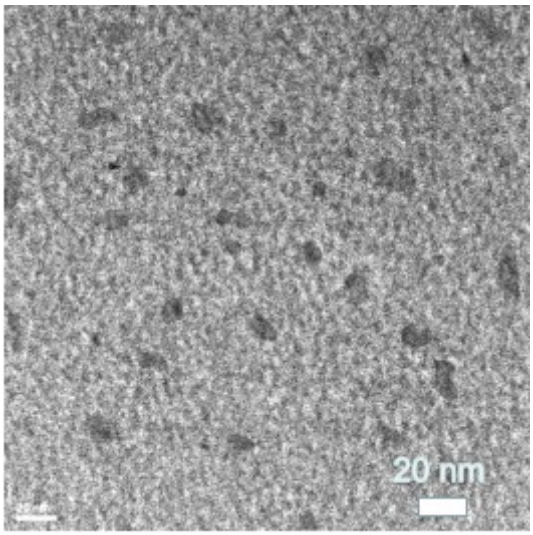


Fig.S2 TEM image of p-CDs

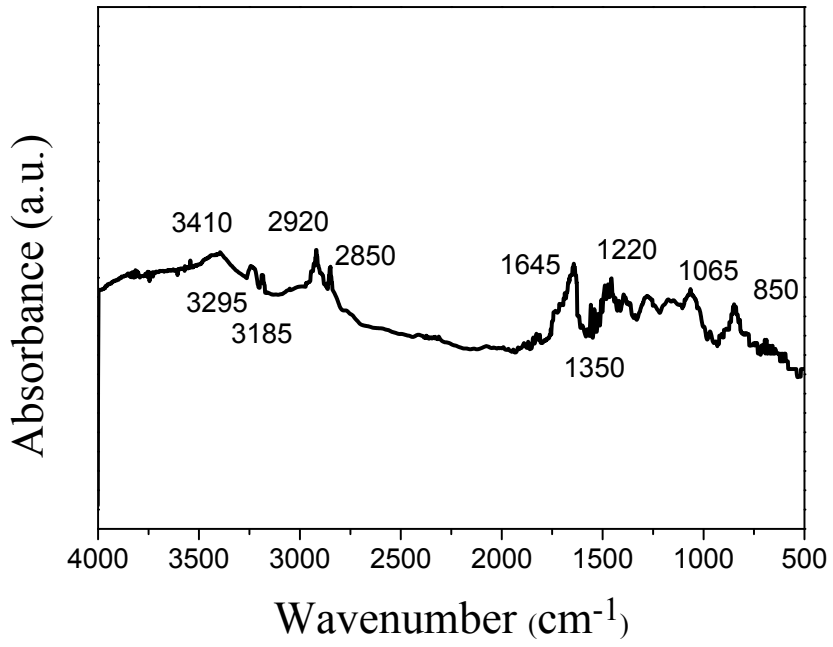


Fig. S3 FTIR spectra of p-CDs.

