Superfast Structural Transformation as a Naked-eye Detector: Conversion of Quasi-HKUST to Fe(BTC) for Detection of Fe(III)

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Materials and methods

Iron(III) chloride hexahydrate (97%), trimesic acid (95%), Copper(II) nitrate dehydrate (99%) and required solvents, including Ethyl alcohol (ACS spectrophotometric grade, 95.0%) and methanol (anhydrous, 99.8%), were prepared nfrom Merck and Aldrich companies, and no further purification was required. The Nicolet 100 spectrometer was used to record IR spectra (in KBr) in the range 4000-400 cm-1. XRD measurements were carried out with a Philips X'pert diffractometer using monochromated Cu-kα radiation (λ=1.54056A).

Supplementary spectra (Figure S1-S4 and Table S1)

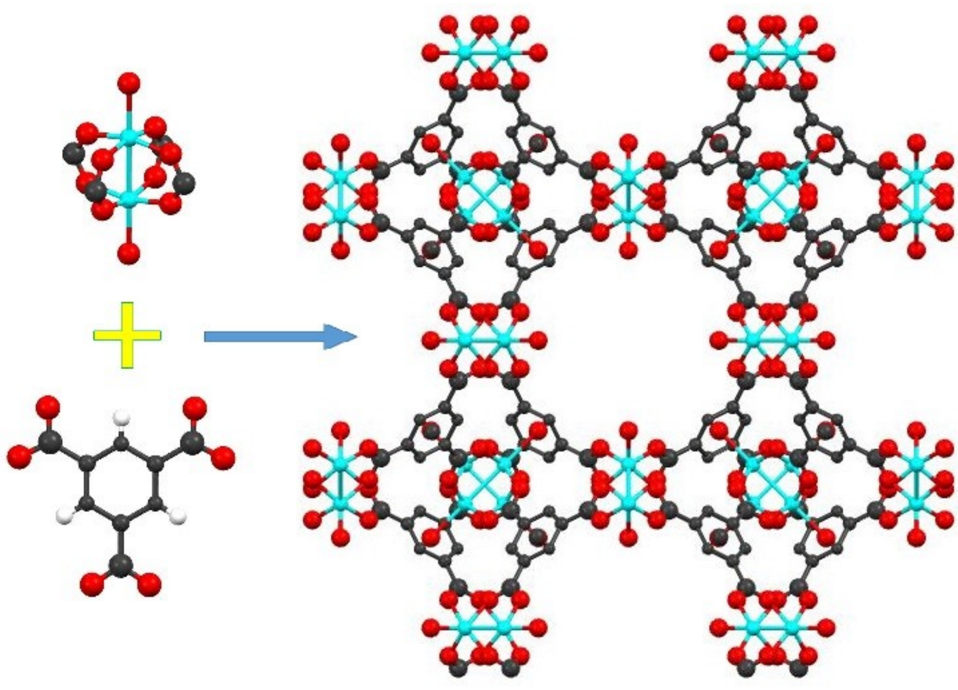

Fig. S1. The schematic figure of HKUST and its ingredients. (Color code: blue/Cu, red/O, gray/C and white/H).

