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Supporting information

Anion directing self-assembly of 2D and 3D water-stable silver(I) nano-porous metal organic frameworks and their applications in real-time discriminating Cysteine and DNA detection

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Experimental details of synthesis and characterizations for MOF 1 and 2

1. General methods.

The **L** Ligand was prepared according to reported methods[1]. All reagents were purchased commercially and used without further purification. DNA sequences used in this study were synthesized by Shanghai Sangon Biotechnology Co. Ltd (Shanghai, China): Deionized water was used as solvent in this work. C, H, and N microanalyses were carried out with a Perkin-Elmer 240 elemental analyzer. Poweder X-Ray Diffraction (PXRD) was determined on a D/Max-2500 X-ray diffractometer using Cu-Kα radiation. FT-IR spectra (4000-500 cm-1) were recorded using a NICOLET 6700 FT-IR spectroscope with KBr pellets (NICOLET, USA). ultrasonic preparation was carried by a SB-100DT Ultrasonic bath (XJ Biotechnology Instrument, ZheJiang, china). Ultraviolet-visible (UV-vis) adsorption spectra were collected on a PerkinElmer Lambda 35 spectrophotometer. Photo-luminescent sensing measurements were performed on an Cary Eclipse fluorescence spectrophotometer (Agilent Technologies) equipped with a plotter unit and a quartz cell (1 cm × 1 cm) in the phosphorescence mode. The morphology and size of **2** were characterized by both Nova-Nano 230 scanning electron microscope (SEM; FEI instrument, USA) with gold coating and Tecnai G^2 F20 Transmission Electron Microscope (TEM; FEI instrument, USA). Zeta potential was measurements were performed on Nano-ZS, Worcestershire, (Malvern, UK). The N_2 sorption isotherm tests were characterized by Micromeritics ASAP 2020 HD88 surface area and porosimetry system (Micromeritics instrument, USA).

DNA sequences:

FAM-P: 5'-ACCAATCTCAAAGCAAATTA-3'-FAM

FAM-P': 5'- GGTGGTGGGGGGGGTTGGTAGGGTGTCTTC-3'-FAM

T: 5'-TAATTTGCTTTGAGATTGGT-3'

R: 5'-ACGGCTGGTCGTACATCGCT-3'

2. X-ray Data Collection and Structure Determinations

X-ray Crystallography. Diffraction intensities for **1-2** were collected on a Bruker SMART 1000 CCD diffractometer with graphite-monochromated Mo-Kα radiation (λ = 0.71073 Å) by using the ω-ϕ scan technique. Lorentz polarization and absorption corrections were applied. The structures were solved by direct methods and refined with the full-matrix least-squares technique using the SHELXS-97 and SHELXL-97 programs. Anisotropic thermal parameters were assigned to all non-hydrogen atoms. The organic hydrogen atoms were generated geometrically; the hydrogen atoms of the water molecules were located from difference maps and refined with isotropic temperature factors. Analytical expressions of neutral-atom scattering factors were employed, and anomalous dispersion corrections were incorporated[2]. The crystallographic data and details of refinements for **1-2** were summarized in **Table S1**, the selected bond lengths and angles were listed in **Table S2**, and the selected hydrogen bonds lengths [Å] and angles [°] calculated with the program PLATON were listed in **Tables S3**. CCDC: 1439109 for **1** and 1439108 for **2**, contained the supplementary crystallographic data for this work. These data can be obtained free of charge from The Cambridge Crystallographic Data Centre via www.ccdc.cam.ac.uk/data_request/cif.

3. Computational Details.

DFT and TDDFT calculations were performed with the Gaussian 09 program[3] and the molecular orbitals were analyzed using Gaussview software. PBE0[4] functional with SDD[5] basis set were used for Ag and 6-31+g* basis set for all other atoms. SMD solvation model and the water solvent in the experiments was used for solvent effects. The first 20 excited states of coordination polymer were calculated in all TDDFT calculations.

4. Preparation of $\{[Ag(L)_2]BF_4\}_n$ (1) (method 1).

L (1.74g, 10 mmol) with deionized water (10mL) were transfer into the beaker. They were heaed and stirred for 3 min until boiling, and then 10ml silver tetrafluoroborate (1.9467 g, 10 mmol) aqueous solution were transferred into the beaker instantly. The resulting colorless block-shaped crystals were washed several times by water. The yield of **1** was 41% based on **L**. Elemental analysis found (%) for: C 50.63, H 4.35, N 26.10; calcd: C 50.94 H 4.75, N 26.40. FT-IR data (cm^{-1}): 3406 (m), 3336(w), 3129 (w), 1616 (w), 1518 (m), 1443(m), 1283(w), 1254 (w), 1142 (m), 875(w), 808(w), 673(w), 503(w).

Preparation of $\{[Ag_3(L)_3]\cdot(H_2O)\cdot(CF_3SO_3)_3\}_n$ (2) (method 1).

L (1.74g, 10 mmol) with deionized water (10mL) were transfer into the beaker. They were heaed and stirred for 3 min until boiling, and then 10ml Silver trifluoromethanesulfonate (2.5694g, 10 mmol) aqueous solution were transferred into the beaker instantly. The resulting colorless block-shaped crystals were washed several times by water. The yield of **1** was 58% based on L. Elemental analysis found (%) for: C 26.95, H 1.96, N 12.47; calcd: C 27.52, H 2.31, N 12.84. FT-IR data (cm^{-1}): 3411(w), 3358(w), 3202(w), 3124(w), 1614 (m), 1518(m), 1271(m), 775(m), 636(w), 516(w).

Preparation of $\{[Ag_3(L)_3]\cdot(H_2O)\cdot(CF_3SO_3)_3\}_n$ (2) (method 2).

