# Supplementary information

# Nanoscale carbon dots-embedded metal-organic framework for turned-on fluorescent detection of water in organic solvents

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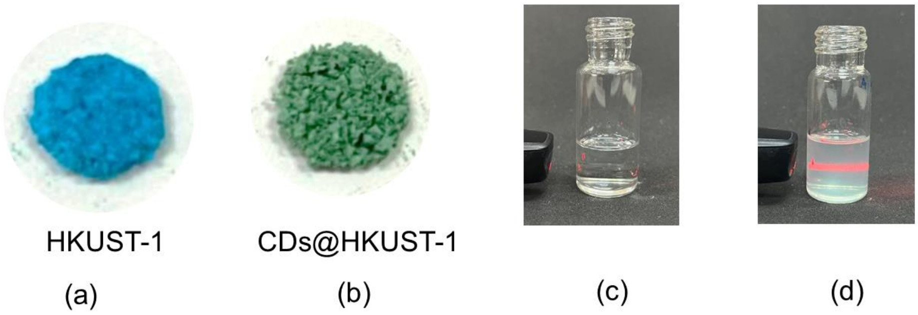



**Figure S1** Photographs of (a) HKUST-1 and (b) CDs@HKUST-1. Tyndall effect of a colloidal ethanol suspension of CDs@HKUST-1 material. Ethanol solution (c) without and (d) with CDs@HKUST-1.

