Supporting Information for

Growth inhibition of *Microcystic aeruginosa* by Metal-organic frameworks: effect of variety, metal ion and organic ligand

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1. Preparation and characterization of the MOFs

1.1 Synthesis of MOFs

1.1.1 Synthesis of Cu-MOF-74

The synthesis of Cu-MOF-74 is mainly based on the researches of Sanz et al.[1] 0.299 g of 2,5-dihydroxyterephthalic acid was dissolved in a mixed solution of 54 mL dimethylformamide (DMF) and 6 mL methanol with continuous stirring at ambient temperature. Then stirring was followed again after the addition of 0.731 g of $Cu(NO_3)_2 \cdot 3H_2O$ until the solution was clear. The stirred solution was transferred to a hydrothermal reactor and placed in a 120°C muffle furnace for 24 h. At the end of the reaction, the hydrothermal reactor was taken out and cooled to room temperature. The resultant sample was washed sequentially with DMF and methanol, then the sample was dried at 85°C again to obtain a brown powder.

1.1.2 Synthesis of Zn-MOF-74

The synthesis of Zn-MOF-74 is mainly according to Àngels et al.[2] 0.450 g of $Zn(AC)_2 \cdot 2H_2O$ and 0.200 g of 2,5-dihydroxyterephthalic acid were dissolved in 10 mL of DMF to form Solution A and Solution B, respectively. Then, solution A was poured into solution B whilst stirring at room temperature for 24 h. After washed twice with DMF and once with methanol, the sample was dried at 85°C to obtain yellow powder.

1.1.3 Synthesis of ZIF-8

The synthesis of ZIF-8 is mainly based on the researches of Kida et al.[3] 0.745 g of $Zn(NO_3)_2 \cdot 6H_2O$ was dissolved in 45 mL of distilled water to form solution A, 4.100 g of 2-methylimidazole was dissolved in 5 mL of distilled water to form solution B. After the solution A was added into the solution B, the mixture was placed on the magnetic stirrer to stir for 1 h, then centrifuged to get raw sample. After that, the raw sample was washed with distilled water for three times and dried at 85°C to obtain a white powder.

1.1.4 Synthesis of Ag/AgCl@ZIF-8

The synthesis of Ag/AgCl@ZIF-8 is mainly according to Gao et al.[4] 2.348 g $Zn(NO_3)_2 \cdot 6H_2O$ and 5.192 g 2-methylimidazole were dissolved in 160 mL of methanol to form solution A and solution B, respectively. After solution A was poured into solution B, the mixture solution was stirred for 2 h followed by centrifugation. The obtained precipitate was washed with absolute ethanol for three times and then dried at 85°C to obtain white powder named sample A. Then 0.1 g sample A was dispersed in 7 mL of 53.7 mmol/L $AgNO_3$ water: ethanol (V : V=1:6) solution keeping stirring for 3 h to acquire solution C. Afterwards, the solution C was added to 49 mL of 10.48 mmol/L NaCl water : ethanol (V : V=1:6) solution dropwise within 20 min, then the mixture was stirred for 10 h at room temperature until the solution turned from white to light blue color, centrifuged. The resultant sample was washed with distilled water for 3 times and then dried at 85°C to obtain powder.

1.1.5 Synthesis of MIL-125(Ti)

The synthesis of MIL-125(Ti) is mainly based on the researches of Kim et al.[5] 1.56 g terephthalic acid was dissolved in solution of methanol (10 ml) : DMF (V : V=1:9) whilst stirring for 1 h by the magnetic stirrer. After adding 1.7 mL isopropyl titanate, the mixture was placed on a magnetic stirrer to stir for 1 h again. Then the reaction was carried out at 150°C for 24 h and cooled down to the room temperature naturally to obtain sample. After that, the sample was washed twice with dimethylformamide, once with methanol, and then dried at 85°C to obtain white powder.

1.2 Characterization of MOFs

XRD pattern was recorded with an X-ray diffractometer (Rigaku. Co., Ltd., Japan) using Cu Kα radiation to analyze the crystal structure. Field-emission scanning electron microscope (FESEM S-4800, Hitachi. Ltd., Japan) was used to observe the microstructure of the sample. X-ray photoelectron spectroscopy (XPS) spectra was

acquired by X-ray photoelectron spectrometer (Thermo-VG Scientific, ESCALAB 250, USA) to analyze the elemental composition and element valence of MOFs.