L (1.74g, 10 mmol), Silver trifluoromethanesulfonate (2.5694g, 10 mmol) and 20 ml distilled water were transferred into the beaker. The beaker was transferred in the ultrasonic bath. Then, the ultrasonic bath was performed for 60 min, at a power of 100 W. The resulting precipitates were isolated by centrifugation, washed with distilled water and dried in air. The resulting colorless block-shaped crystals were washed several times by water. The yield of **2** was 63% based on L.

5. Details of the amino acids sensing experiments

Ground samples of **1** (0.01g) were dispersed in the aqueous solutions (100 ml) with the aid of ultrasonic treatment for 30min and then obtained solutions (0.1g/L). The displayed emissions bands located around 290 nm (excited at 280 nm) (Fig.S8). Selectivity experiments towards various amino acids were conducted by adding 5μm of L-Histidine, Glycine, L-Arginine, Threonine, L-Methionine, L-Leucine, L-Serine, Creatine, L-Valine, L-cystine, L-Phenylalanine, D-Cysteine and L-Cysteine under the established conditions.

6. Details of the DNA sensing experiments

DNA buffer solutions were prepared by dissolving DNA (P, T, R) into PBS buffer (pH 7.4). Each DNA probe was diluted to a 1μm concentration using PBS buffer. Then, 0.017μm P, 0.017μm T and 0.003g/L MOF **2** were mixed in PBS buffer and incubated for 15 min at room temperature then the fluorescence intensity was measured.

7. Geometries for MOF 1

Ag	**1.02146100**	**0.74038400**	**0.40008500**
N	**-0.82826300**	**-0.08706700**	**1.36607700**
N	**2.60819900**	**-0.63090400**	**-0.44474300**
N	**0.22934400**	**2.38019200**	**-1.17627300**
N	**2.41874400**	**2.11733100**	**1.86801400**
B	**-10.09116000**	**-3.39387600**	**-2.36283000**
F	**-9.93432300**	**-2.12729700**	**-1.87877700**
F	**-9.00491100**	**-3.72613100**	**-3.14781400**
F	**-10.18027300**	**-4.32212700**	**-1.34089900**
F	**-11.24944600**	**-3.46906600**	**-3.14195100**
C	**-1.77165800**	**-0.85618800**	**0.80624200**
C	**-1.07176100**	**-0.27015500**	**2.69166700**
N	**-2.49847500**	**-1.43801500**	**1.72768700**

N	-2.06950400	-1.07007300	2.97759900
C	-3.55737300	-2.45376400	1.59044700
N	-8.69889100	-1.20182400	3.70844200
C	-7.38836800	-1.44056000	3.25374100
H	-9.01007700	-0.36472800	3.59929700
H	-8.65430800	-1.44948700	4.57224100
N	-5.98329400	4.12027700	-1.16357700
C	-6.92757900	4.64205000	-0.36499800
N	-5.54839900	5.06237000	-2.04682400
C	-5.48842400	2.75321700	-1.21141400
C	-6.26371800	6.09900200	-1.71262700
N	-7.14925400	5.90622900	-0.69947700
C	-1.17332700	2.48470900	-1.20945700
H	0.61114400	3.26362800	-0.94168600
H	0.55586900	2.14175200	-2.08014600
H	-0.55338600	0.15296400	3.36624200
H	-1.89800200	-0.96334600	-0.12930500
C	-4.85864600	-2.05292600	2.20661900
H	-3.25088900	-3.29499300	2.01341200
H	-3.70383000	-2.63676100	0.62818000
C	-5.58357100	-0.97244500	1.73094500
C	-5.41729600	-2.82195200	3.23063300
C	-6.82969400	-0.65528500	2.25182500
H	-5.22078500	-0.43735200	1.03563800
H	-7.30354800	0.09984400	1.92275300
C	-6.65871000	-2.52863000	3.74968100
H	-7.01959100	-3.06578700	4.44621900
H	-4.92898300	-3.56058600	3.57632300
H	-6.16981900	6.93749200	-2.15010700
H	-7.36985600	4.17491600	0.33342200

C	-3.98150300	2.66349400	-1.19430700
H	-5.82645000	2.31855500	-2.03430300
H	-5.84837200	2.25345000	-0.43689500
C	-3.32897500	1.73990400	-1.99013600
C	-3.19163100	3.48055300	-0.37517200
C	-1.84004500	3.38936900	-0.39104900
H	-3.61187000	4.10864500	0.20195800
H	-1.33087100	3.96023600	0.17378700
C	-1.94405800	1.63801800	-1.99832300
H	-1.52090300	0.98654600	-2.54571900
H	-3.84043200	1.16283600	-2.54438100
C	2.82986000	-1.89518000	-0.11024300
N	3.77406000	-2.41684000	-0.90883600
H	2.38749800	-2.36220100	0.58816300
N	4.20894200	-1.47484400	-1.79206200
C	4.26893000	-3.78390000	-0.95667300
H	3.93089000	-4.21865900	-1.77954100
H	3.90896800	-4.28376400	-0.18213300
C	5.77585100	-3.87362400	-0.93956500
C	6.56582100	-3.05657900	-0.12043800
C	6.42836500	-4.79731000	-1.73537400
H	6.14556900	-2.42858400	0.45671300
C	7.91739400	-3.14786000	-0.13629500
H	8.42656800	-2.57699400	0.42854200
C	8.58402700	-4.05240800	-0.95471600
N	9.98679700	-4.15694000	-0.92153900
C	7.81328200	-4.89919600	-1.74356100
H	8.23655000	-5.55058600	-2.29098500
H	5.91690900	-5.37437800	-2.28961900
H	10.36859600	-3.27350400	-0.68695200

