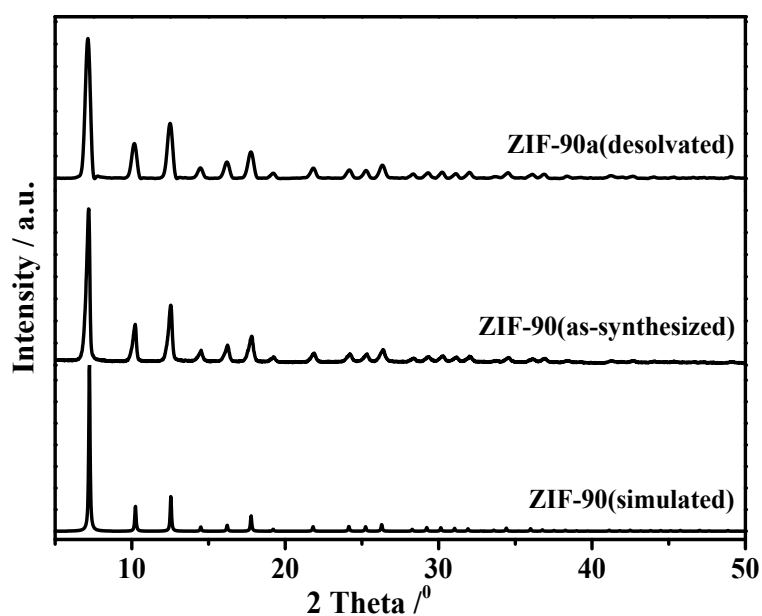


A luminescent zinc metal-organic framework for sensing of metal cations, anions and small molecules

*Chang Liu and Bing Yan\**

Department of Chemistry, Tongji University, Siping Road 1239, Shanghai 200092, China



**Figure S1** The PXRD patterns of simulated ZIF-90, as-synthesized ZIF-90 and ZIF-90a (desolvated ZIF-90).

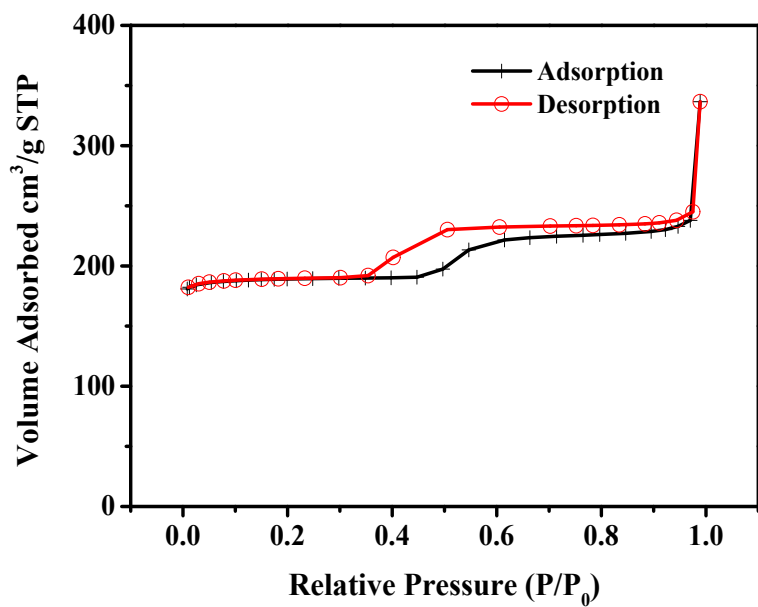


Figure S2 N<sub>2</sub> sorption isotherms for ZIF-90a at T=77K.