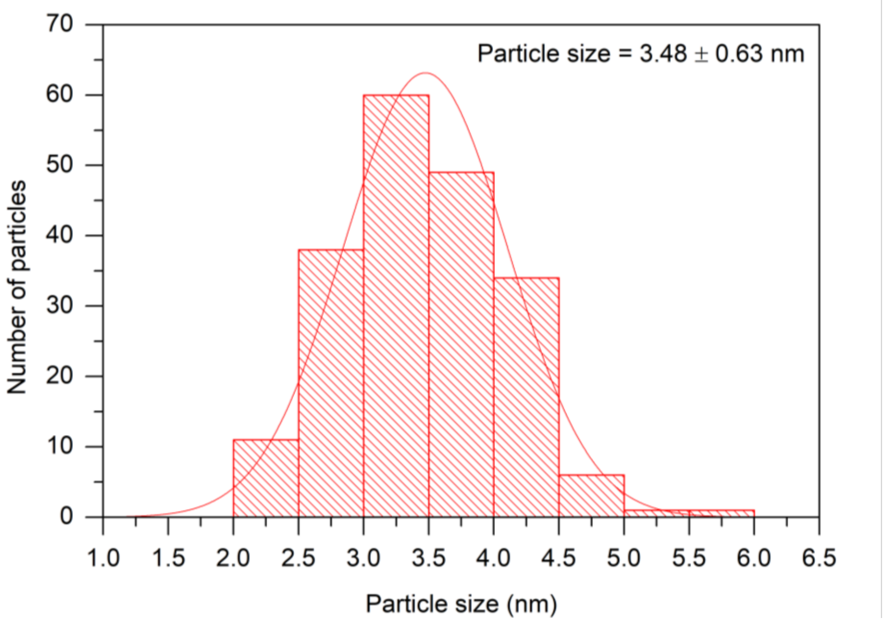



**Figure S2** Size distribution histogram of CDs

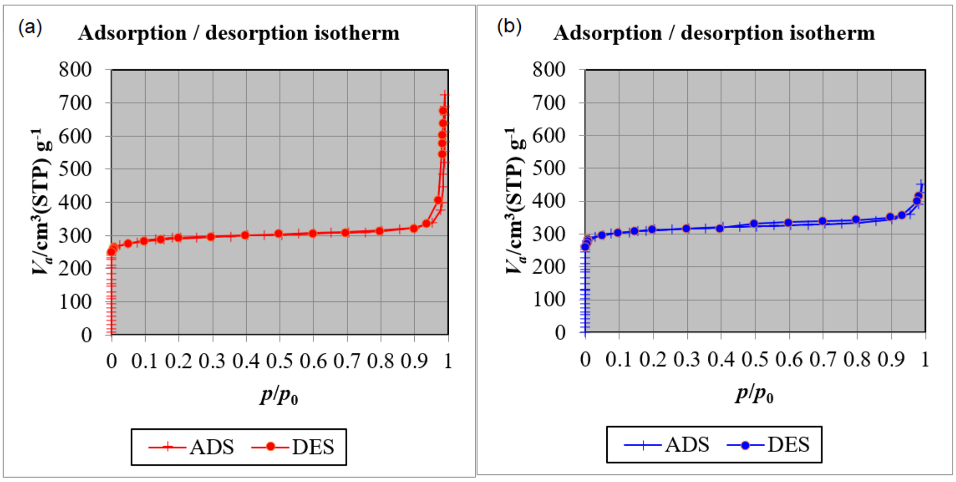



**Figure S3** $N_2$ adsorption–desorption isotherms of (a) HKUST-1 and (b) CDs@HKUST-1

**Table S1** BET surface area, total pore volume and average pore diameter of the HKUST-1 and CDs@HKUST-1

| | **HKUST-1** | **CDs@HKUST-1** |
|---|---|---|
| BET surface area ($m^2 g^{-1}$) | 1144.8 | 1233.2 |
| Total pore volume ($p/p_0$=0.9900) ($cm^3 g^{-1}$) | 1.0677 | 0.6959 |
| Average pore diameter (nm) | 3.7307 | 2.2571 |