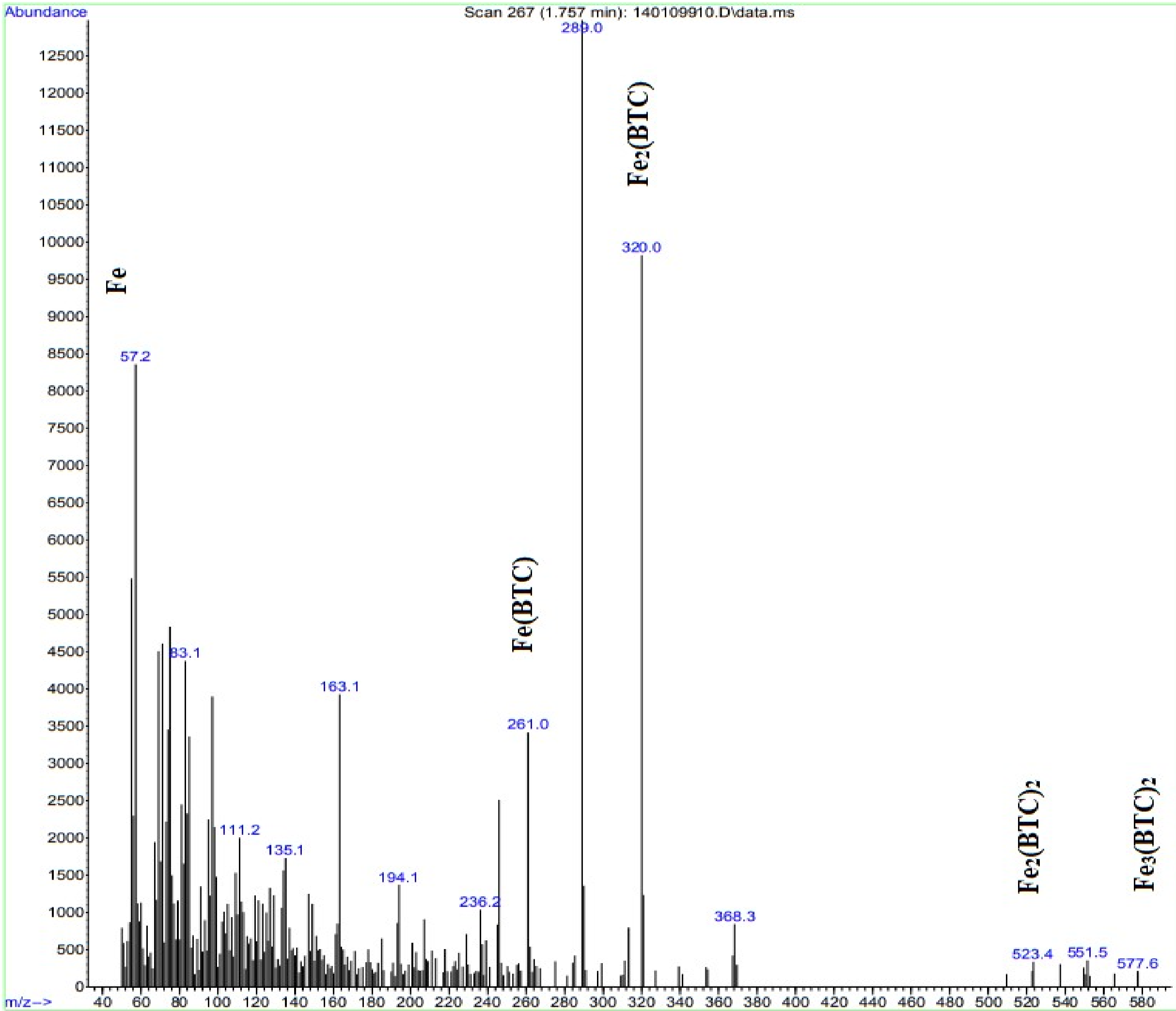

Fig. S2. Mass spectroscopy of obtained $Fe_3(BTC)_2$

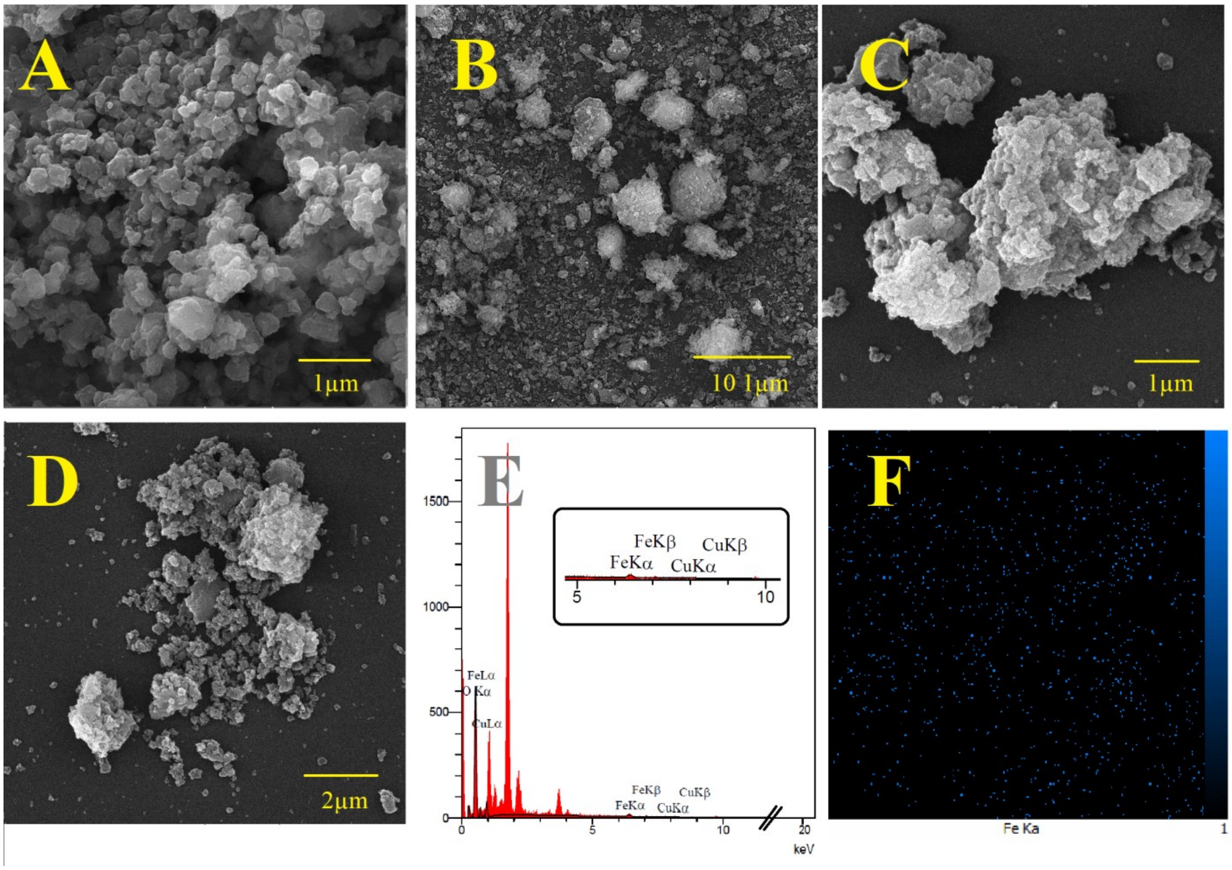

Fig. S3. The SEM images of (A) HKUST, (B) and (C) QH-240 and (D) Fe(BTC), (E) EDX analysis result of Fe(BTC) (Magnification of the section related to iron and copper inserted) and (F) EDS mapping of Fe in Fe(BTC).