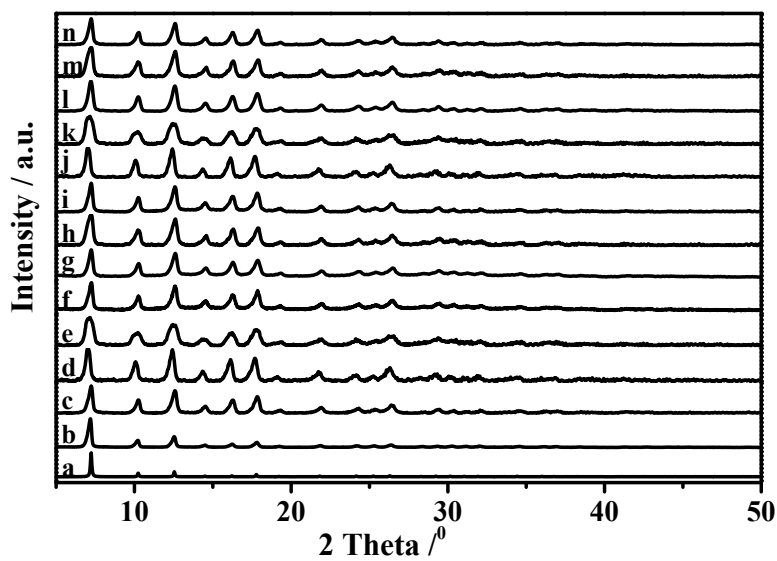
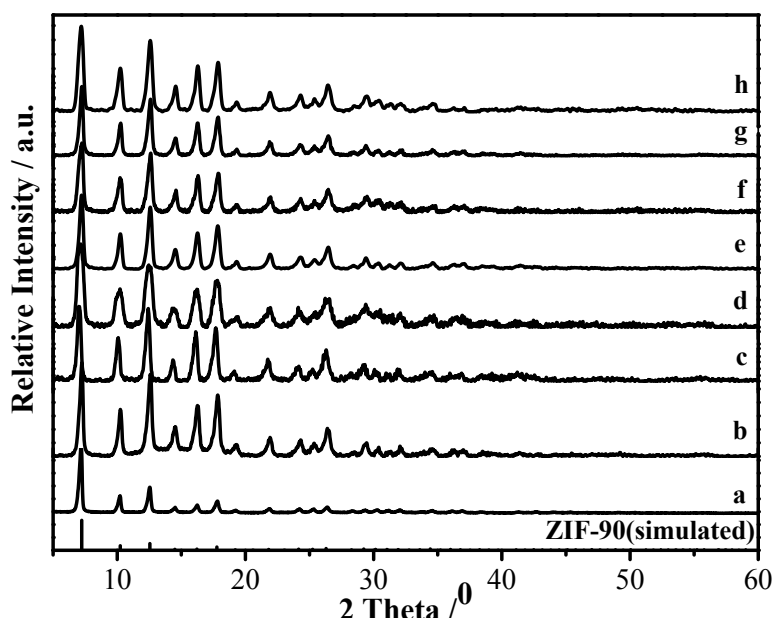
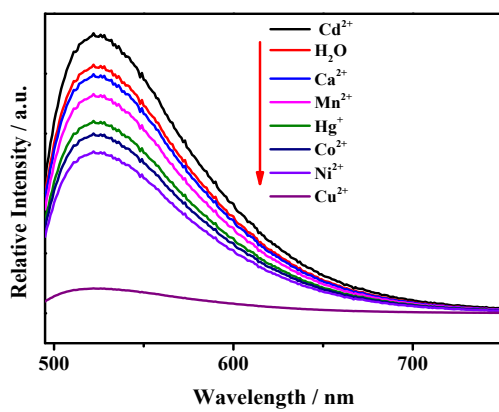