H	10.31332100	-4.39538100	-1.82541200
H	2.10754500	2.95433100	1.75889000
H	2.46341100	1.86955600	2.73182500
C	3.72936500	1.87858000	1.41330600
C	4.45891100	0.79042800	1.90927400
H	4.09803100	0.25327100	2.60581200
C	5.70033800	0.49720300	1.39020400
C	6.25907400	1.26611800	0.36620400
H	6.18875000	-0.24144500	1.73588800
C	7.56034700	0.86527900	-0.24996800
C	5.53416200	2.34669500	-0.10949000
H	5.89693500	2.88169100	-0.80477700
N	8.61924400	1.88102800	-0.11272800
H	7.86683000	0.02405000	0.17299700
H	7.41390300	0.68237900	-1.21225500
N	9.04813100	2.24908200	1.13717100
C	9.34597600	2.46296700	-1.03418600
C	10.04595900	3.04888800	0.85125200
N	10.28937100	3.23208800	-0.47435100
H	9.21971800	2.35569700	-1.96972000
H	10.56423500	3.47202300	1.52583500
C	3.49362200	-0.43821300	-1.45786500
H	3.60787000	0.38744500	-1.91385600
C	4.28794100	2.66387100	0.41139700
H	3.81600500	3.42049800	0.08127100

8. Excitation energies, oscillator strengths and selected frontier orbitals of MOF 1

Excitation energies and oscillator strengths:

Excited State 1: Singlet-A 4.8031 eV 258.13 nm f=0.0185 <S2>=0.000**

211 -> 215 0.32625

212 -> 215 -0.10852

214 -> 215 0.49482

214 -> 216 0.16523

214 -> 218 0.10281

214 -> 220 0.10396

This state for optimization and/or second-order correction.