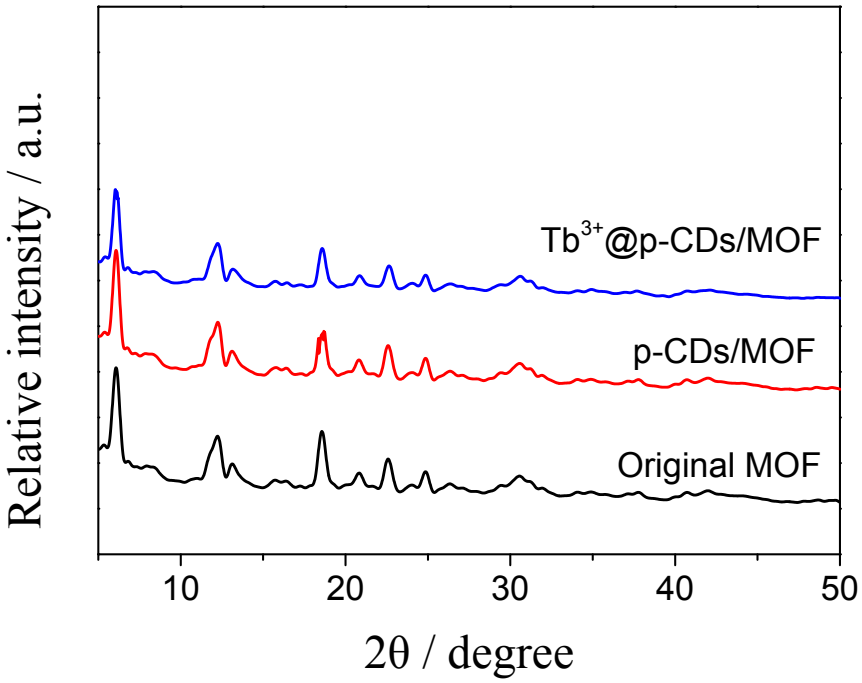


Fig. S4 PXRD patterns of original MOF, p-CDs/MOF and Tb^{3+}@p-CDs/MOF

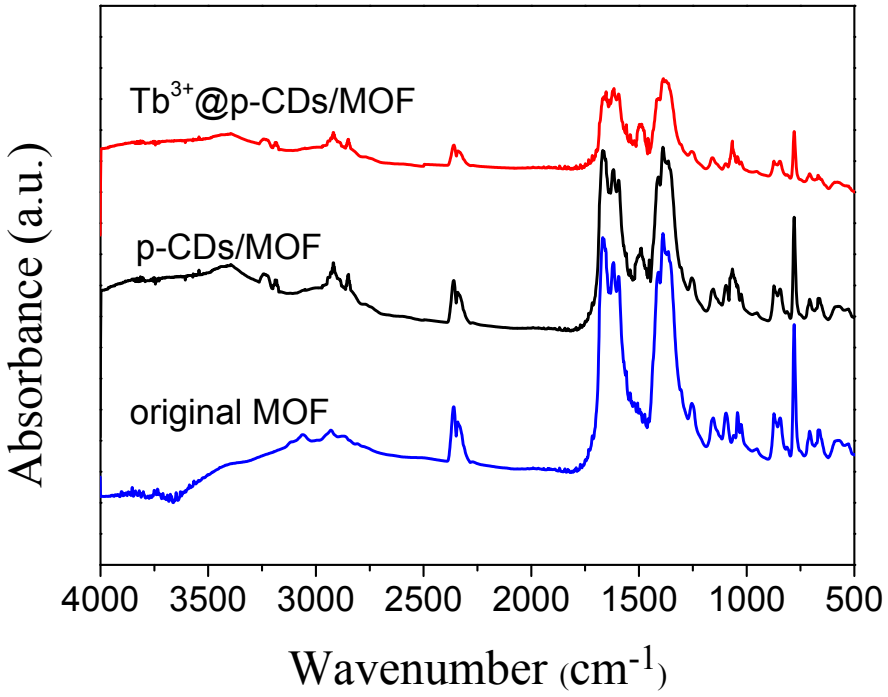


Fig. S5 FTIR spectra of original MOF, p-CDs/MOF and Tb^{3+}@p-CDs/MOF.

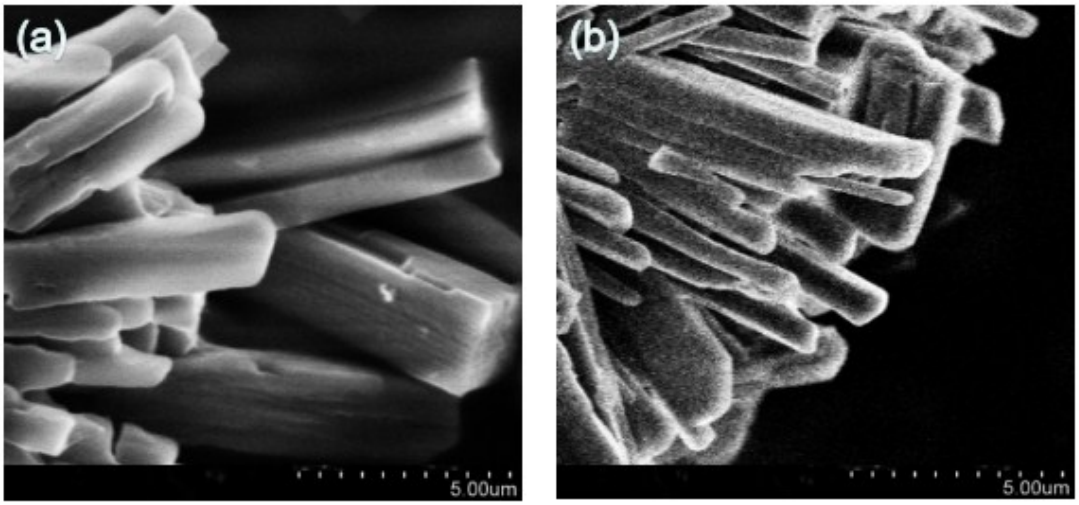


Fig. S6 SEM of (a) original MOF and (b) p-CDs/MOF.