2. MOFs material water stability experiment

MOFs stock solution (1000 g/L) was acquired by adding 0.01 g MOFs into 10 mL distilled water and underwent ultrasonic dispersion (40 kHz, 100 W) for 15 mins.A certain amount of above MOFs (Cu-MOF-74, Zn-MOF-74, Ag/AgCl@ZIF, ZIF- 8 and MIL-125 (Ti)) stock solution immersed in five flasks containing 100 mL deionized water at room temperature under stirring respectively to acquire five MOFs suspension with the concentrations of 1 mg/L.A given time intervals (1,2,3,4,5,6 days), the concentrations of metal ions released by MOFs were measured by ICP (Optima 8000, PerkinElmer, US) respectively, which was used previously by Liu et al[6].

FIGURE CAPTIONS AND FIGURES

Fig. S1. XRD patterns of Cu-MOF-74, Zn-MOF-74, ZIF-8, Ag/AgCl@ZIF-8, and MIL-125 (Ti).

Fig. S2. SEM images of five MOFs samples: (a) Cu-MOF-74, (b) Zn-MOF-74, (c) ZIF-8, (d) Ag/AgCl@ZIF-8, (e) MIL-125(Ti).

Fig. S3. XPS spectra of: (a) Ag/AgCl@ZIF-8, (b) Zn 2p, (c) N 1s, (d) Ag 3d, (e) Cl 2p, (f) O 1s, (g) C 1s.

Fig. S4. XPS spectra of: (a) Zn-MOF-74, (b) Zn 2p, (c) N 1s, (d) O 1s, (e) C 1s.

Fig. S5. XPS spectra of: (a) Cu-MOF-74, (b) Cu 2p, (c) N 1s, (d) O 1s, (e) C 1s.

Fig. S6. XPS spectra of: (a) ZIF-8, (b) O 1s, (c) C 1s, (d) N 1s, (e) Zn 2p.

Fig. S7. XPS spectra of: (a) MIL-125(Ti), (b) Ti 2p, (c) O 1s, (d) C 1s.

Fig. S8. The metal ions release curves of the MOFs.

Figure S1

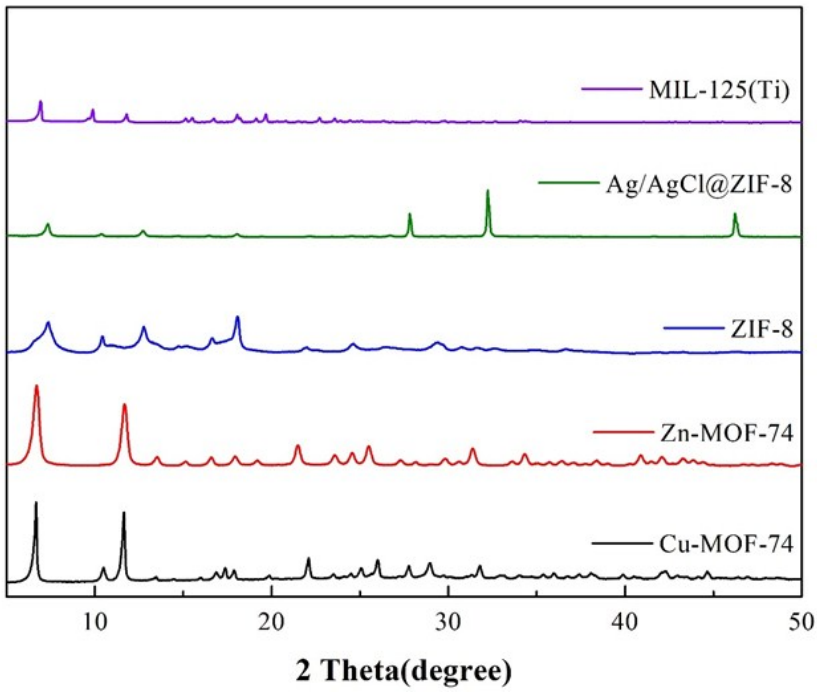

Fig. S1. XRD patterns of Cu-MOF-74, Zn-MOF-74, ZIF-8, Ag/AgCl@ZIF-8, and MIL-125 (Ti).