Total Energy, E(TD-HF/TD-KS) = -2839.82432291

Excited State 2: Singlet-A 4.8403 eV 256.15 nm f=0.0327 <S2>=0.000**

211 -> 216 0.10018

211 -> 217 -0.10426

212 -> 215 -0.13045

212 -> 216 0.42330

212 -> 217 -0.30890

212 -> 218 -0.19930

212 -> 219 0.23221

Excited State 3: Singlet-A 4.8585 eV 255.19 nm f=0.0515 <S2>=0.000**

211 -> 216 -0.13398

211 -> 217 -0.25257

211 -> 219 -0.11161

212 -> 217 0.10882

214 -> 216 0.27127

214 -> 217 0.45989

214 -> 219 0.12137

214 -> 222 0.11448

Excited State 4: Singlet-A 4.8840 eV 253.86 nm f=0.0490 <S2>=0.000**

207 -> 227 -0.12733

212 -> 220 -0.10692

213 -> 215 -0.19887

213 -> 218 0.26130

213 -> 219 0.21985

213 -> 220 0.46949

213 -> 221 0.12321

214 -> 218 -0.10139

Excited State 5: Singlet-A 4.9101 eV 252.51 nm f=0.3219 <S2>=0.000**

214 -> 215 -0.17180

214 -> 216 0.32169

214 -> 218 0.42373

214 -> 219 -0.25281

214 -> 221 -0.16678

Excited State 6: Singlet-A 5.0628 eV 244.89 nm f=0.0425 <S2>=0.000**

211 -> 216 0.28794

211 -> 218 0.26200

211 -> 219 -0.22880

212 -> 218 -0.14605

214 -> 215 -0.15267

214 -> 216 0.11994

214 -> 218 -0.22904

214 -> 219 -0.26583

214 -> 220 0.14053

Excited State 7: Singlet-A 5.0972 eV 243.24 nm f=0.0178 <S2>=0.000**

211 -> 216 0.14545

211 -> 218 0.30323

211 -> 221 -0.19569

212 -> 218 -0.16128

213 -> 218 -0.11200

214 -> 216 -0.17992

214 -> 218 0.26179

214 -> 219 0.30751

214 -> 221 -0.15077

Excited State 8: Singlet-A 5.1264 eV 241.85 nm f=0.0129 <S2>=0.000**

213 -> 215 0.24594

213 -> 216 -0.24260

213 -> 217 -0.10255

213 -> 218 0.11469

213 -> 219 0.44475

213 -> 221 -0.19340

214 -> 218 0.11773

Excited State 9: Singlet-A 5.1567 eV 240.43 nm f=0.0211 <S2>=0.000**

211 -> 215 -0.18029

211 -> 216 0.19273

211 -> 218 -0.10718

211 -> 219 -0.18979

212 -> 215 0.11248

212 -> 216 -0.14264

212 -> 217 -0.15443

212 -> 218 0.19664

212 -> 219 0.16034

212 -> 220 -0.13436

212 -> 221 0.12567

213 -> 219 -0.17207

213 -> 221 0.16510

214 -> 215 0.13061

214 -> 218 0.10342

214 -> 221 0.23511

214 -> 224 -0.10415

Excited State 10: Singlet-A 5.2017 eV 238.35 nm f=0.0890 <S2>=0.000**

211 -> 215 0.24973

211 -> 218 0.13949

212 -> 217 -0.22642

212 -> 218 0.28049

212 -> 220 -0.20723

212 -> 221 0.27099

214 -> 215 -0.21342

214 -> 219 0.10608

214 -> 221 -0.12694

Excited State 11: Singlet-A 5.2211 eV 237.47 nm f=0.0038 <S2>=0.000**

211 -> 215 0.30855

211 -> 218 -0.13250

211 -> 220 0.12302

212 -> 215 -0.12771

212 -> 217 0.11932

213 -> 215 -0.22845

214 -> 215 -0.24619

214 -> 216 -0.20909

214 -> 218 0.14378

214 -> 220 -0.12277

214 -> 221 0.19987

214 -> 222 0.16507

Excited State 12: Singlet-A 5.2553 eV 235.92 nm f=0.0556 <S2>=0.000**

211 -> 215 0.13540

211 -> 217 -0.10198

212 -> 215 -0.16121

213 -> 215 0.51988

213 -> 216 0.18735

213 -> 220 0.20204

214 -> 219 -0.11499

214 -> 222 0.12111

Excited State 13: Singlet-A 5.2695 eV 235.29 nm f=0.0297 <S2>=0.000**

211 -> 215 -0.13391

211 -> 217 -0.18054

211 -> 218 0.18146

211 -> 220 -0.11217

212 -> 216 0.23099

212 -> 217 0.12401

212 -> 218 0.13501

212 -> 222 -0.12994

212 -> 224 0.16841

212 -> 225 0.19022

212 -> 228 0.13961

213 -> 215 -0.12220

214 -> 216 -0.10858

214 -> 217 -0.15450

214 -> 219 -0.18757

214 -> 222 0.14626

Excited State 14: Singlet-A 5.2749 eV 235.05 nm f=0.0953 <S2>=0.000**

211 -> 219	**0.13029**
211 -> 222	**-0.11400**
212 -> 216	**-0.15702**
212 -> 217	**-0.12055**
212 -> 222	**0.20802**
212 -> 224	**-0.13068**
212 -> 225	**-0.14502**
214 -> 219	**-0.13142**
214 -> 221	**-0.12995**
214 -> 222	**0.30131**
214 -> 223	**0.28205**
214 -> 224	**0.17177**

Excited State 15: Singlet-A 5.2966 eV 234.08 nm f=0.1298 <S2>=0.000**

211 -> 216	**0.24171**
211 -> 217	**0.21815**
211 -> 218	**-0.11582**
211 -> 219	**-0.15022**
211 -> 221	**0.13362**
211 -> 222	**-0.10415**
212 -> 221	**-0.13374**
212 -> 222	**-0.12225**
212 -> 224	**0.15254**
212 -> 225	**0.12709**
214 -> 219	**0.19138**
214 -> 221	**-0.20539**
214 -> 222	**0.12231**
214 -> 223	**0.24221**

214 -> 224 0.13535

Excited State 16: Singlet-A 5.3015 eV 233.87 nm f=0.0376 <S2>=0.000**

211 -> 217 0.19097

211 -> 218 0.10974

211 -> 219 0.30777

211 -> 220 -0.14852

212 -> 217 -0.12134

212 -> 219 -0.18934

212 -> 222 -0.10367

214 -> 217 0.29312

214 -> 219 -0.11066

214 -> 220 -0.10305

214 -> 221 0.17930

214 -> 223 0.14336

214 -> 224 -0.11680

Excited State 17: Singlet-A 5.3227 eV 232.93 nm f=0.0191 <S2>=0.000**

211 -> 218 0.12865

213 -> 216 0.18410

213 -> 218 0.30736

213 -> 221 -0.16646

213 -> 222 0.12462

213 -> 223 -0.20086

213 -> 227 -0.22738

213 -> 229 -0.27545

213 -> 232 0.10092

214 -> 220 -0.11005

Excited State 18: Singlet-A 5.3301 eV 232.61 nm f=0.0581 <S2>=0.000**

211 -> 215 -0.11465

211 -> 216 0.14719

211 -> 219 0.14650

211 -> 223 -0.13050

213 -> 218 0.14221

213 -> 229 -0.10023

214 -> 216 -0.15538

214 -> 217 0.24317

214 -> 218 0.10746

214 -> 219 -0.11594

214 -> 220 0.35450

214 -> 221 -0.16529

214 -> 223 -0.22554

Excited State 19: Singlet-A 5.3561 eV 231.48 nm f=0.0087 <S2>=0.000**

211 -> 217 0.17793

211 -> 219 0.11065

211 -> 220 0.12385

211 -> 221 -0.20190

211 -> 222 -0.16354

214 -> 216 0.28014

214 -> 217 -0.19596

214 -> 219 0.17993

214 -> 220 0.16297

214 -> 221 0.24513

214 -> 222 0.25031

Excited State 20: Singlet-A 5.3701 eV 230.88 nm f=0.0137 <S2>=0.000**

211 -> 216 0.18055

211 -> 218 -0.14733

211 -> 219	**0.13011**
211 -> 221	**-0.30198**
212 -> 216	**0.12923**
212 -> 217	**0.30250**
212 -> 221	**0.12147**
212 -> 224	**-0.11762**
214 -> 218	**-0.17592**
214 -> 220	**-0.18649**
214 -> 221	**-0.16740**

9. FT-IR characterization

FT-IR spectra of MOFs **1** and **2** were recorded to display characteristic absorption bands for triazole, and phenyl moieties of **L** (**Fig.** S7). The peak located at ca. 3400 cm^{-1} which can be attribute anilino group. The peaks located at ca. 3100 cm^{-1} and 1100-1300 cm^{-1} can be attributed to ν (C-H) and ν (C-N) or ν (N-N) of triazole moieties. The triazole out of plane ring absorption was at 630 cm^{-1}. The benzene ring exhibited medium peaks around 1500 cm^{-1} [2]. The medium narrow peaks ca. 860 cm^{-1}, indicated the phenyl groups in the para-orientation mode.