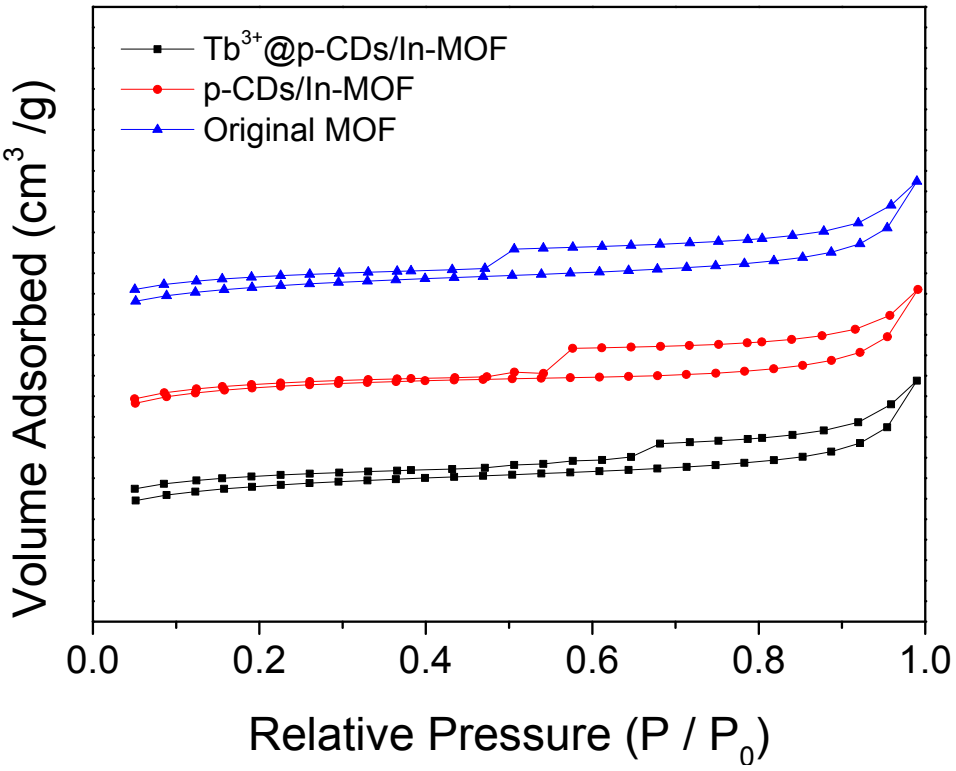


Fig. S7 N_2 adsorption and desorption isotherms of original MOF, p-CDs/MOF and Tb^{3+}@p-CDs/MOF. The BET surface areas of original MOF, p-CDs/MOF and Tb^{3+}@p-CDs/MOF are calculated to be 650, 536 and 355 m^2/g.