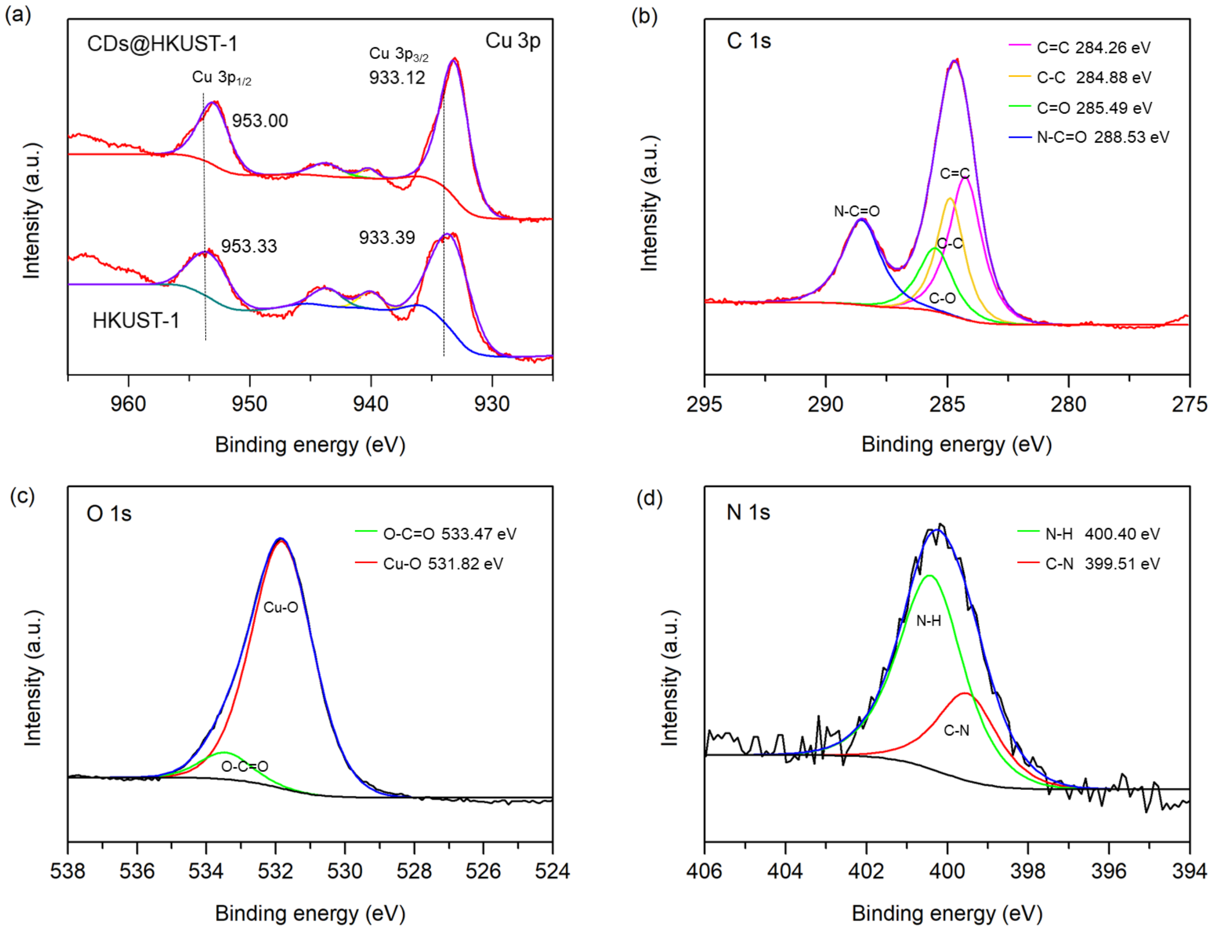



**Figure S4** High-resolution XPS of (a) Cu 3*p* of HKUST-1 and CDs@HKUST-1, (b-d) C 1*s*, O 1*s*, and N 1*s* spectra of CDs@HKUST-1.

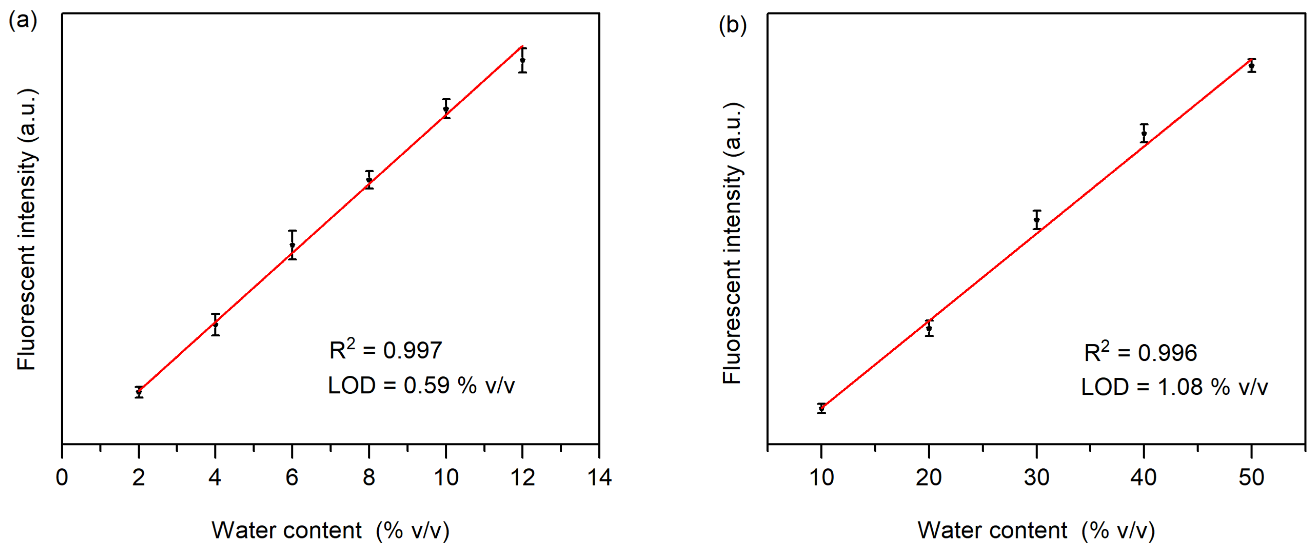



**Figure S5** The linear relationship between fluorescent intensity at 450 nm of CDs@HKUST-1 in (a) ACN and (b) acetone with the incremental addition of water content.