Figure S2

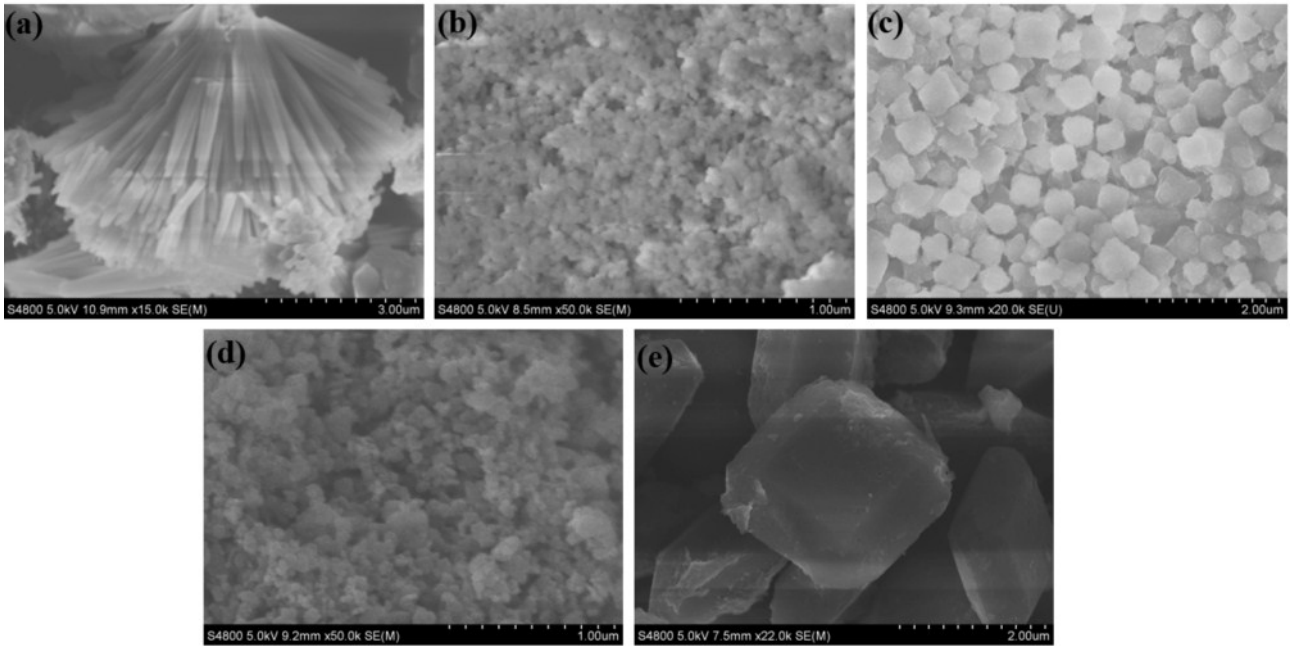

Fig. 2. SEM images of five MOFs samples: (a) Cu-MOF-74, (b) Zn-MOF-74, (c) ZIF-8, (d) Ag/AgCl@ZIF-8, (e) MIL-125(Ti).