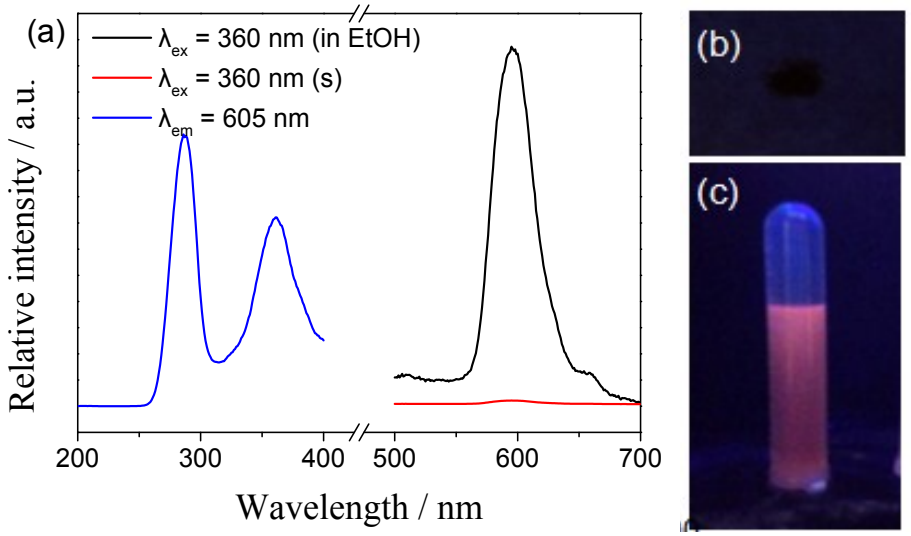


Fig. S8 (a) Room temperature excitation (blue line), emission spectra (red line) of p-CDs in ethanol solution and emission spectra (black line) of p-CDs particles; (b) the corresponding photographs of dried p-CDs particles (top) and p-CDs in ethanol solution (bottom) under UV light irradiation at 365 nm.