Table S1. Crystallographic Data and Details of Refinements for MOFs **1**-**2** [a]

	1	**2**
Formula	$C_{18}H_{20}AgBF_4N_8$	$C_{30}H_{30}Ag_3F_9N_{12}O_{10}S_3$
M (g mol^{-1})	543.10	1309.45
crystal system	Monoclinic	Monoclinic
space group	*Cc*	*Cc*
a (Å)	10.1679(9)	20.2784(12)
b (Å)	21.1811(18)	11.6978(7)
c (Å)	9.9402(8)	20.6670(12)
α (º)	90	90
β (º)	92.138(2)	115.4640(10)
γ (º)	90	90
V (Å^3)	2139.3(3)	4426.2(5)
Z	4	4
F (000)	1088	2576
ρ_{calc} (Mg m^{-3})	1.686	1.965
μ (mm^{-1})	1.000	1.560
data/restraints/params	3664 / 2 / 289	7207 / 2 / 604
GOF on F^2	1.074	1.019
R_1[a] (I=2σ(I))	0.0365	0.0266
ωR_2[a] (all data)	0.0826	0.0571

[a] $R_1 = \Sigma||F_o|$

- $||F_c||/|F_o|$. $^{b}\omega R_2$ = $[\Sigma w(|F_o|^2-|F_c^2|^2/w|F_o^2|^2]^{1/2}$.

Table S2. Selected bond lengths /Å and bond angles /° for MOF **1**

Ag(1)-N(1)	2.245(6)	Ag(1)-N(7)	2.261(6)
Ag(1)-N(8)	2.409(6)	Ag(1)-N(4)	2.450(5)
N(1)-Ag(1) -N(7)	121.03(19)	N(1)-Ag(1) -N(8)	105.2(2)
N(7)-Ag(1) -N(8)	113.5(2)		

Table S3. Selected bond lengths /Å and bond angles /° for MOF **2**

Ag(1)-N(7)	2.198(4)	Ag(1)-N(1)	2.276(4)
Ag(1)-N(8)	2.363(4)	Ag(1)-O(1)	2.702(4)
Ag(2)-N(11)	2.173(4)	Ag(2)-N(5)	2.249(4)
Ag(2)-N(12)	2.504(4)	Ag(3)-N(3)	2.196(4)
Ag(3)-N(4)	2.295(4)	Ag(3)-N(9)	2.379(4)
N(7)-Ag(1) -N(1)	131.41(15)	N(7)-Ag(1) -N(8)	122.26(14)
N(1)-Ag(1) -N(8)	106.23(14)	N(1)-Ag(1) -O(1)	82.69(13)
N(1)-Ag(1) -O(1)	88.68(14)	N(1)-Ag(1) -O(18)	97.13(13)
N(11)-Ag(2) -N(5)	151.69(15)	N(11)-Ag(2) -N(12)	119.62(14)
N(5)-Ag(2) -N(12)	88.68(14)	N(3)-Ag(3) -N(4)	141.52(15)
N(3)-Ag(3) -N(9)	115.16(14)	N(4)-Ag(3) -N(9)	102.22(15)

Table S4. Hydrogen bonds for MOF **1** [Å and °][a]

D-H···A	d(D-H)	d(H···A)	d(D···A)	<(DHA)
N(4)-H(4A)···F(3)	0.90	2.14	2.9846	156
N(4)-H(4B)···F(2)	0.90	2.26	3.1412	166
N(8)-H(8A)···F(2)	0.99	2.47	3.3669	151
N(8)-H(8A)···F(3)	0.99	2.47	3.3688	150
N(8)-H(8B)···F(1)	0.99	2.00	2.9641	166
C(1)-H(1)···F(4)	0.95	2.36	3.3011	172
C(10)-H(10)···N(3)	0.95	2.45	3.3594	159
C(11)-H(11)···F(1)	0.95	2.42	3.3278	160
C(11)-H(11)···F(4)	0.95	2.44	3.1849	135

Table S5. Hydrogen bonds for MOF **2** [Å and °][a]

D-H···A	d(D-H)	d(H···A)	d(D···A)	<(DHA)
N(4)-H(4B)···O(10)	0.88	2.17	2.9312	144
N(8)-H(8A)···O(3)	0.88	2.32	3.0521	141
N(8)-H(8B)···O(6)	0.88	2.32	2.9837	133
N(12)-H(12A)···O(7)	0.88	2.15	2.9829	157
C(12)-H(12B)···O(2)	0.88	2.33	3.0568	140

Table S6. The Ksv values for addition different amino acids in MOF**1**.

L-cysteine	$n_{L\text{-cysteine}}:n_{D\text{-cysteine}}=1:1$	$n_{L\text{-cysteine}}:n_{D\text{-cysteine}}=1:2$	**D-cysteine**
57.3895	7.83398	3.61414	3.42661

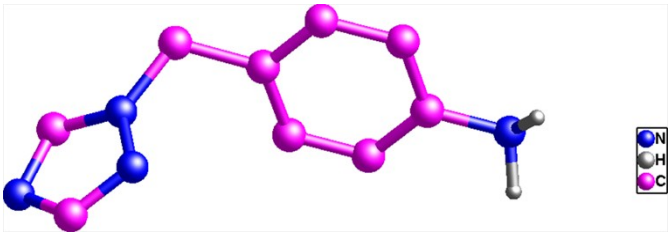

Fig. S1. The flexibility ligand 1-(4-aminobenzyl)-1,2,4-triazole.

