Electronic Supporting Information

A Highly Stable Indium Phosphonocarboxylate Framework as a Multifunctional Sensor for Cu^{2+} and Methylviologen Ions

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Table S1 Selected bond lengths (Å) and angles (º) for **InPCF-1.**

In(1)-O(2)	2.072(6)	O(1)-In(1)#8	2.141(5)
In(1)-O(3)	2.119(7)	In(1)-O(5)	2.254(7)
In(1)-O(1)#1	2.141(5)	In(1)-O(6)	2.302(7)
In(1)-O(1)#2	2.141(5)	P(1)-O(1)	1.528(5)
P(1)-O(2)	1.527(7)	P(1)-O(1)#3	1.528(5)
O(3)-C(14)	1.259(14)	O(4)-C(14)	1.245(14)
O(5)-C(13)	1.261(12)	O(6)-C(13)	1.255(12)
O(2)-In(1)-O(1)#1	99.27(12)	O(2)-In(1)-O(3)	84.5(3)
O(2)-In(1)-O(1)#2	99.27(12)	O(3)-In(1)-O(1)#1	87.90(13)
O(1)#1-In(1)-O(1)#2	160.5(2)	O(3)-In(1)-O(1)#2	87.90(13)
O(3)-In(1)-O(5)	129.2(3)	O(2)-In(1)-O(5)	146.4(2)
O(1)#2-In(1)-O(5)	83.97(12)	O(1)#1-In(1)-O(5)	83.97(12)
O(3)-In(1)-O(6)	173.7(3)	O(2)-In(1)-O(6)	89.3(2)
O(1)#2-In(1)-O(6)	93.13(12)	O(1)#1-In(1)-O(6)	93.13(12)

Symmetry transformations used to generate equivalent atoms: #1 -y+1/2, -x+1/2, -z+3/2; #2 -y+1/2, -x+1/2, z+1/2; #3 x, y, -z+2; #4 -y+1, x, z; #5 y, -x, -z+2; #6 -y, x, z; #7 y, -x+1, -z+2 #8 -y+1/2, -x+1/2, z-1/2

Table S2 Hydrogen bonds for InPCF-1[a].

D–H···A	d(D–H) /Å	d(H···A) /Å	d(D···A) /Å	<DHA / º
O(8)-H(8B)...O(1)	0.85	2.16	2.991(18)	165.4
O(9)-H(9A)...O(4)#8	0.85	1.93	2.78(3)	179.0

[a]Symmetry code: #8 -y+1/2, -x+1/2, z-1/2

Table S3 Comparison of some MOFs for sensing Cu^{2+} ion at room temperature

MOFs	K_{sv}/M^{-1}	Active sites	The charge of frameworks	Pore size
InPCF-1	1840.1	Uncoordinated carbonyl oxygen sites	anion	7.19 × 7.19 Å^2
$[Eu(pdc)]_n$[1]	89.4	Uncoordinated pyridyl nitrogen sites	neutral	6.3 × 8.5 Å^2
$[Mg(DHT)]_n$[2]	170.2	Uncoordinated hydroxyl oxygen sites	neutral	5.3 × 5.5 Å^2
$\{[Tb_4(\mu_3\text{-}OH)_4(BPDC)_3(BPDCA)_{0.5}(H_2O)_6]\text{-}ClO_4\}_n$[3]	344.7	Uncoordinated pyridyl nitrogen sites	cationic	4.5 × 5.5 Å^2
$[Eu_2(FMA)_2(OX)(H_2O)_4]_n$[4]	528.7	Carboxylate oxygen sites	neutral	4.0 × 5.0 Å^2 3.8 × 3.8 Å^2
$[Eu_3(L)_2(HCOO)_2(DMF)_2(H_2O)][H_2N(Me)_2]$[5]	2350	Uncoordinated pyridyl nitrogen sites	anion	4.5 × 5.5 Å^2(window) 11 Å (cage)

References

1 B. L. Chen, L. B. Wang, Y. Q. Xiao, F. R. Fronczek, M. Xue, Y. J. Cui and G. D. Qian, *Angew. Chem. Int. Ed.* **2009**, *48*, 500–503.

2 K. Jayaramulu, R. P. Narayanan, S. J. George and T. K. Maji, *Inorg. Chem.* **2012**, *51*, 10089–10091.

3 Y. Q. Xiao, Y. J. Cui, Q. Zheng, S. C. Xiang, G. D. Qian and B. L. Chen, *Chem. Commun.* **2010**, ***46***, 5503−5505.