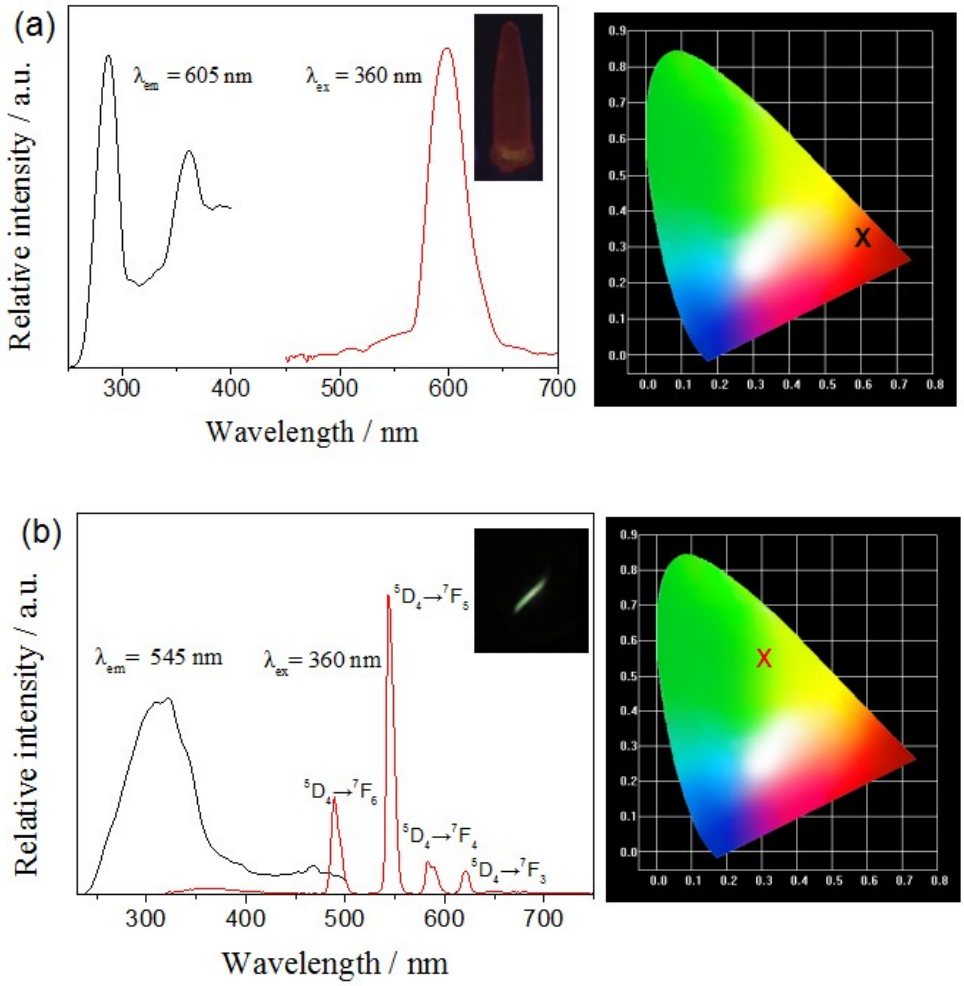


Fig. S9 (a) The excitation (black) and emission spectra (red) of p-CDs/MOF in ethanol (monitored and excited at 605 nm and 360 nm, respectively); photoluminescence colour with 365 nm UV excitations using a Xe lamp as the excitation source; CIE chromaticity diagram of p-CDs/MOF excited at 360 nm (X= 0.61, Y=0.34); (b) The excitation (black) and emission spectra (red) of Tb^{3+}@MOF (monitored and excited at 545 nm and 360 nm, respectively); photoluminescence colour with 360 nm UV excitations using a Xe lamp as the excitation source; CIE chromaticity diagram of Tb^{3+}@MOF excited at 360 nm (X= 0.31, Y=0.55).

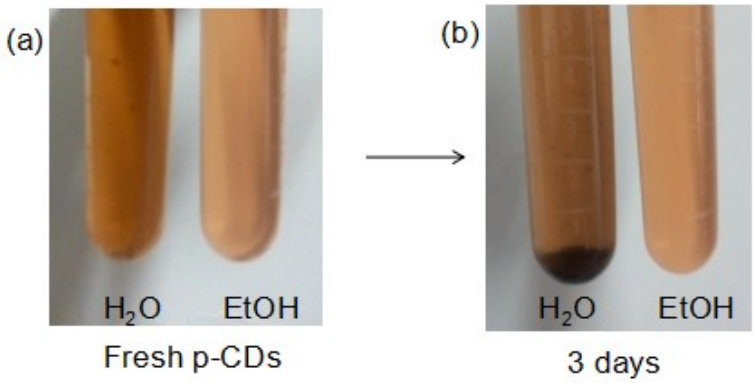


Fig. S10 (a) Photographs of fresh p-CDs in H_2O or EtOH; (b) p-CDs in H_2O or EtOH after three days.