Figure S3

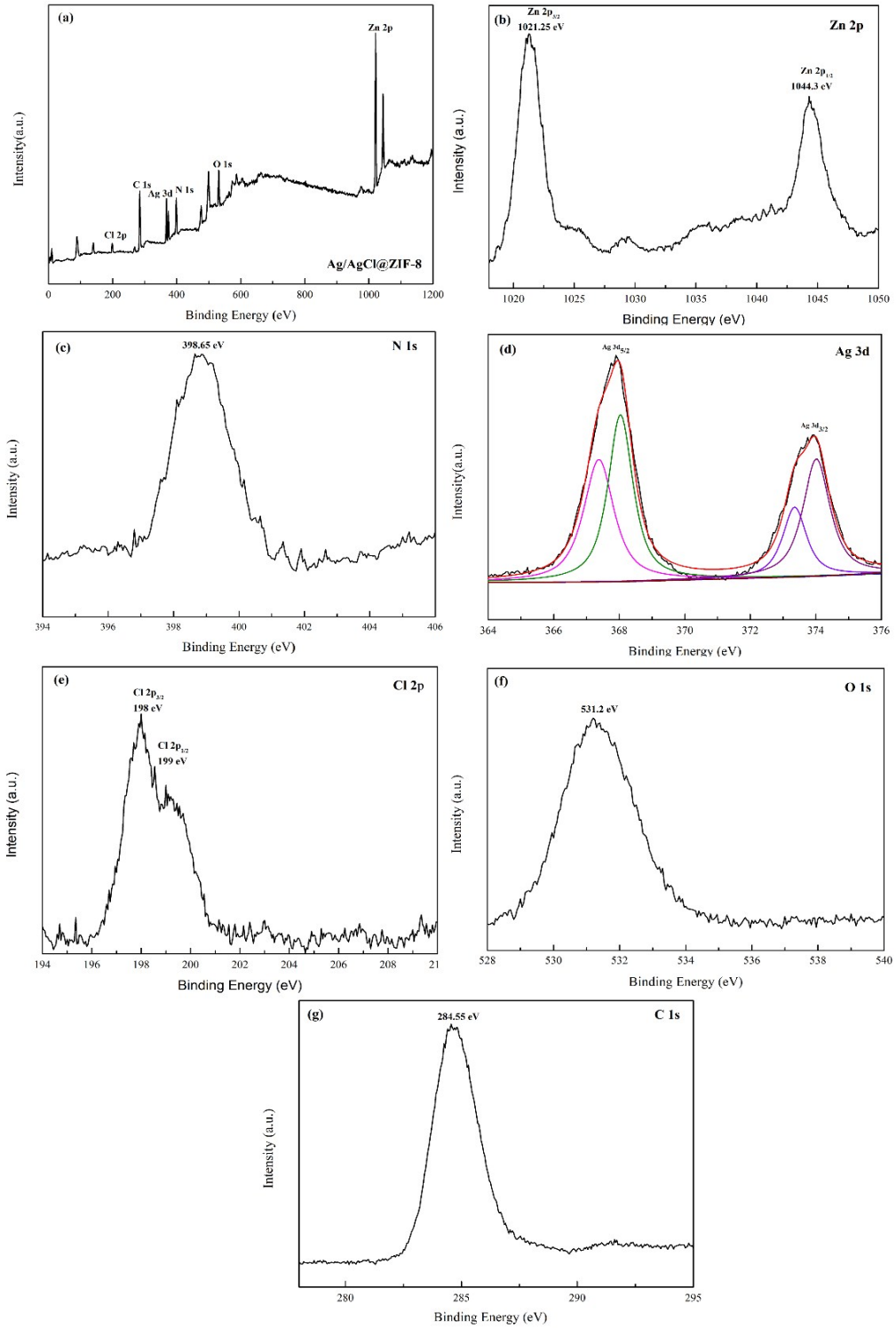

Fig. S3. XPS spectra of: (a) Ag/AgCl@ZIF-8, (b) Zn 2p, (c) N 1s, (d) Ag 3d, (e) Cl 2p, (f) O 1s, (g) C 1s.

Figure S4

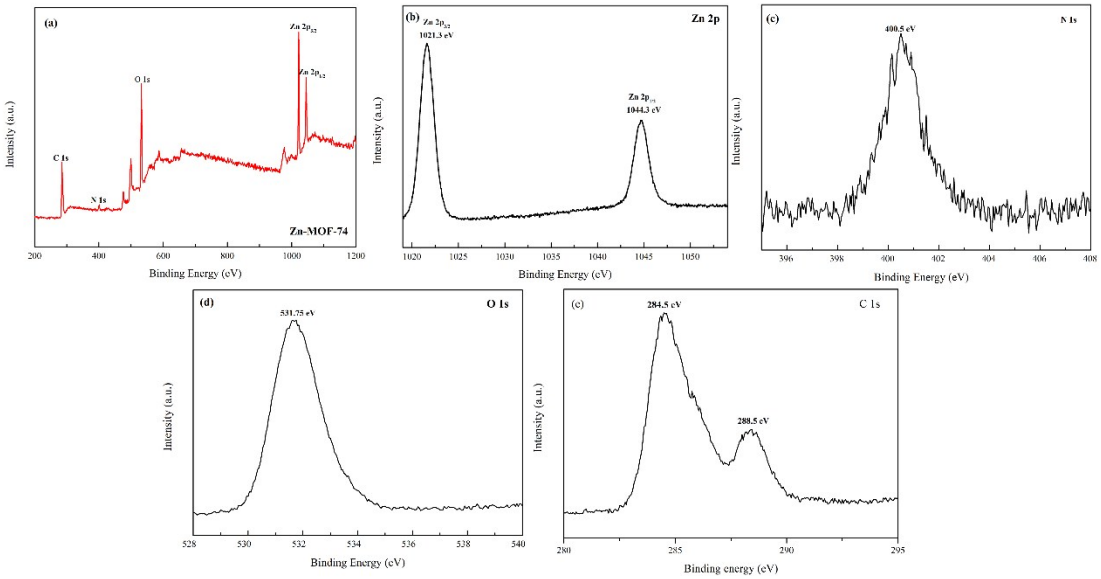

Fig. S4. XPS spectra of: (a) Zn-MOF-74, (b) Zn 2p, (c) N 1s, (d) O 1s, (e) C 1s.