4 J. M. Zhou, W. Shi, H. M. Li, H. Li and P. Cheng, *J. Phys. Chem. C* **2014**, *118*, 416–426.

5 B. Liu, W. P. Wu, L. Hou and Y.Y. Wang, *Chem. Commun.* **2014**, *50*, 8731–8734.

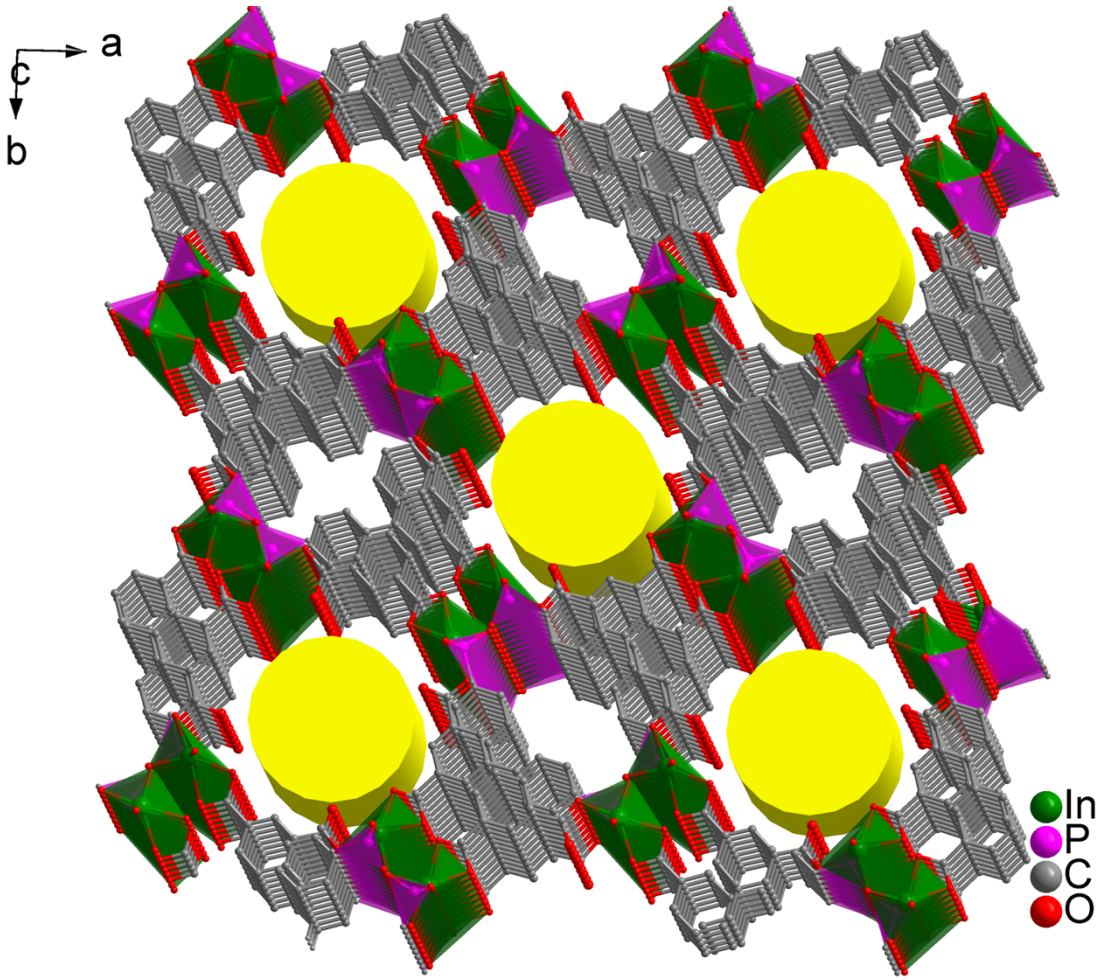

Figure S1 Packing view of **InPCF-1** (Water and hydrogen atoms is omitted for clarity yellow columns are added to highlight the 1-D channels).

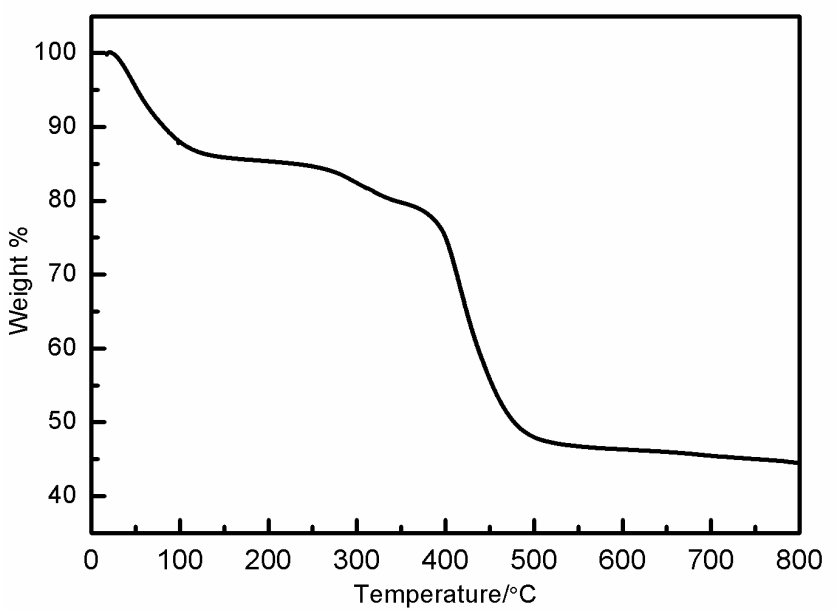

Figure S2 TGA curve of as-synthesized **InPCF-1.**

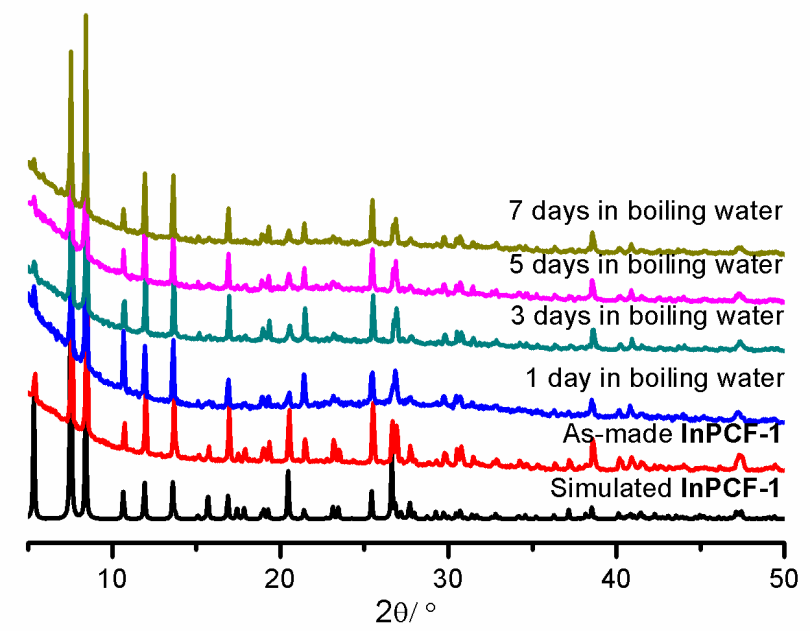

Figure S3 The PXRD patterns for **InPCF-1** in boiling water for up to 7 days.

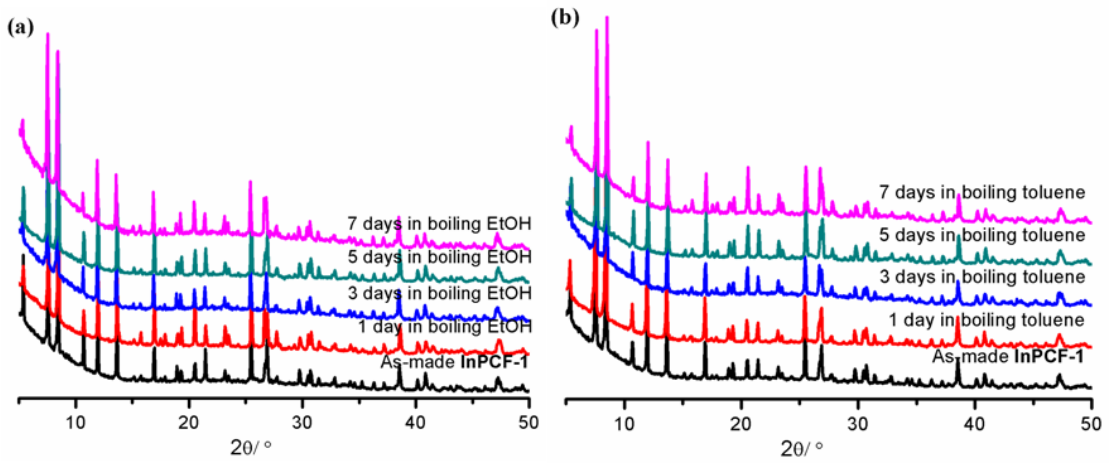

Figure S4 The PXRD patterns for **InPCF-1** measured during chemical stability tests. (a) In refluxing EtOH at 80 °C for up to 7 days. (b) In refluxing toluene at 110 °C for up to 7 days.