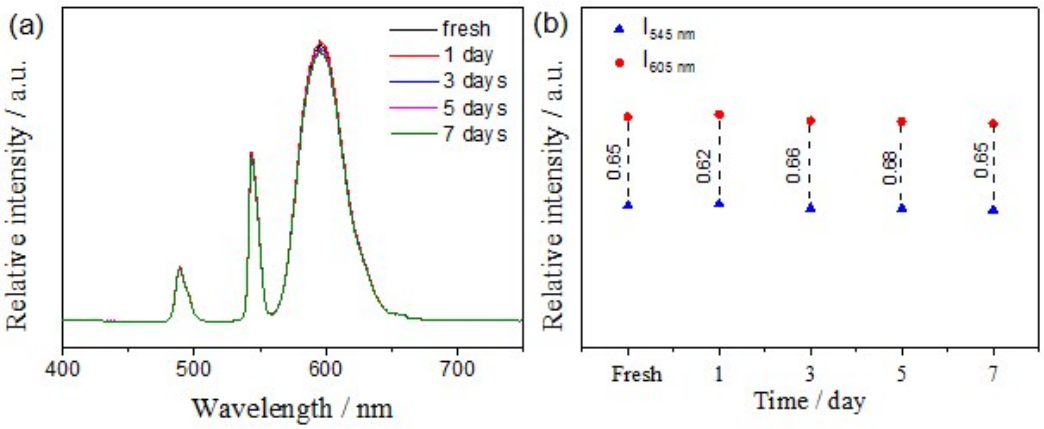
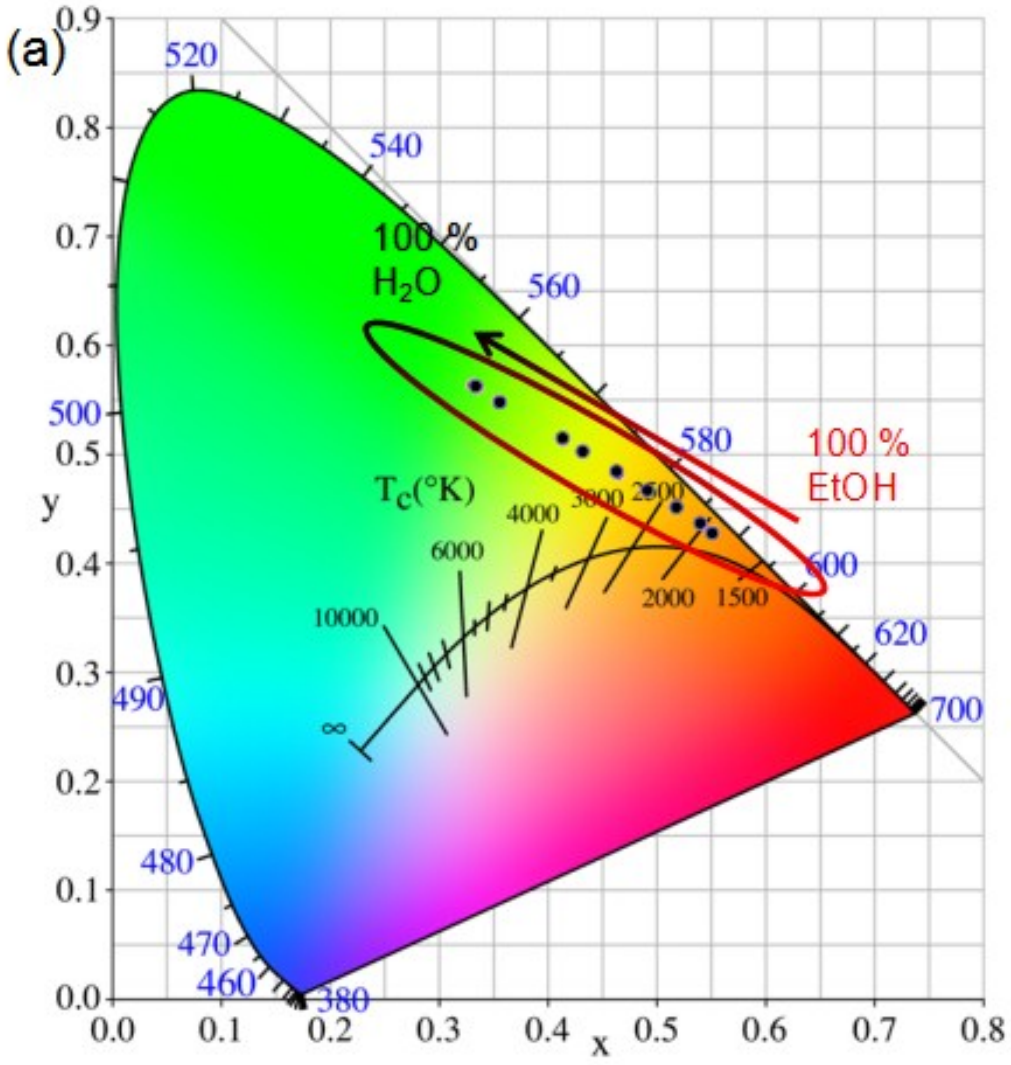


Fig. S11 (a) Stability of PL intensity of Tb^{3+}@p-CDs/MOF after immersing in ethanol solution for 7 days, (b) changes in the corresponding values of I_{545nm} and I_{605nm} and ratio of I_{545nm}/I_{605nm}.



(b) CIE chromaticity diagram	
Water Content %	**(X, Y)**
0	(0.55, 0.43)
2	(0.54, 0.44)
5	(0.51, 0.45)
10	(0.49, 0.47)
15	(0.46, 0.48)
20	(0.43, 0.50)
30	(0.41, 0.51)
40	(0.35, 0.55)
50	(0.34, 0.56)
70	(0.33, 0.56)
100	(0.32, 0.56)

Fig. S12 (a) CIE chromaticity diagram of Tb^{3+}@p-CDs/MOF scattered in the ethanol solution containing different water content excited at 360 nm. (b) Related values of CIE chromaticity diagram.