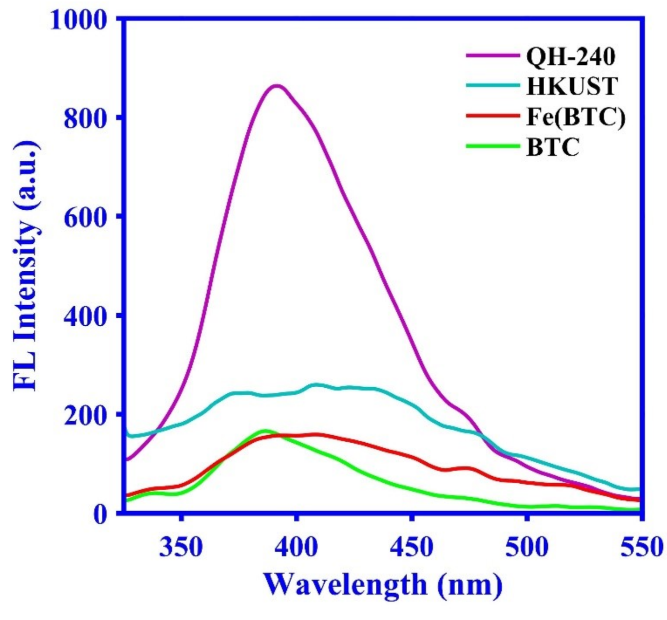

Fig. S4. Comparison of fluorescence spectrum of BDC, HKUST, QH-240 and Fe(BTC).

Table S1. Summary of reported fluorescence sensors for Fe^{3+} in aqueous solution.

MOF-based sensor	Linear range	LOD	Reference
Zr-MOF 85	-	9.10×10^{-7} M	1
Eu−HODA	-	6.4 ppb	2
$[Zn_2(cptpy)(btc)(H_2O)]_n$	-	4.33×10^{-6} M	3
RhB@DiCH$_3$MOF-5	1–10 μM	0.36×10^{-6} M	4
$([Ln_2(FDC)_3DMA(H_2O)_3]\cdot DMA\cdot 4.5H_2O$	0.02-0.1 mM	2.22×10^{-6} M	5
$[Eu_2(pdba)_3(H_2O)_3]\cdot 2H_2O\}_n$	5×10^{-2}- 10^{-6} M	1×10^{-6} M	6
QH-240	20−300 nM	20 nM	This work

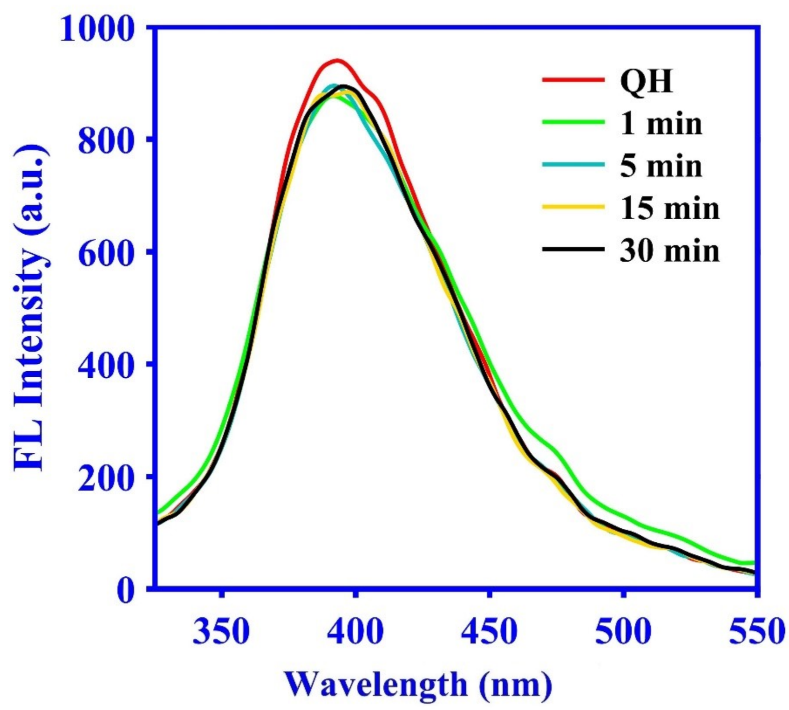

Fig. S5. Time-dependent absorption and emission spectra change of QH-240 in the presence of 50 ppb of Fe(III)