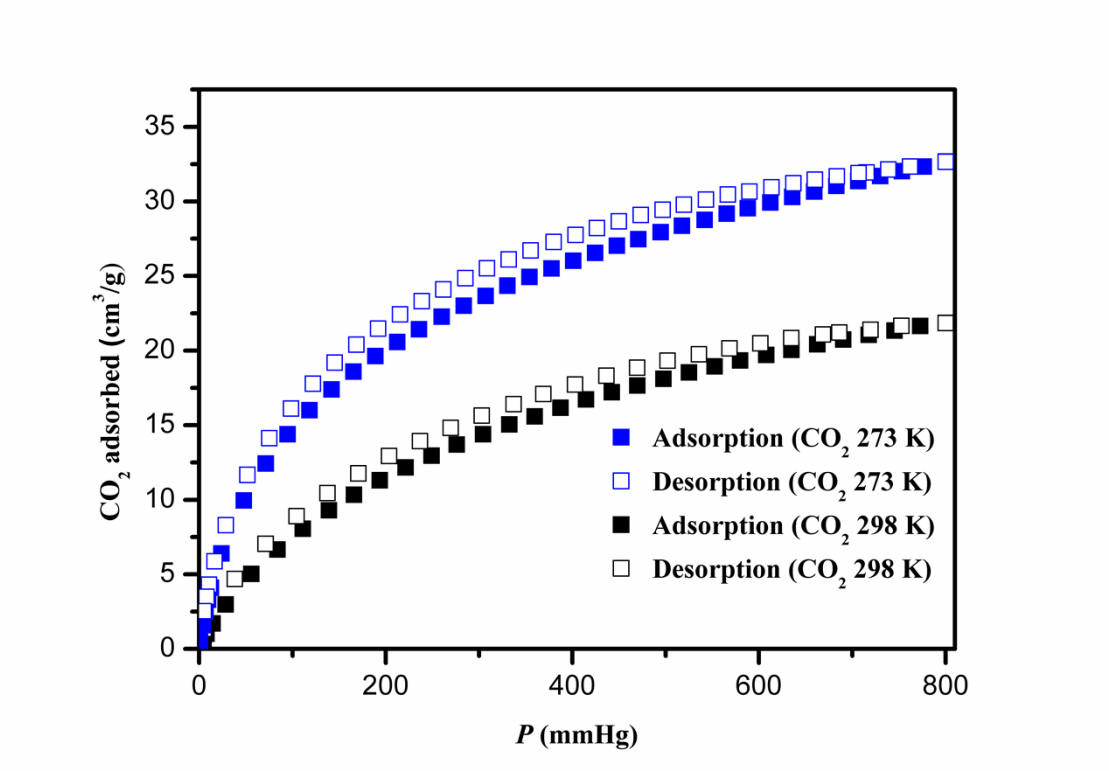

Figure S5 The CO_2 isotherms at 273 K and 298 K for **InPCF-1**.

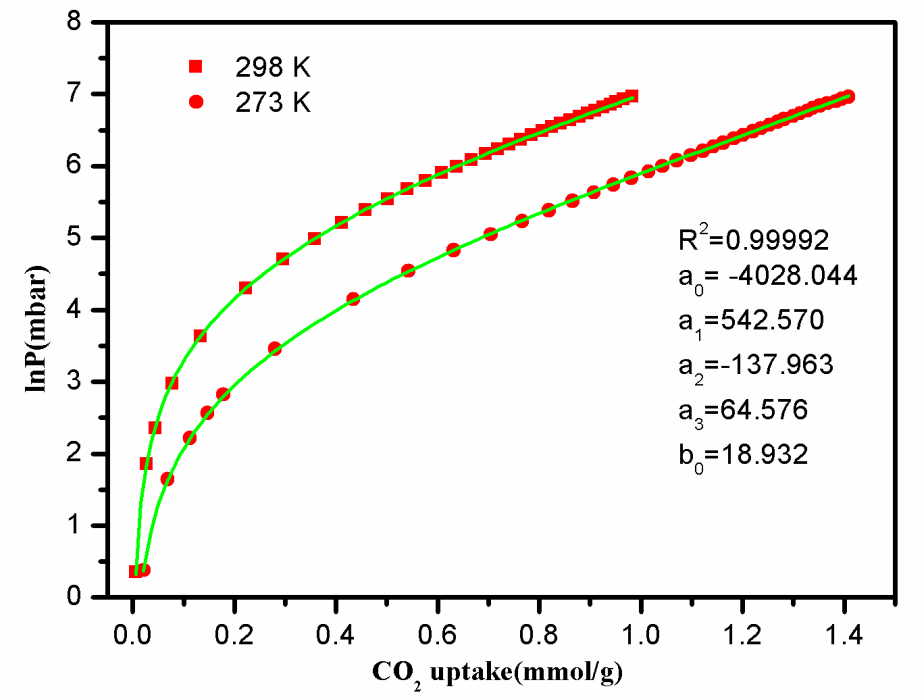

Figure S6 The CO_2 isotherms at 273 K and 298 K (symbols) and the Virial equation fits (lines) for **InPCF-1**.