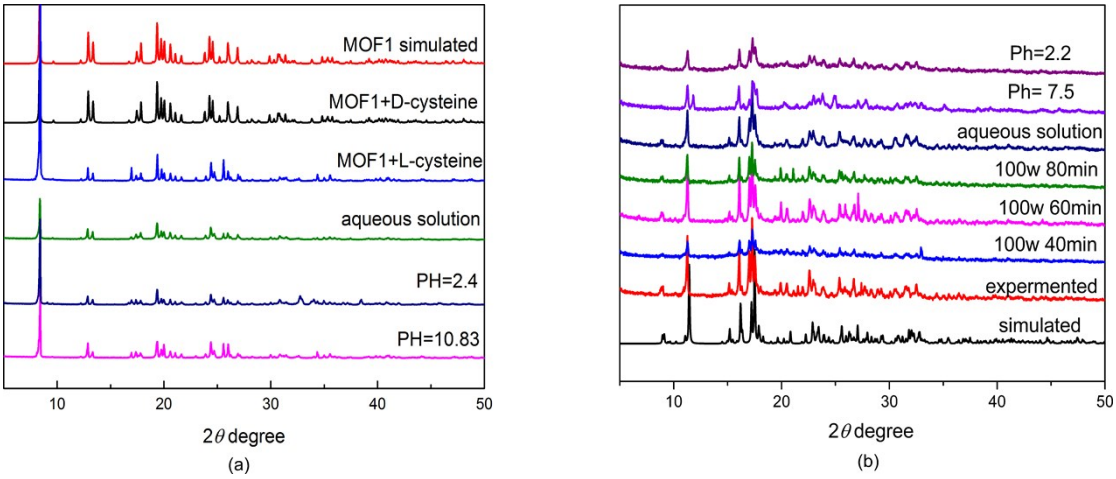

Fig. S2. (a) Powder X-Ray patterns for **MOF 1** in different PH buffer solution, in addition of L,D-cysteine aqueous solution. (b) Powder X-Ray patterns for **MOF 2** in different PH buffer solution, sonochemical time and different ultrasound irradiation power.

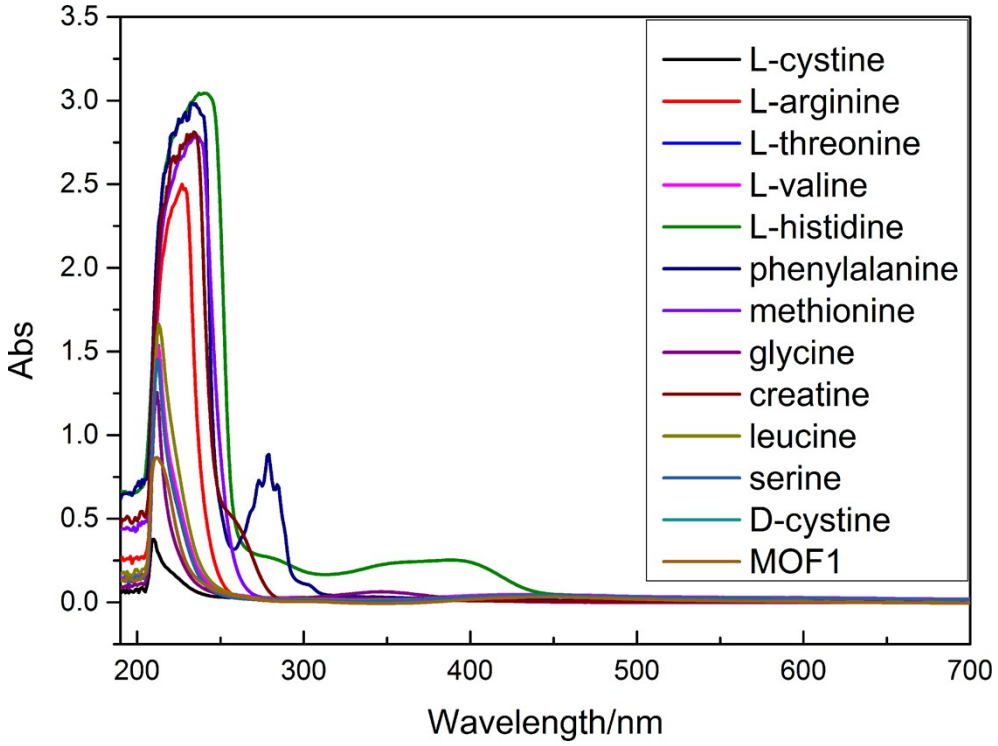

Fig. S3 UV-vis spectra of MOF **1** and animo acids.

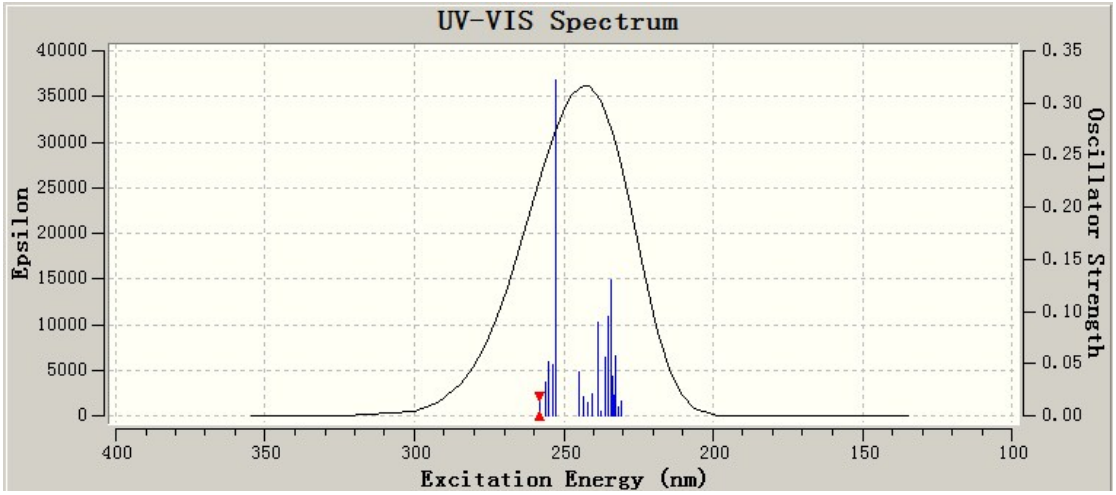

Fig. S4 calculated UV/vis absorption of 2D MOF **1**.