Figure S5

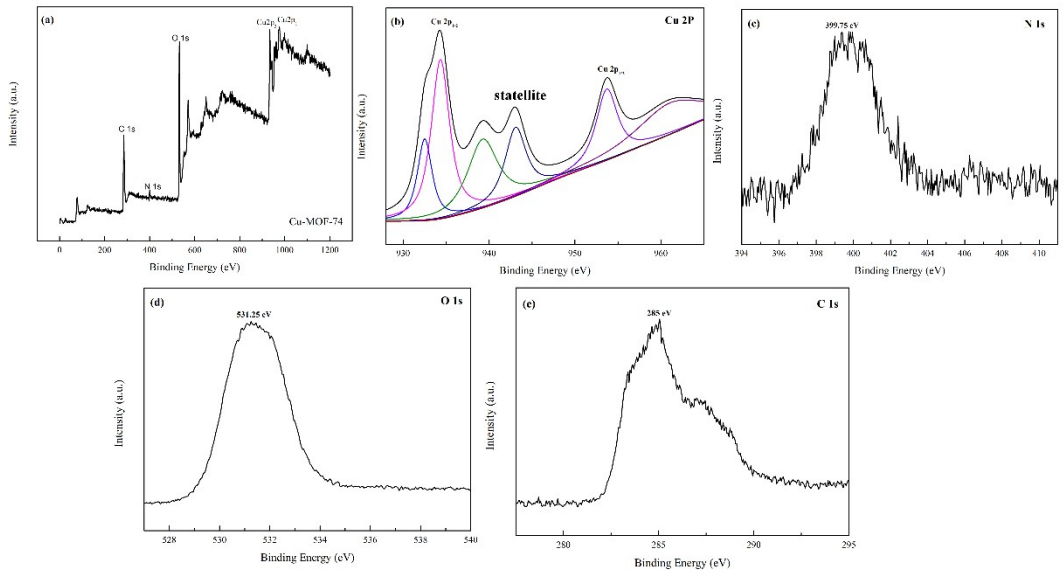

Fig. S5. XPS spectra of: (a) Cu-MOF-74, (b) Cu 2p, (c) N 1s, (d) O 1s, (e) C 1s.