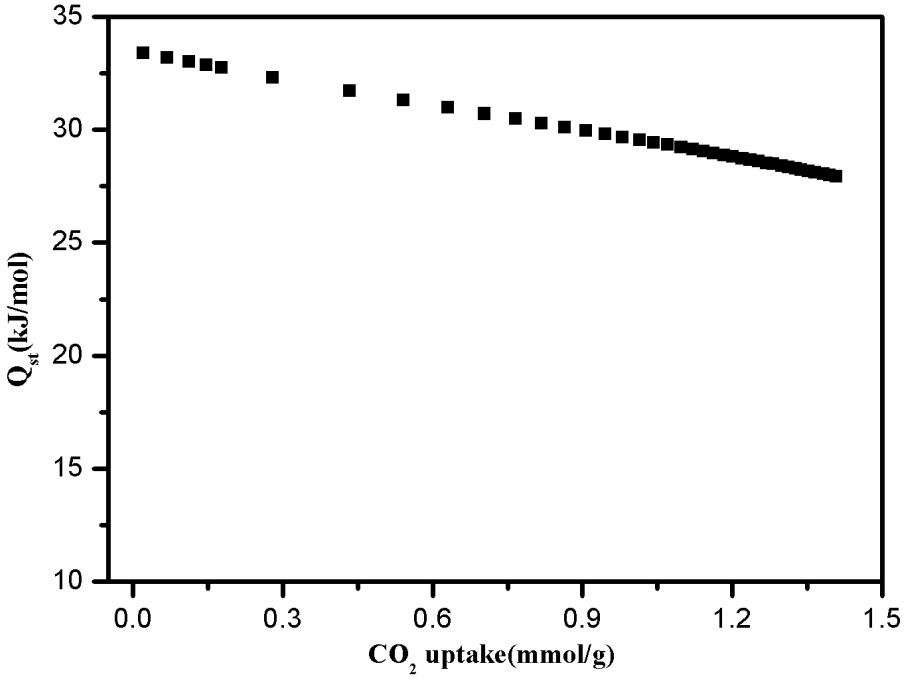

Figure S7 Isosteric heats of CO_2 adsorption for **InPCF-1**

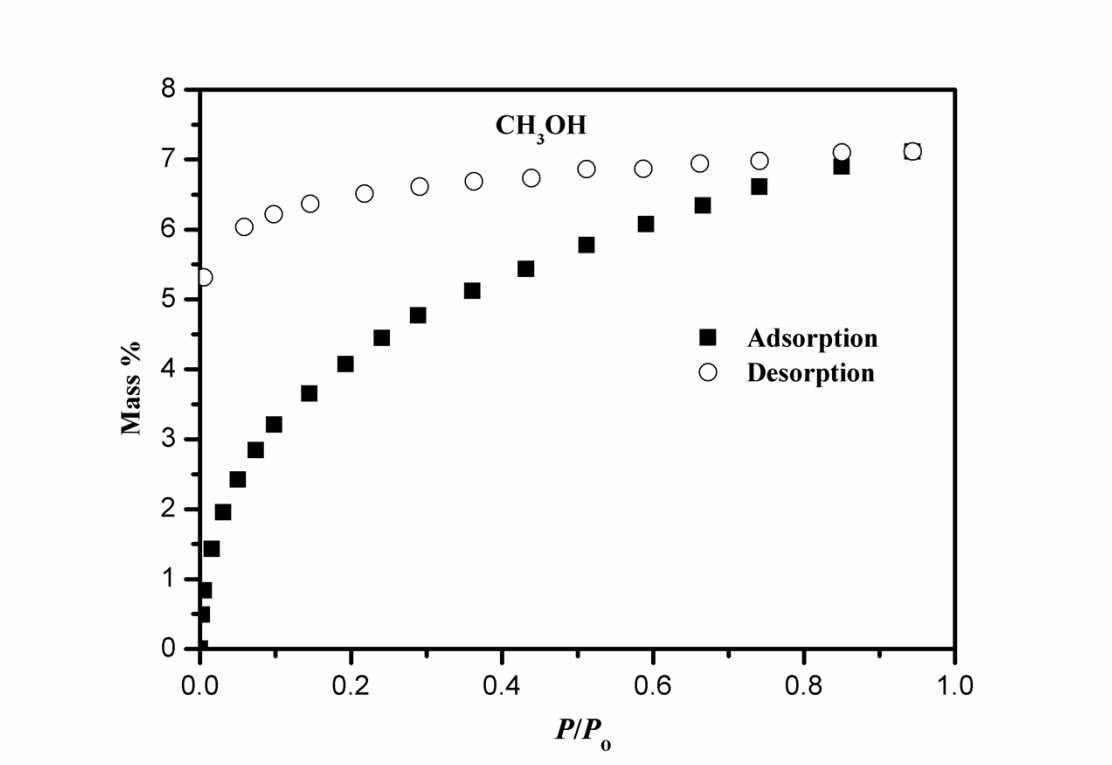

Figure S8 The CH_3OH isotherm at 298 K for **InPCF-1**.

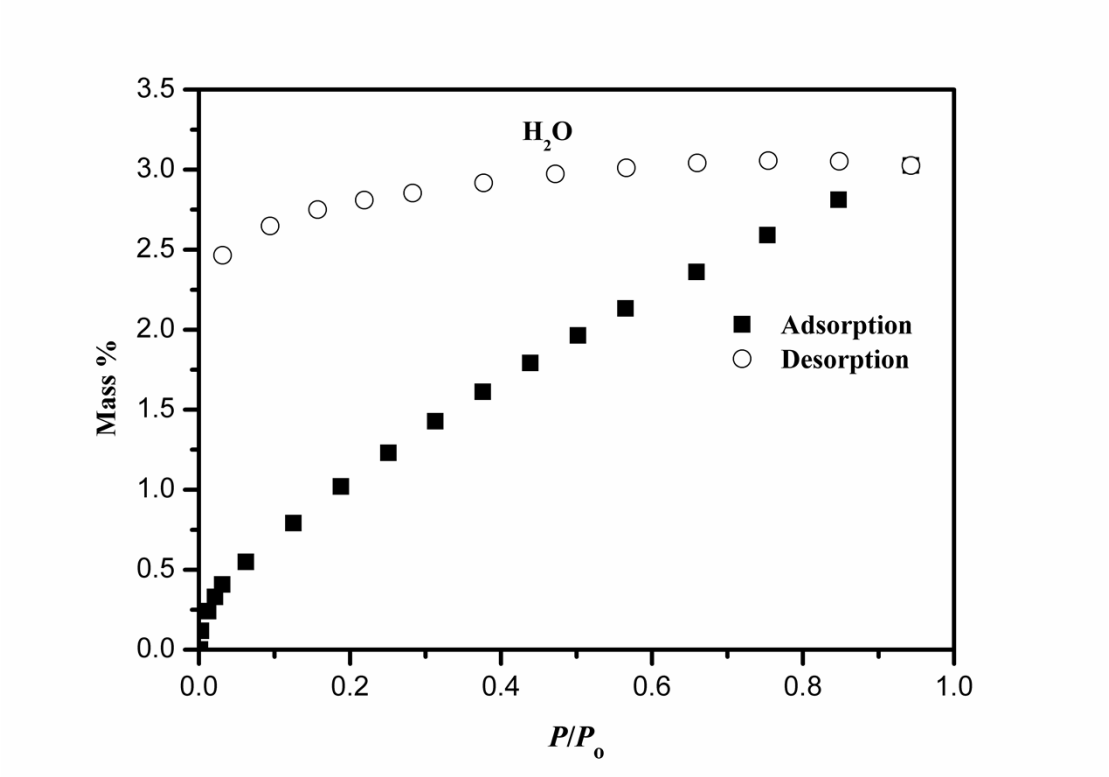

Figure S9 The H_2O isotherm at 298 K for **InPCF-1**.