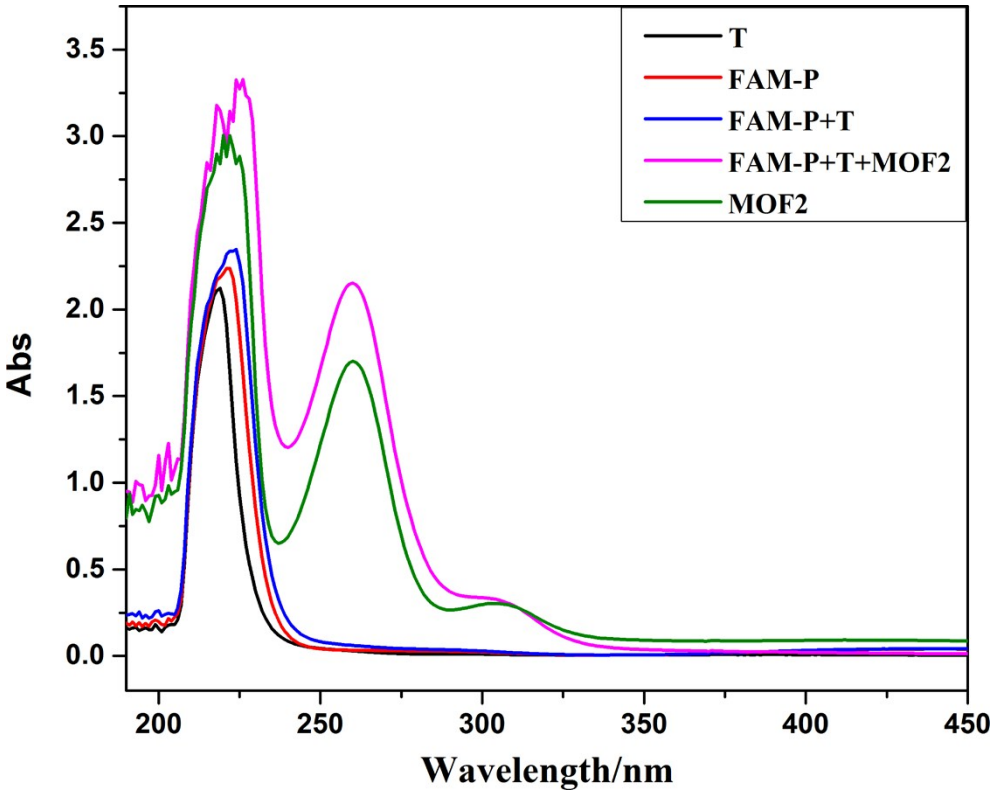

Fig. S5 UV-vis spectra of **P**, **T** and mixture solution of FAM-**P**, **T** and **2.**

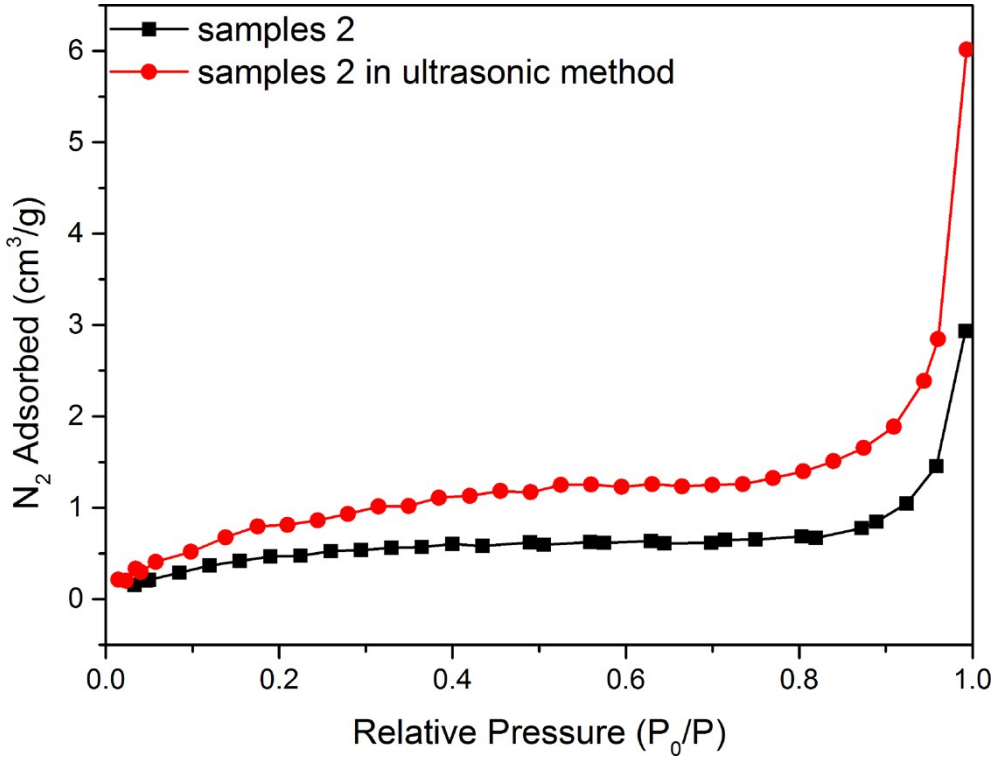

Fig. S6 The N_2 sorption isotherm tests of samples **2**.