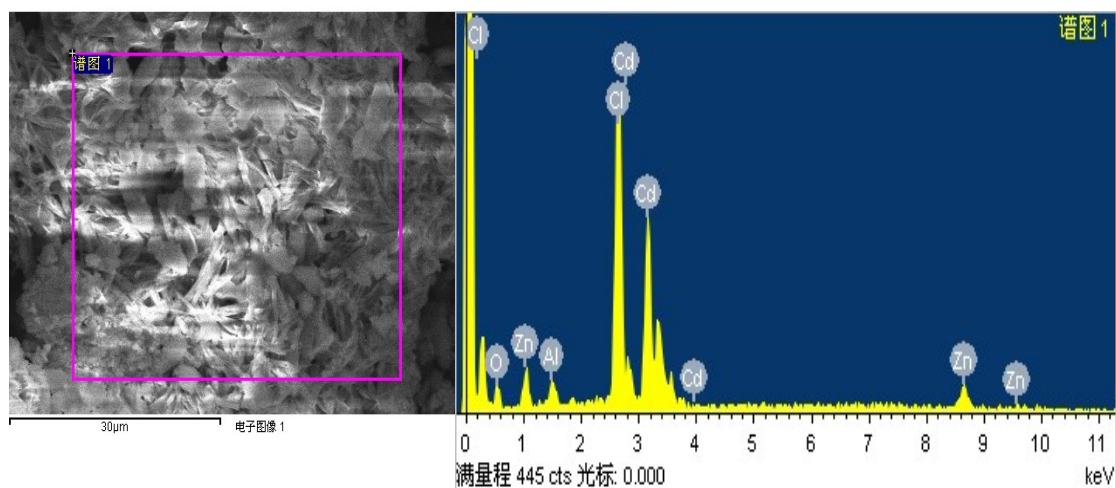
Figure S3 Powder X-ray diffraction patterns of a) simulated ZIF-90, b) as-synthesized ZIF-90, and diffraction patterns obtained after the introduction of various anions: c) NO<sub>3</sub><sup>-</sup>, d) C<sub>2</sub>O<sub>4</sub><sup>2-</sup>, e) CO<sub>3</sub><sup>2-</sup>, f) Br<sup>-</sup>, g) F<sup>-</sup>, h) Cl<sup>-</sup>, i) I<sup>-</sup>, j) PO<sub>4</sub><sup>3-</sup>, k) CrO<sub>4</sub><sup>2-</sup>, l) HCO<sub>3</sub><sup>-</sup>, m) NO<sub>2</sub><sup>-</sup> and n) S<sup>2-</sup>.



**Figure S4** Powder X-ray diffraction patterns obtained after the introduction of various organic small molecules: a) formamide, b) ethylenediamine, c) dimethyl formamide, d) acetonitrile, e) diethyl ether, f) acetone, g) methanol and h) ethanol, both are almost identical to the simulated ZIF-90.



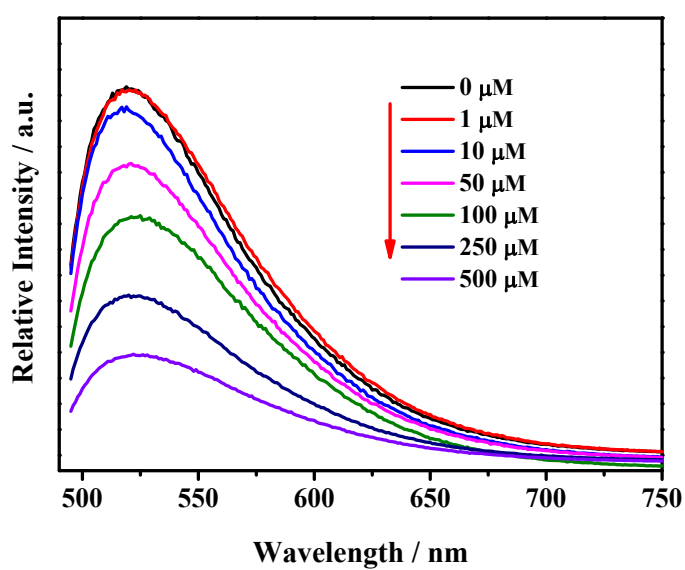
**Figure S5** the photoluminescence spectra of ZIF-90a (3 mg) dispersed into different aqueous solution of various metal ions ( $10^{-2}$  M).



**Figure S6** The scanning electron microscope (SEM) (a) and energy dispersive spectrometer (EDS) (b) analysis of the ZIF-90a/Cd<sup>2+</sup>.