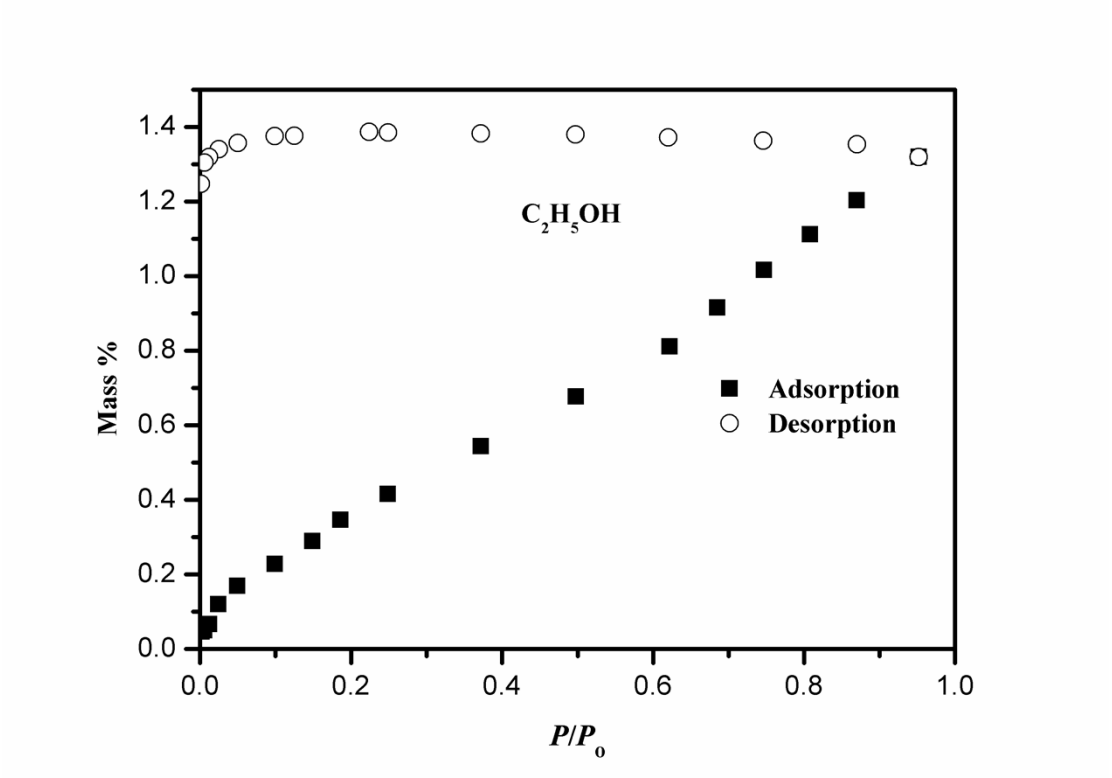

Figure S10 The C_2H_5OH isotherm at 298 K for **InPCF-1**.

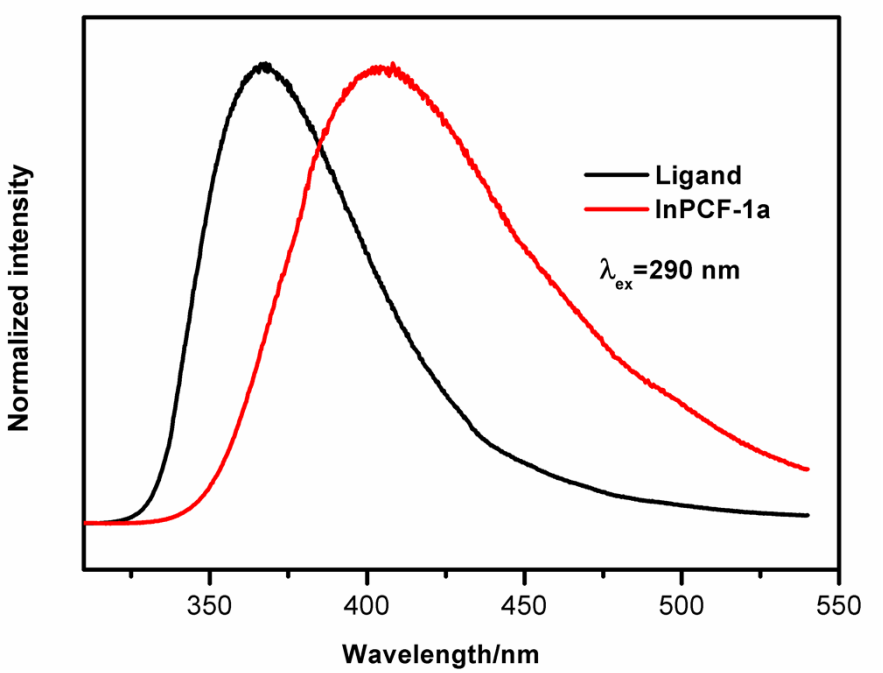

Figure S11 Solid state luminescence spectra of ligand and **InPCF-1a** upon excitation at 290 nm at room temperature.