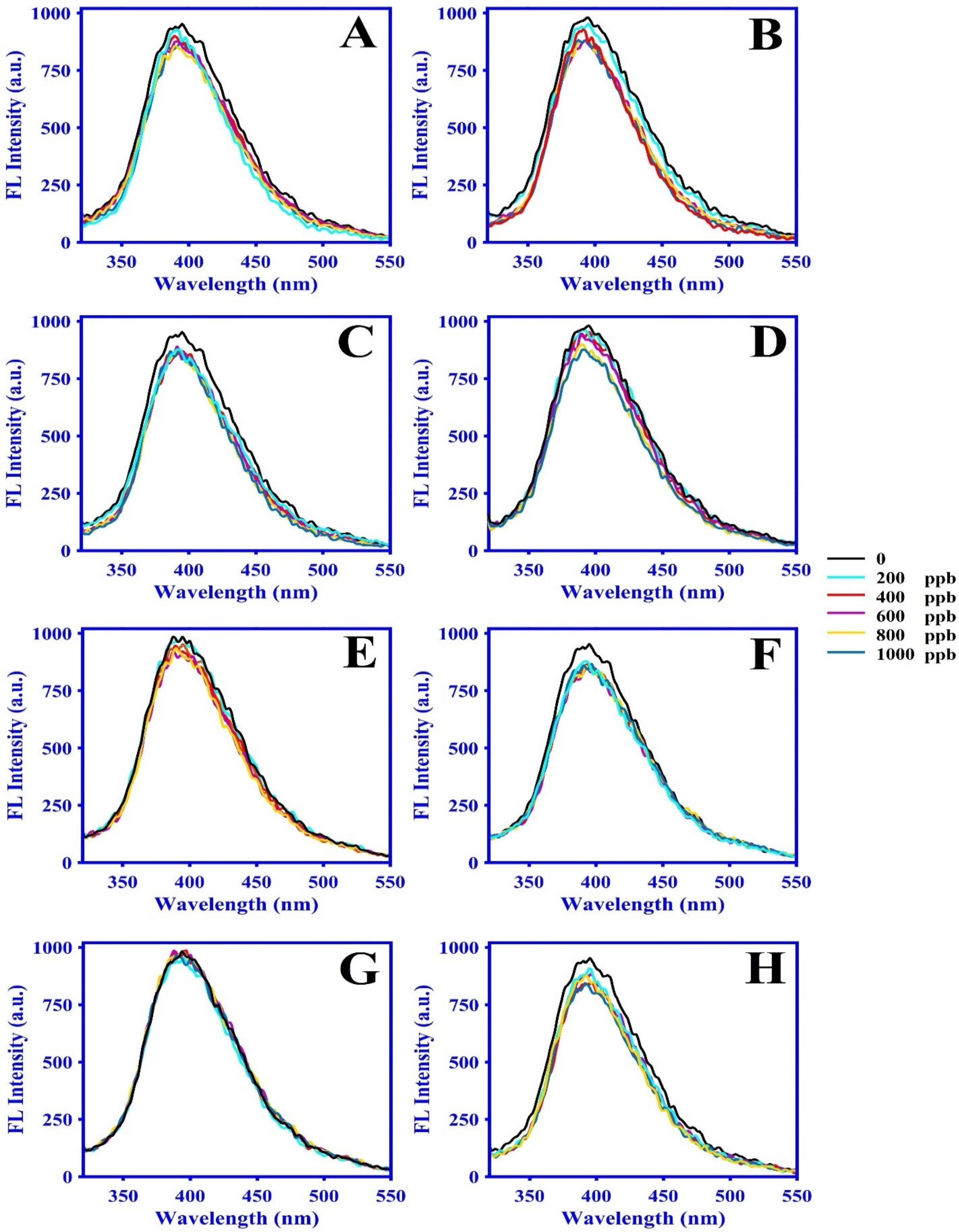

Fig S6. Photoluminescence spectra for QH-240 in the presence of different concentration of (A) Cd(II), (B) Co(II), (C) Cr(III), (D) Fe(II), (E) Hg(II), (F) Ni(II), (G) Pb(II), (H)Zr(IV).