**Table S1** The weight percent and atomic percent of elements in the ZIF-90a/Cd<sup>2+</sup>.

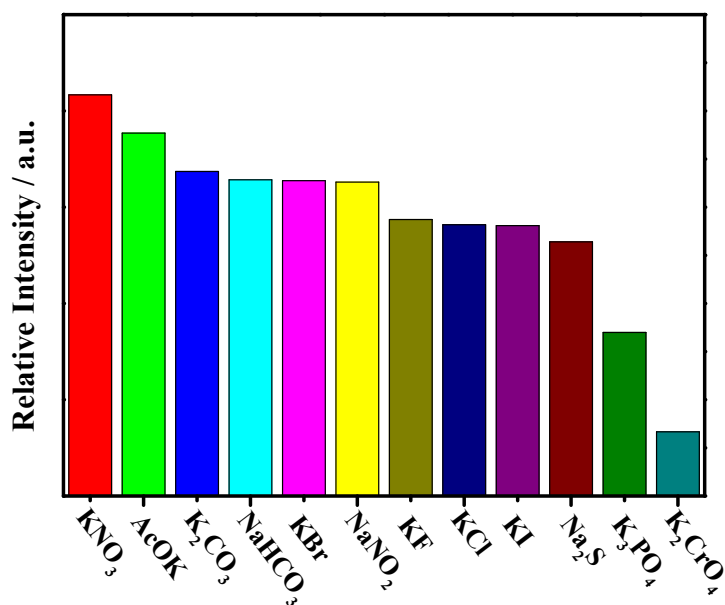
<i>element</i>	<i>weight percent</i>	<i>atomic percent</i>
O	9.17	28.04
Al	1.47	2.67
Cl	24.66	34.05
Zn	22.55	16.88
Cd	42.16	18.36
total	100.00	



**Figure S7** Emission spectra of ZIF-90a/Cu<sup>2+</sup> in the presence of various concentrations of Cu<sup>2+</sup> under excited at 476 nm.

**Table S2** Response of luminescence lifetime of ZIF-90a1 towards aqueous solutions of various metal cations.

Metal ions	$\tau$ ( $\mu$ s)
Cd <sup>2+</sup>	315.51
Ca <sup>2+</sup>	252.30
Mn <sup>2+</sup>	243.68
Hg <sup>2+</sup>	226.74
Co <sup>2+</sup>	204.72
Ni <sup>2+</sup>	202.88
Cu <sup>2+</sup>	128.71



**Figure S8** The luminescence intensity of the ZIF-90a interacting with different anions in 10<sup>-2</sup> mol L<sup>-1</sup> aqueous solution of K<sub>x</sub>N1 and Na<sub>x</sub>N2 (excited monitored at 476 nm).