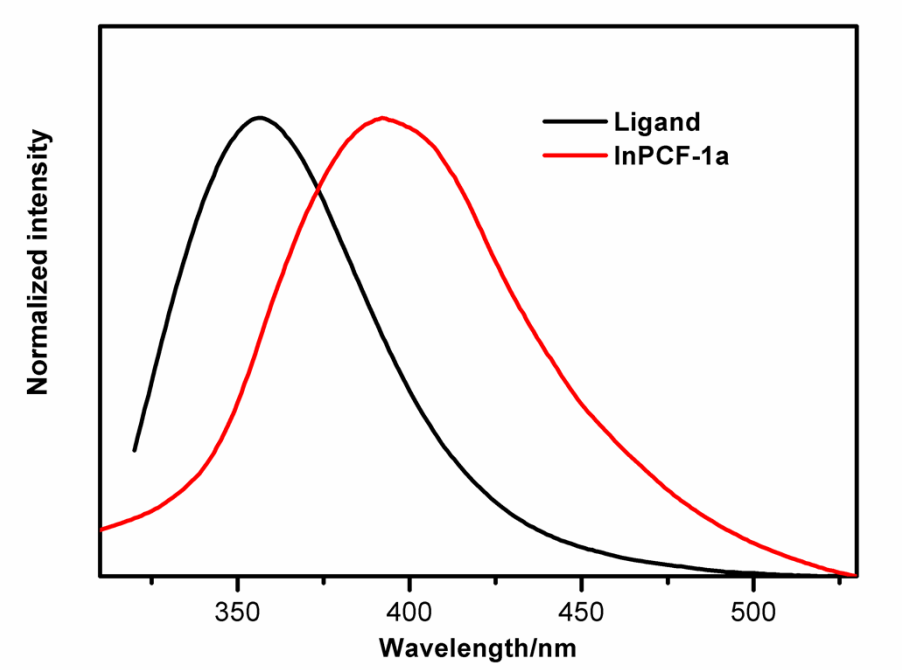

Figure S12 Luminescence spectra of ligand and **InPCF-1a** in DMF solution upon excitation at 290 nm.

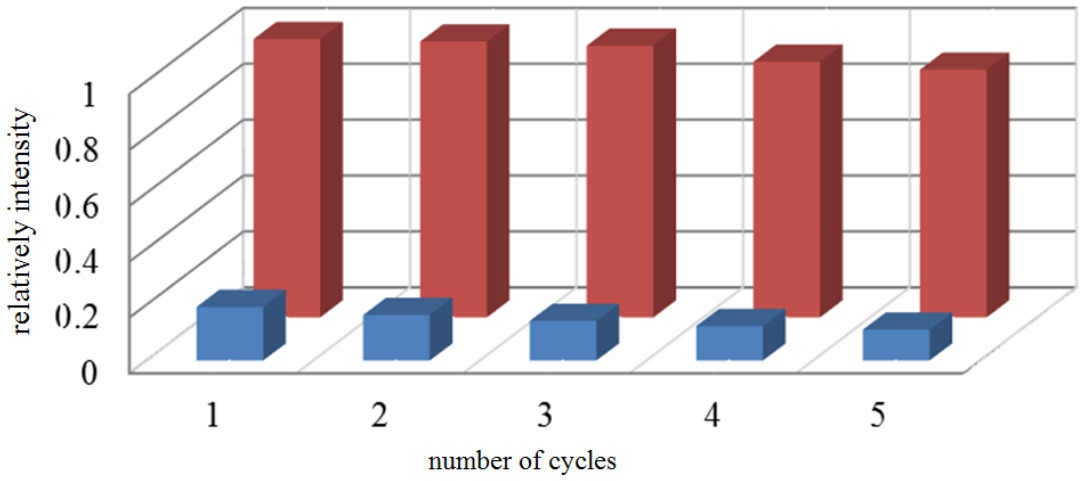

Figure S13 Multiple cycles for the quenching by $Cu(NO_3)_2$ and the recovery after filtration and ultrasonic washing by DMF for three times. The red bars show the pristine intensity and regenerated ones after washing; while the blue bars show the intensities after addition of $Cu(NO_3)_2$@DMF solutions

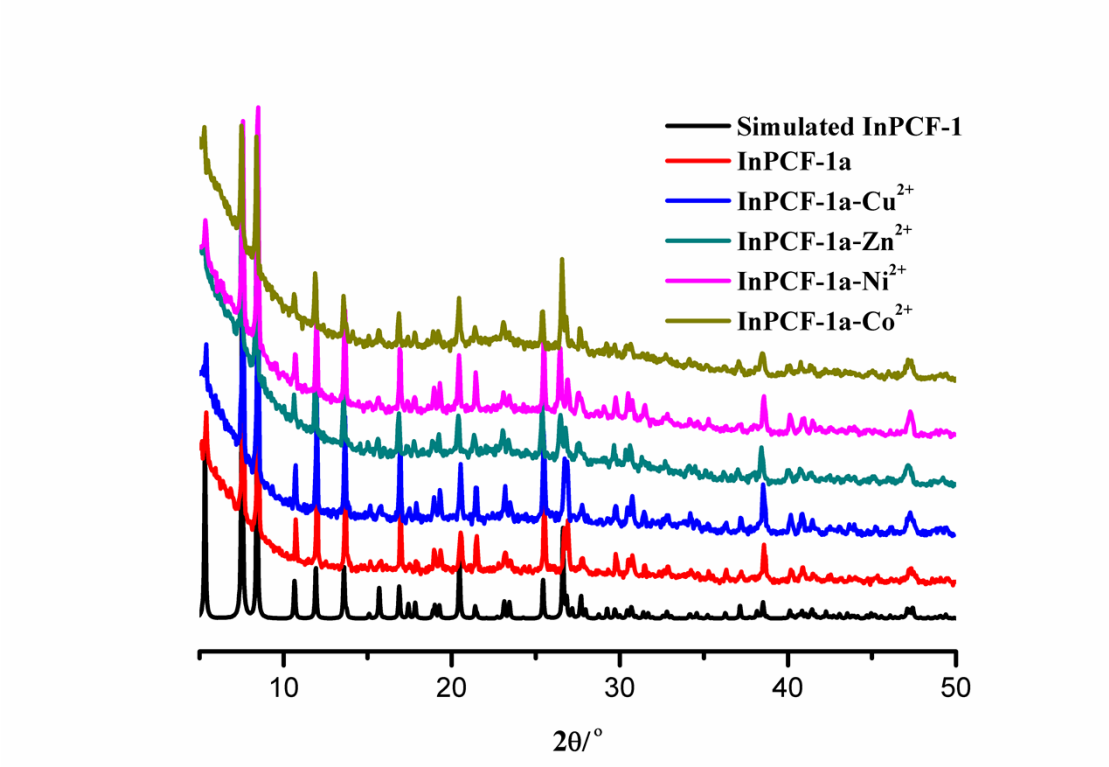

Figure S14 PXRD of **InPCF-1a** and sample after immersing $M(NO_3)_2$(M = Cu^{2+} Zn^{2+} Ni^{2+} Co^{2+}) DMF solution