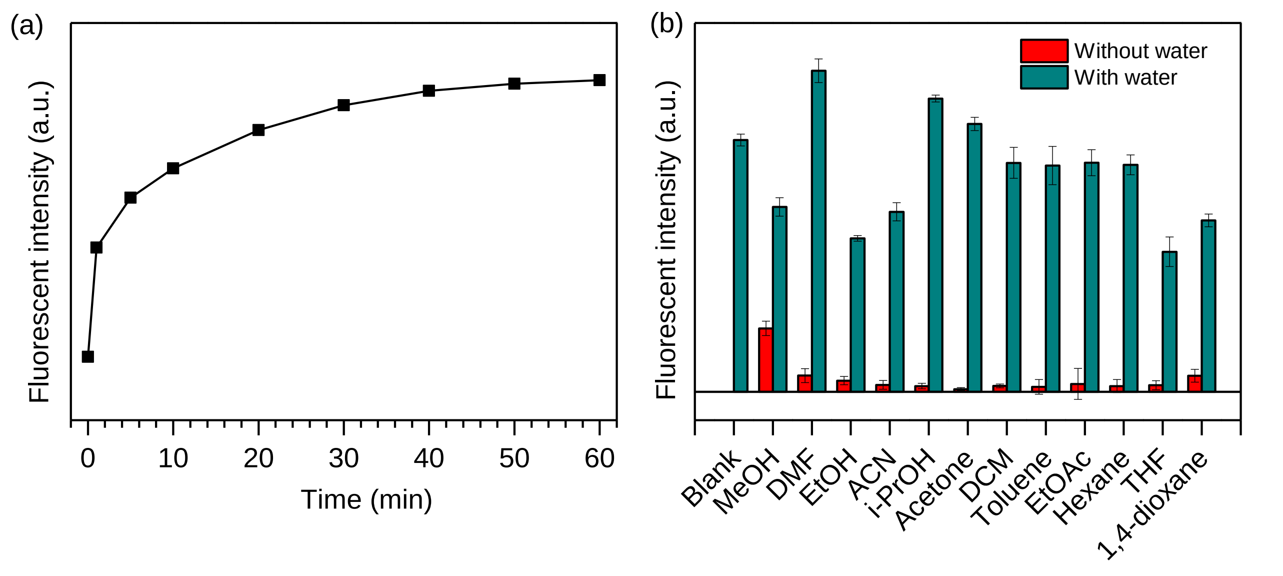



**Figure S6** (a) The response speed of CDs@HKUST-1 toward water (50 %v/v) in EtOH solution. (b) Comparison of fluorescent intensity of CDs@HKUST-1 with organic solvent in the absence and presence of water (50 %v/v).