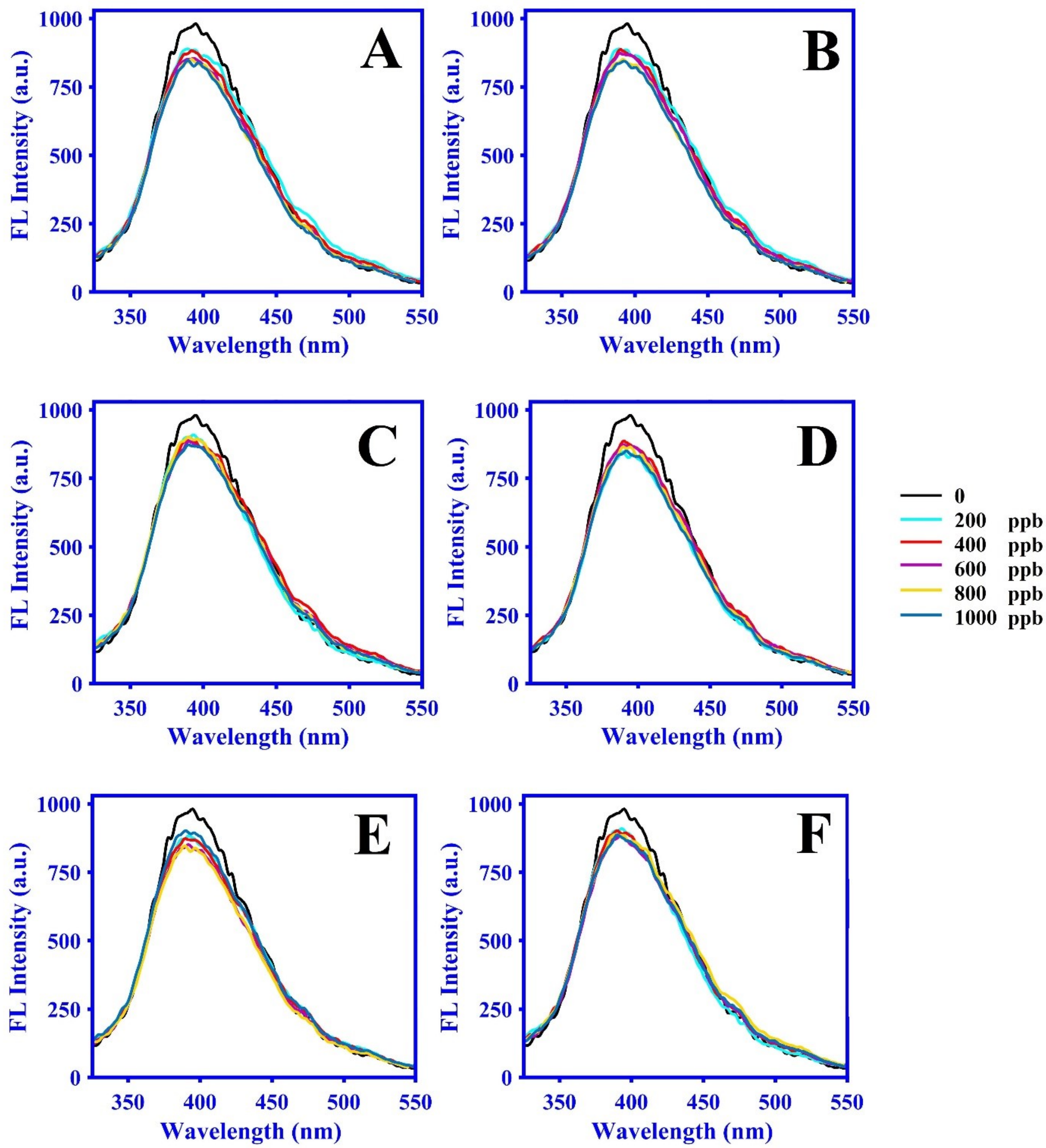

Fig S7. Photoluminescence spectra for QH-240 in the presence of different concentration of (A) Li(I), (B) Ba(II), (C) Ca(II), (D) Cu(II), (E) Mg(II), (F) Mn(II).

Section D. Reference of supporting information.

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