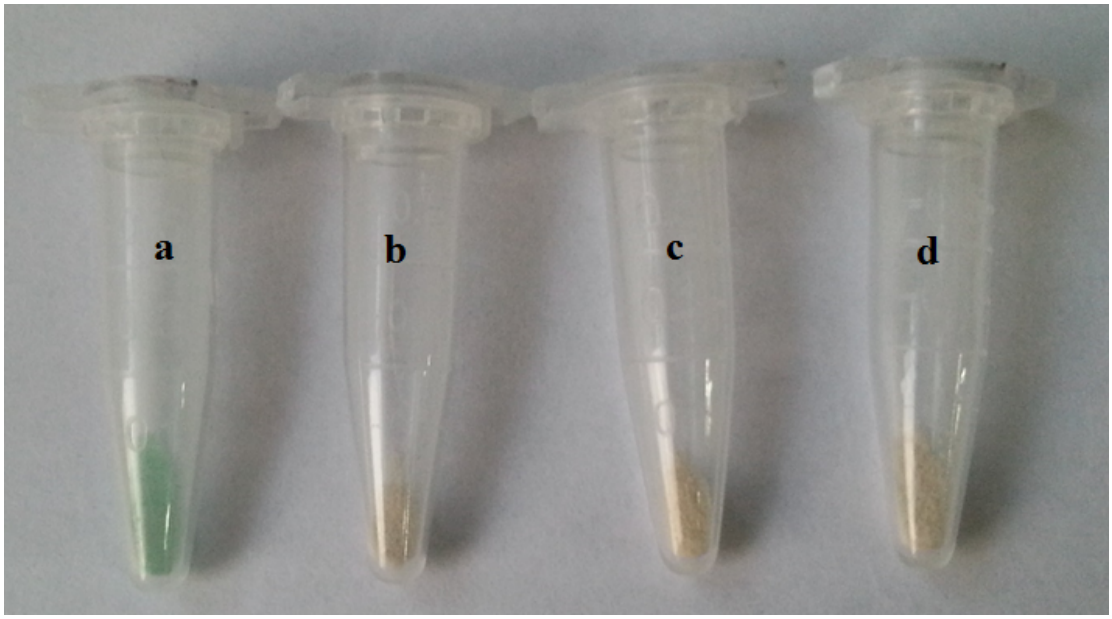

Figure S15 Photographs of **InPCF-1a** soaked in DMF solution containing $M(NO_3)_2$ with 10^{-2} M, a) Cu^{2+}, b) Co^{2+}, c) Ni^{2+}, d) Zn^{2+} for 24 h.

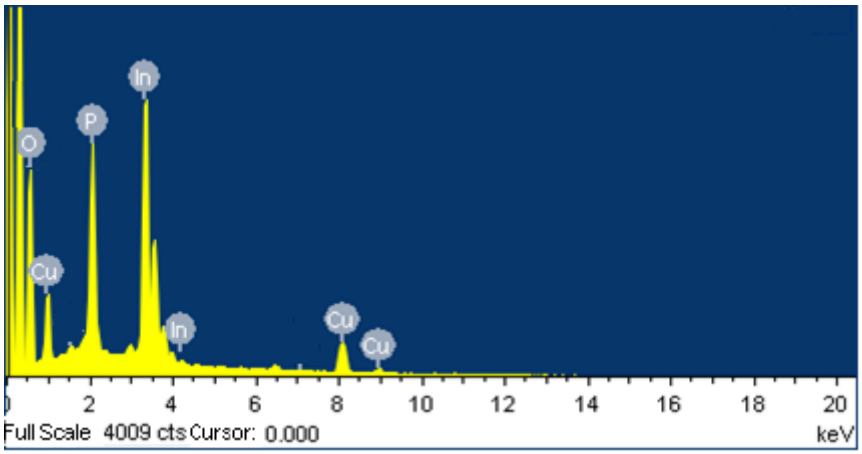

Figure S16 The EDS of the solid samples of **InPCF-1a-Cu^{2+}** obtained by centrifugal separation of **InPCF-1a** soaked in DMF solution containing $M(NO_3)_2$ with 10^{-2} M, washing with DMF , and drying in 60 ^{o}C oven.

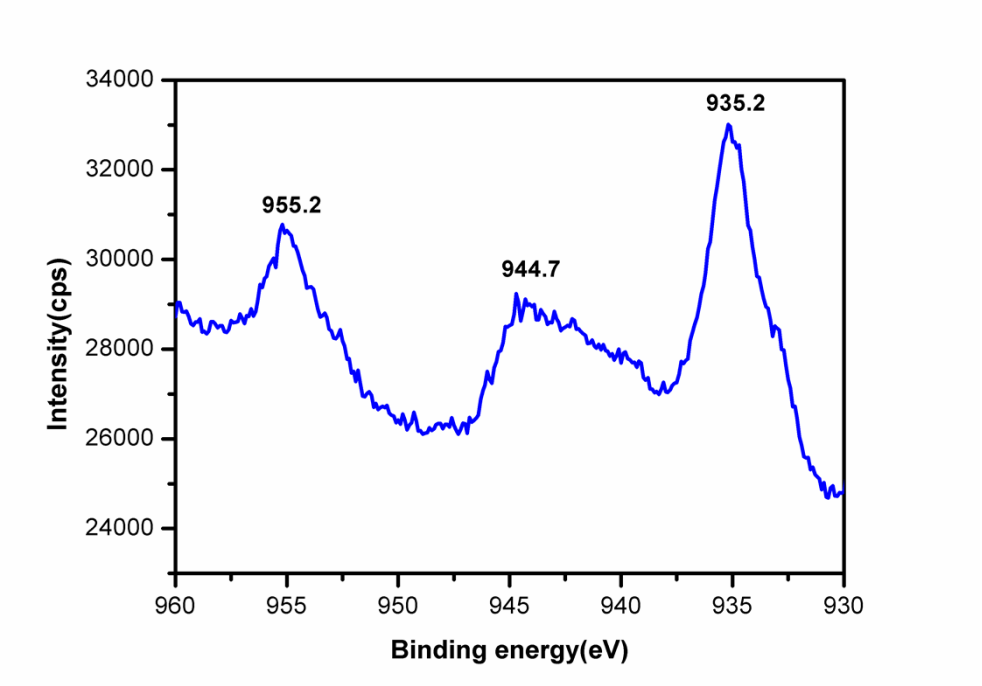

Figure S17 X-ray photoelectron spectroscopy (XPS) spectra of Cu^{2+}-incorporated **InPCF-1a.**