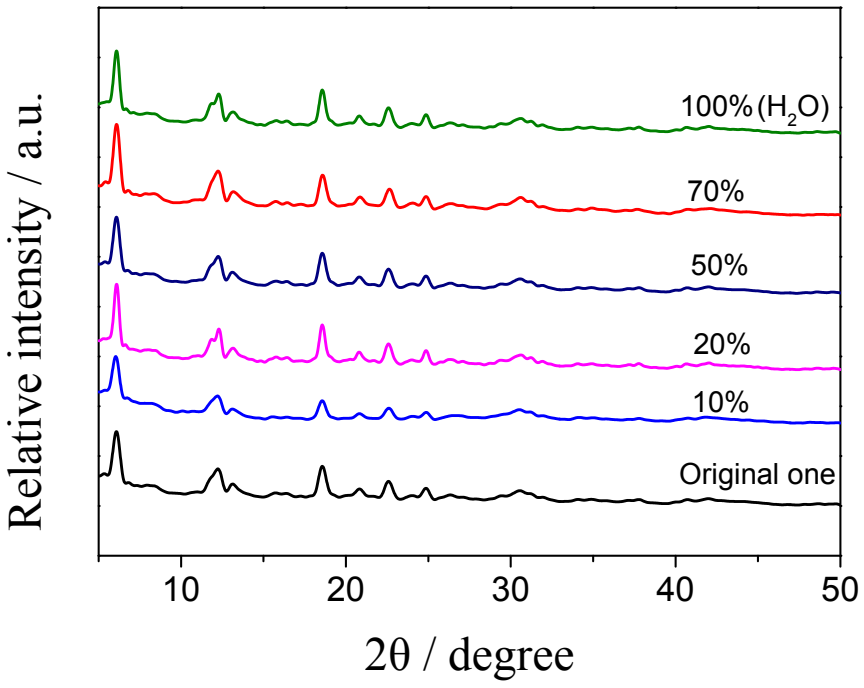


Fig. S13 PXRD patterns of Tb^{3+}@p-CDs/MOF in ethanol upon addition of different amounts of water (original one: 0, 10%, 20%, 50%, 70% and 100%).

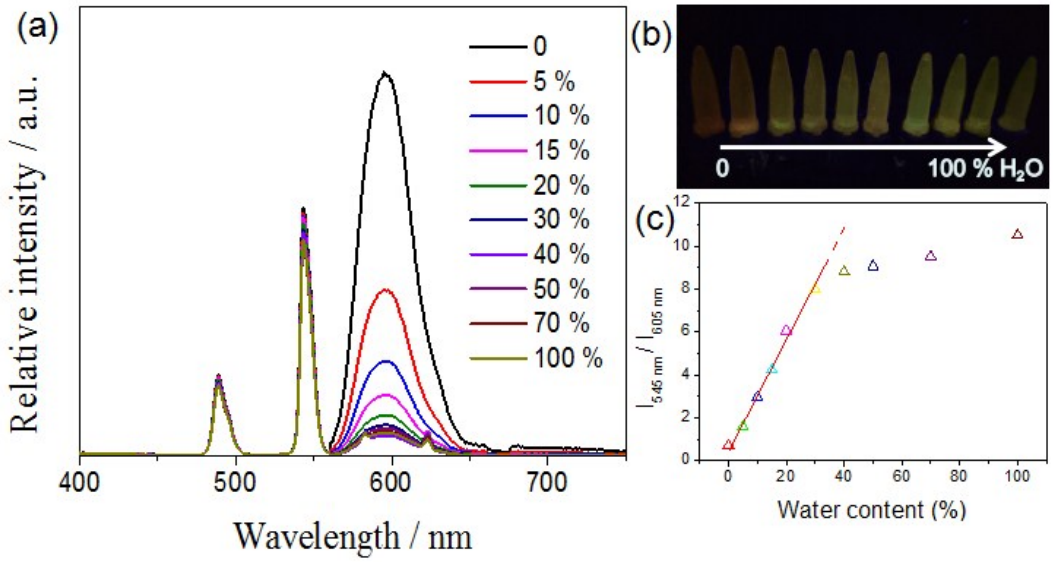


Fig. S14 (a) PL spectra (λ_{ex} = 360 nm) of Tb^{3+}@p-CDs/MOF dispersed in DMF with various water contents under; (b) corresponding visual PL photos shot under 365 UV light; (c) linear relationship of $I_{545\ nm}/I_{605\ nm}$ versus the water content in DMF.