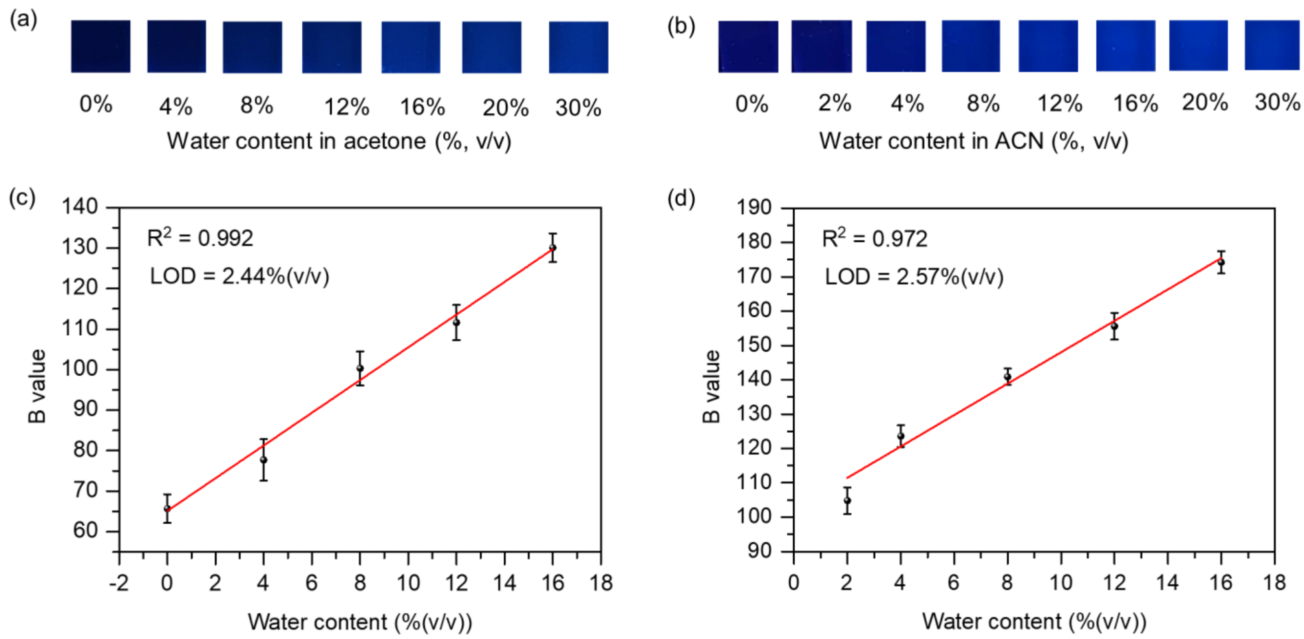



**Figure S7** The digital images of fluorescence change of CDs@HKUST-1 with different water contents in (a) acetone and (b) ACN under UV light (365 nm). Linear relationship between B value and water contents in (c) acetone and (d) ACN.

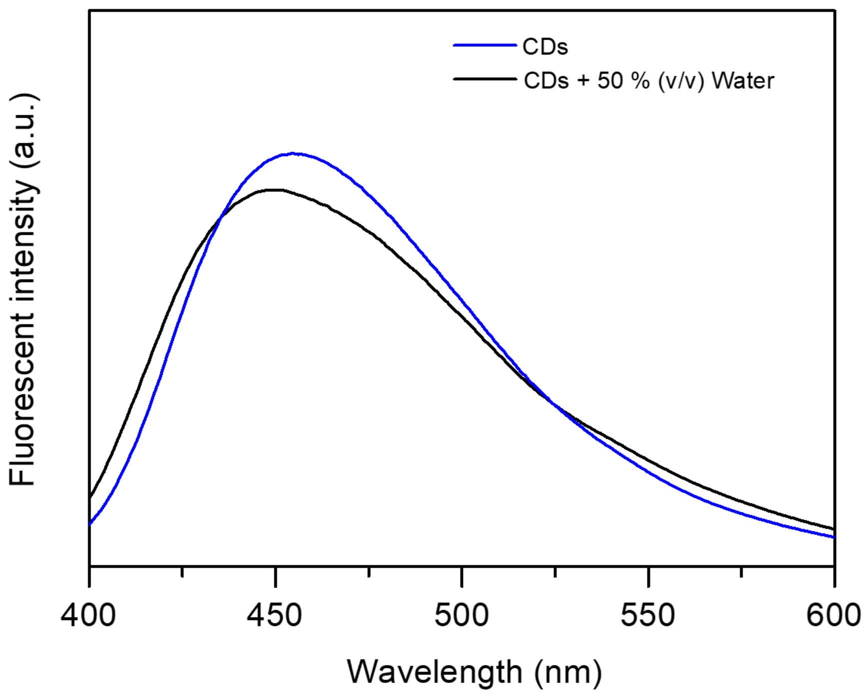
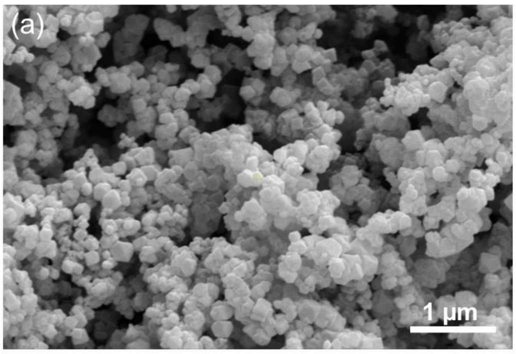