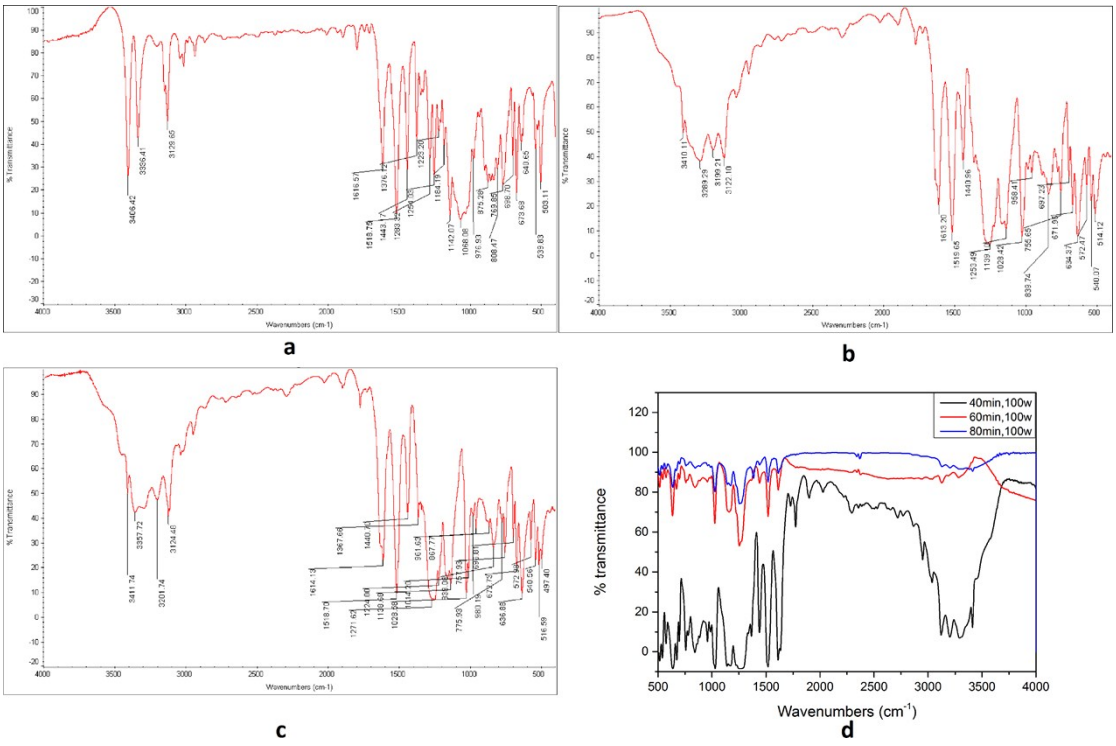

Fig. S7 FT-IR spectra of MOF **1** isolated by method **1** (a), MOF **2** isolated by method **1** (b), method **2** (70 w, 60min) and (c) method **2** (100w, 40min. 100w, 60min. 100w, 80min).

References

1. Y. Y. Wang, Q. Jin, S. X. Liu, C. Guo, Y. Y. Liu, B. Ding, X. X. Wu; Y. Li, Z. Z. Zhu, *RSC Advances,2015, **5**,* 35238.
2. F. Simkovic, S. Oychinnikov, D. Baker, D.J. Rigden, Iucrj. 2017, ***4***, 291.
3. Gaussian 09, revision E.01, M. J. Frisch, G. W. Trucks, H. B. Schlegel, G. E. Scuseria, M. A. Robb, J. R. Cheeseman, G. Scalmani, V. Barone, B. Mennucci, G. A. Petersson, H. Nakatsuji, M. Caricato, X. Li, H. P. Hratchian, A. F. Izmaylov, J. Bloino, G. Zheng, J. L. Sonnenberg, M. Hada, M. Ehara, K. Toyota, R. Fukuda, J. Hasegawa, M. Ishida, T. Nakajima, Y. Honda, O. Kitao, H. Nakai, T. Vreven, J. A. Montgomery, J. E. Peralta, F. Ogliaro, M. Bearpark, J. J. Heyd, E. Brothers, K. N. Kudin, V. N. Staroverov, R. Kobayashi, J. Normand, K. Raghavachari, A. Rendell, J. C. Burant, S. S. Iyengar, J. Tomasi, M. Cossi, N. Rega, J. M. Millam, M. Klene, J. E. Knox, J. B. Cross, V. Bakken, C. Adamo, J. Jaramillo, R. Gomperts, R. E. Stratmann, O. Yazyev, A. J. Austin, R. Cammi, C. Pomelli, J. W. Ochterski, R. L. Martin, K. Morokuma, V. G. Zakrzewski, G. A. Voth, P. Salvador, J. J. Dannenberg, S.

Dapprich, A. D. Daniels, O. Farkas, J. B. Foresman, J. V. Ortiz, J. Cioslowski, D. J. Fox, Gaussian, Inc. , Wallingford, CT, 2013.

4. a) J. P. Perdew, K. Burke, M. Ernzerhof, Phys. Rev. Lett. 1996, 77, 3865; b) J. P. Perdew, K. Burke, M. Ernzerhof, Phys. Rev. Lett. 1997, **78**, 1396; c) C. Adamo, V. Barone, J. Chem. Phys. 1999, 110, 6158.
5. P. Fuentealba, H. Preuss, H. Stoll, L. Von Szentpály, Chem. Phys. Lett. 1982, **89**, 418.