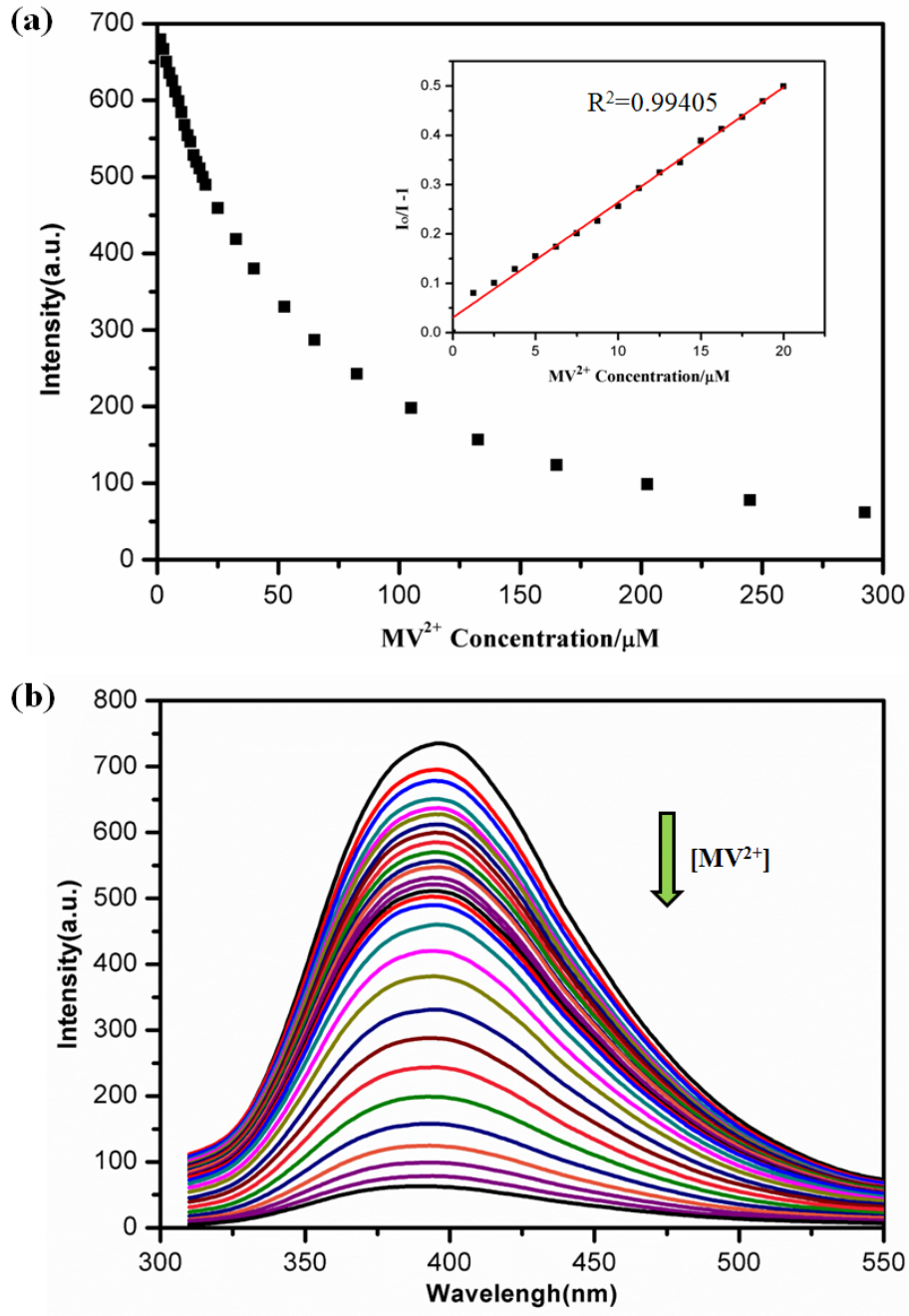

Figure S18 (a) and (b) Concentration-dependent luminescence intensities of **InPCF-1a** by the addition of different contents of MV^{2+} DMF solution (Ex at 290 nm)

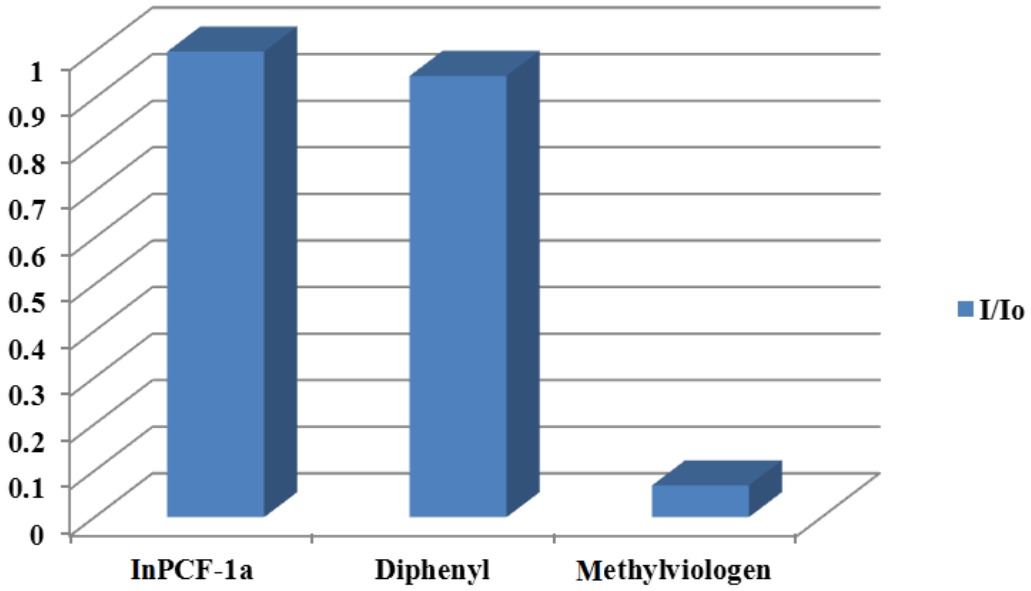

Figure S19 Luminescence spectra of **InPCF-1a**, **InPCF-1a** with 29 mM diphenyl, and **InPCF-1a** with 29 mM methylviologen.