Figure S6

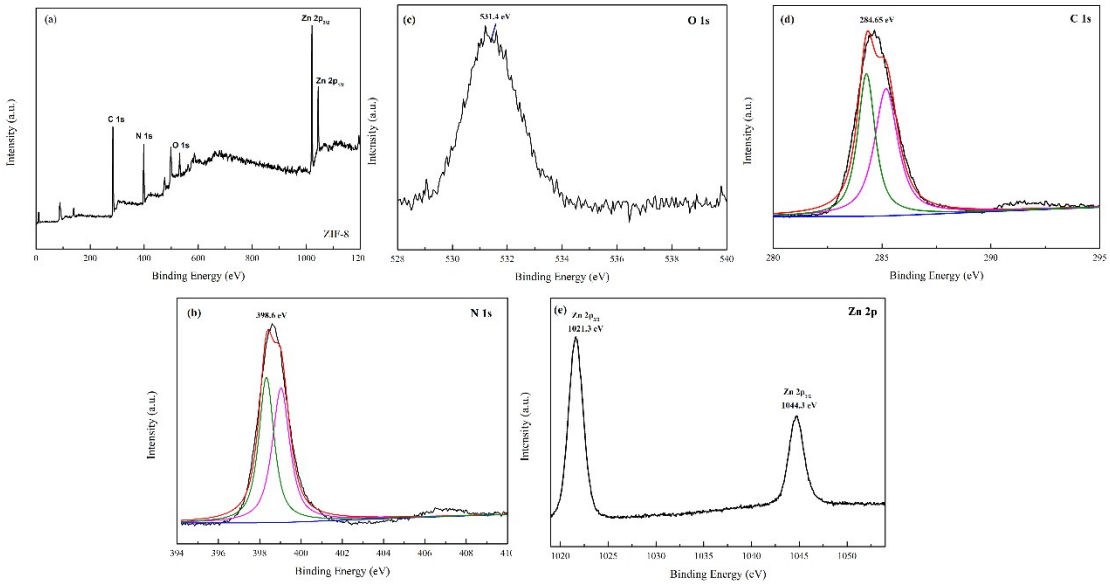

Fig. S6. XPS spectra of: (a) ZIF-8, (b) O 1s, (c) C 1s, (d) N 1s, (e) Zn 2p.

Figure S7

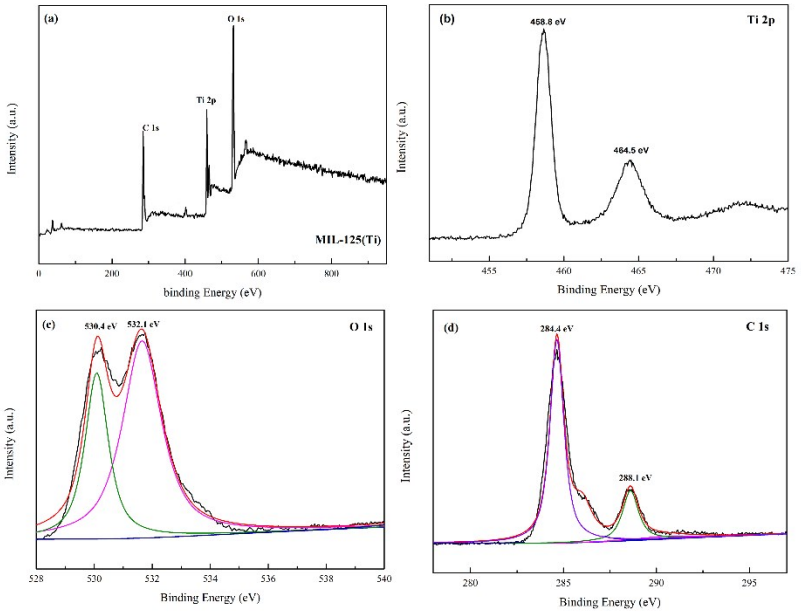

Fig. S7. XPS spectra of: (a) MIL-125(Ti), (b) Ti 2p, (c) O 1s, (d) C 1s.

Figure S8

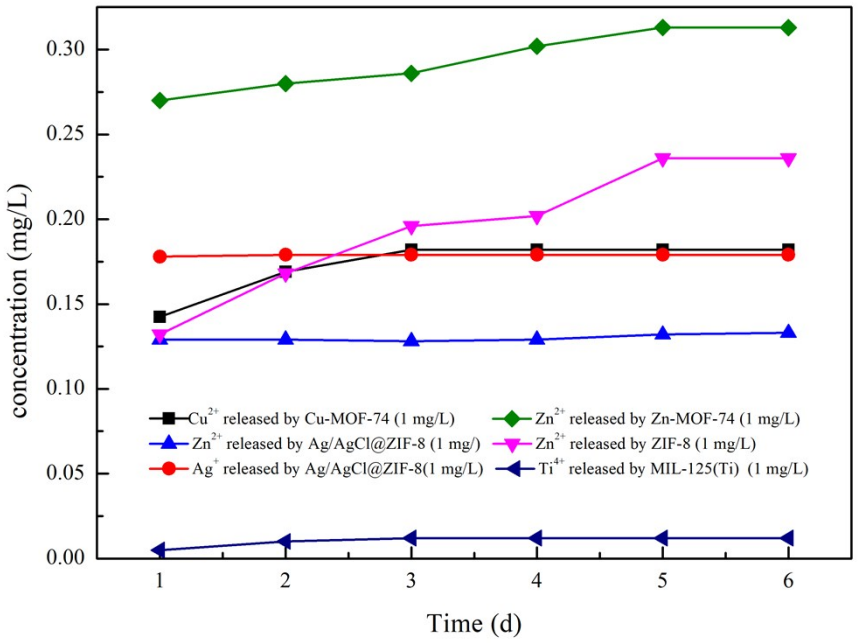

Fig. S8. The Change of metal ions concentration released by MOFs (1 mg/L) in water.

References:

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