**Figure S8** Fluorescent spectra of untreated CDs (blue line) and treated CDs with water (black line).



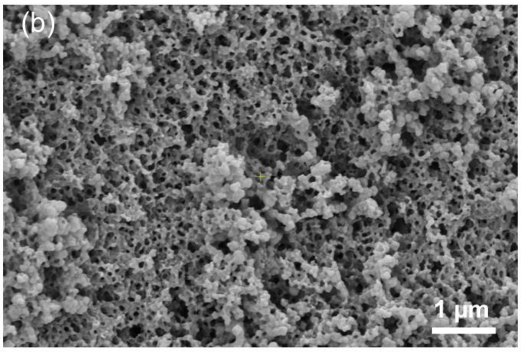



**Figure S9** SEM images of (a) untreated CDs@HKUST-1 and (b) treated CDs@HKUST-1 with water.

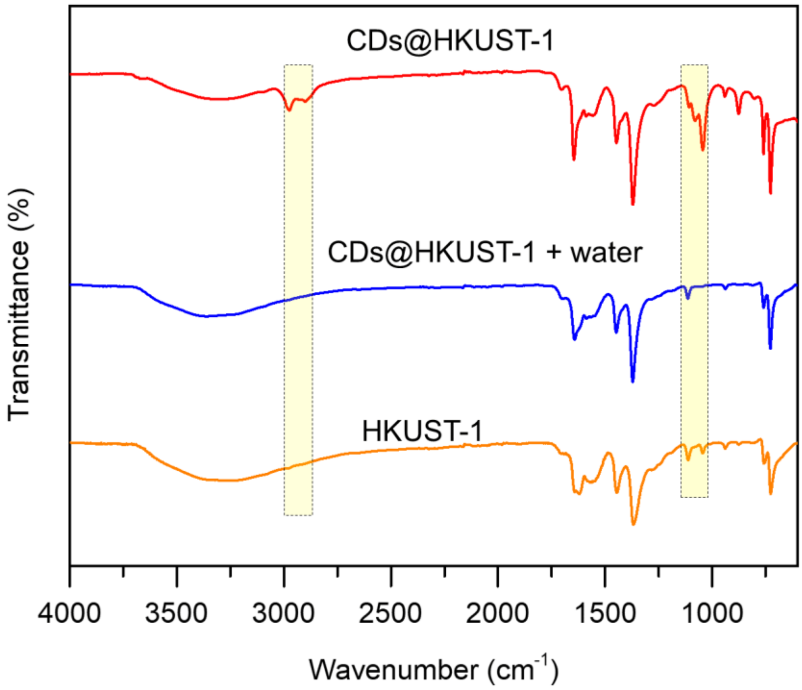



**Figure S10** FT-IR spectrum of HKUST-1 and CDs@HKUST-1 before and after treatment with water.

**Table S2** Calculation of LOD of CDs@HKUST-1 for water in ethanol

| **Blank reading** | **Fluorescent intensity at 450 nm** |
|---|---|
| 1 | 14630.327 |
| 2 | 14050.346 |
| 3 | 14000.756 |
| 4 | 14590.041 |
| 5 | 14300.003 |
| 6 | 14620.382 |
| 7 | 14408.012 |
| Standard deviation (σ) | 246.0342 |
| Slope from linear equation (*S*) | 1053.335 |
| LOD = 3σ/*S* | 0.70 %v/v |

**Table S3** Comparison of the performance of fluorescent sensor of water based on MOFs

| MOFs | Media | LOD (%v/v) | Detection range (%v/v) | Detection method | Ref. |
|---|---|---|---|---|---|
| **$Tb^{3+}$@p-CDs/MOF** | DMF | 0.33 | 0-30 | Turn-off | 1 |
| **$Tb_{97.11}Eu_{2.89}$-L1** | ACN | 0.04 | 0-2.5 | Turn-off | 2 |
| **MOF@$Fe_3O_4$/$SiO_2$** | Hexane | 0.03 | 0-10 | Turn-off | 3 |
| **$Eu^{3+}$@UiO-66-$NH_2$-IM** | Ethanol | 0.05 | 0-2 | Turn-off | 4 |
| **$Eu_{0.02}Dy_{0.18}$-MOF** | Ethanol | 0.1 | 0-0.3 | Turn-off | 5 |
| **AEMOF-1** | THF | 0.05 | 0-2 | Turn-on | 6 |
| **[Cd(py)L($H_2O$)$_2$]** | Iso-propanol | 0.01 | 0-0.36 | Turn-on | 7 |
| **[$Cd_2$(4,5-idc)(2,5-tpt)($H_2O$)$_4$]** | DMF | 0.25 | 0-50 | Shifted emission and turn-off | 8 |
| **N,S-CDs@Eu-MOF** | Ethanol<br>ACN<br>DMF | -<br>-<br>- | 0.19-0.82<br>0.3-2.2<br>0.5-2.5 | Ratiometric sensing | 9 |
| **Zn-MOF74** | Acetone | 0.045 | 0-1.5 | Turn-on | 10 |
| **CDs@HKUST-1** | Ethanol<br>ACN<br>Acetone | 0.70<br>0.59<br>1.08 | 0-70<br>2-12<br>10-50 | Turn-on | **This wok** |

## Reference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