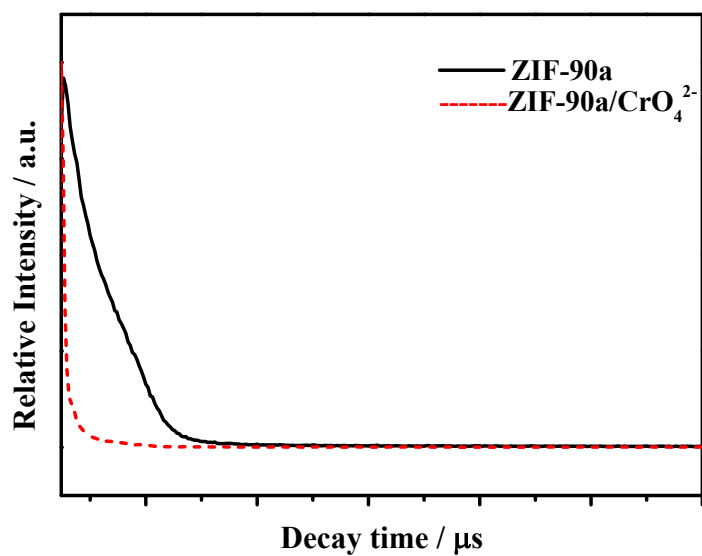
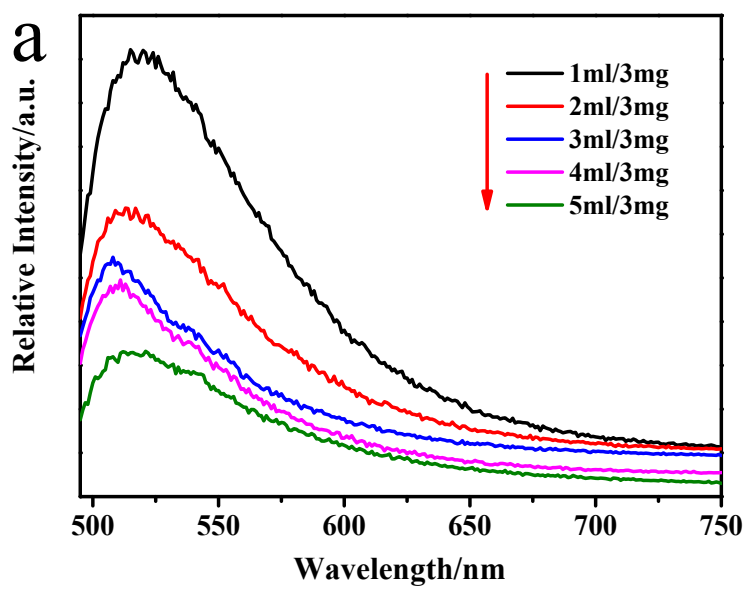
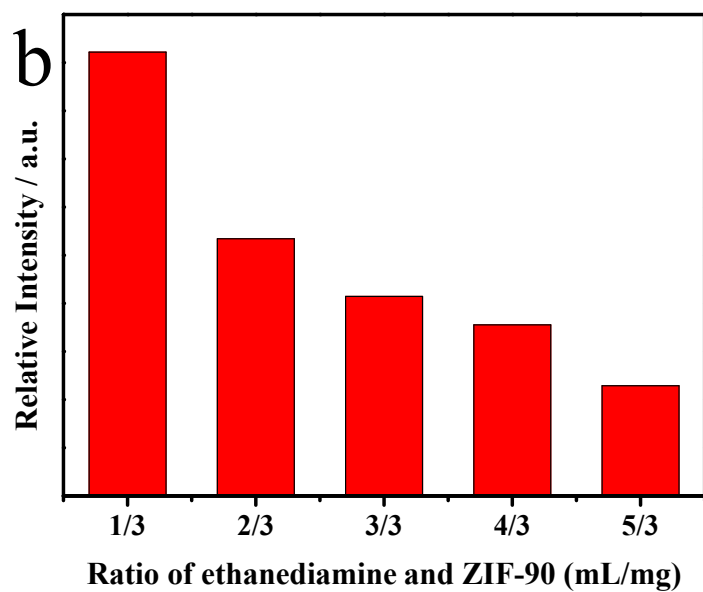
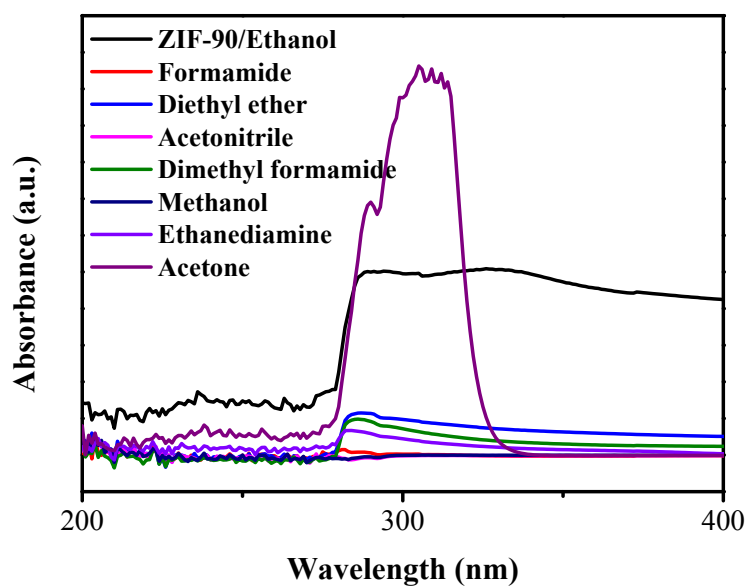


Figure S9 Fluorescence lifetime of ZIF-90a in the absence (black) and presence (red) of CrO<sub>4</sub><sup>2-</sup> in aqueous solution.





**Figure S10** Emission spectra (a) and luminescence intensity (b) of ZIF-90a in the presence of various ratios of ZIF-90a and acetone under excited at 476 nm.



**Figure S11** UV-vis absorption spectra of ZIF-90a and organic small molecules.