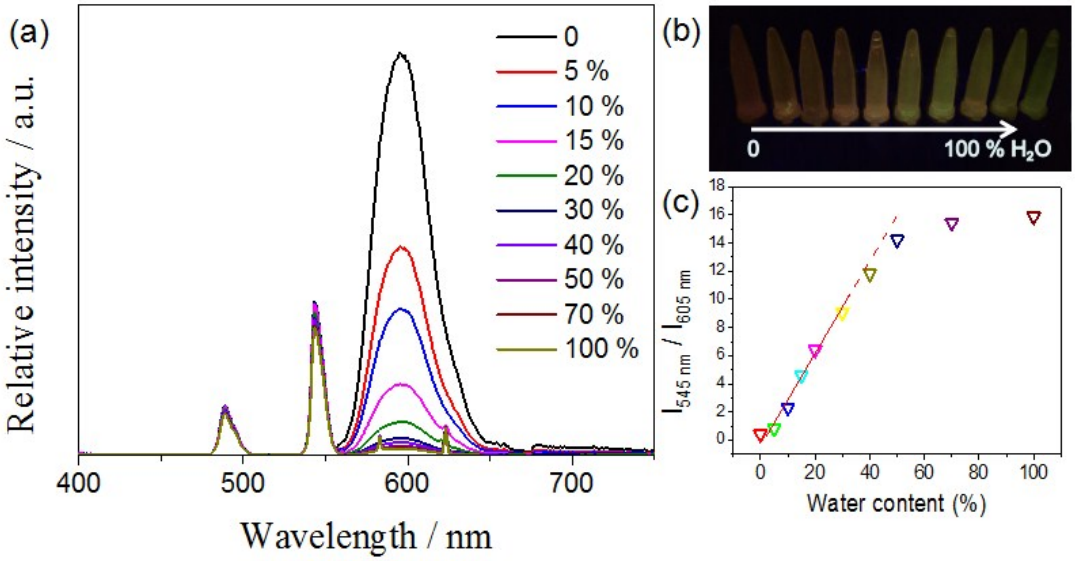


Fig. S15 (a) PL spectra (λ_{ex} = 360 nm) of Tb^{3+}@p-CDs/MOF dispersed in cyclopropane with various water contents under; (b) corresponding visual PL photos shot under 365 UV light; (c) linear relationship of $I_{545\ nm}/I_{605\ nm}$ versus the water content in cyclopropane.

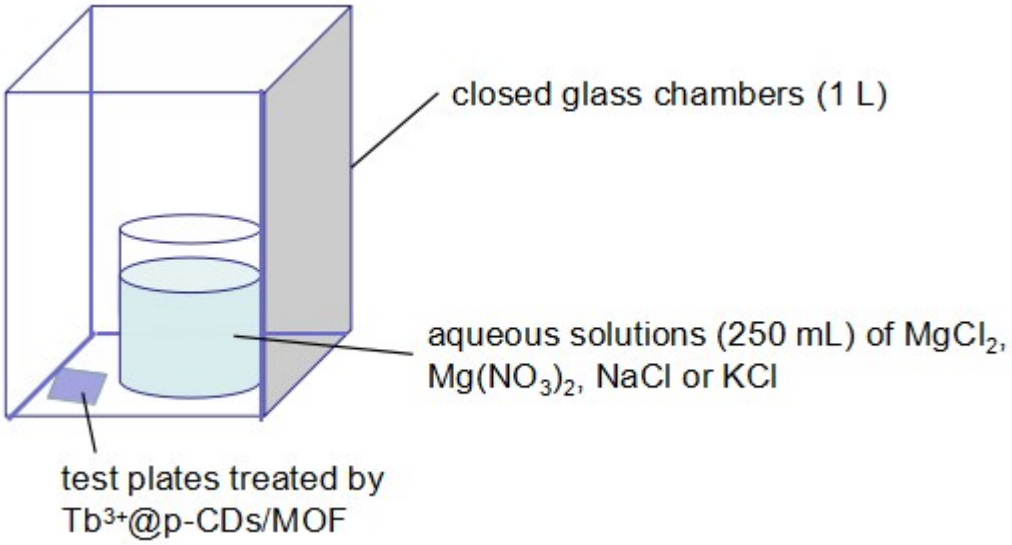


Fig. S16 Humidity detecting device, including a closed glass chambers (1 L) containing test plates with Tb^{3+}@p-CDs/MOF and aqueous solutions (250 mL) of $MgCl_2$, $Mg(NO_3)_2$, NaCl or KCl.