

Supporting Information

Novel thiol-functionalized covalent organic frameworks enabled ICP-MS measurement of ultra-trace metals in complex metrics

Yong Tian^a, Jiawen Cheng^a, Xiaoxuan Han^{b*}, Yutong Li^b, Ting Yang^{b*}, Ming-Li Chen^b,
Jiping Ma^a, Jian-Hua Wang^b

^a School of Environmental & Municipal Engineering, Qingdao University of Technology, Qingdao 266033, China

^b Research Center for Analytical Sciences, and Department of Chemistry, College of Sciences, Northeastern University, Shenyang 110819, China

* Corresponding authors:

Ting Yang, E-mail address: yangting@mail.neu.edu.cn

Xiaoxuan Han, E-mail address: hanxiaoxuan97@163.com

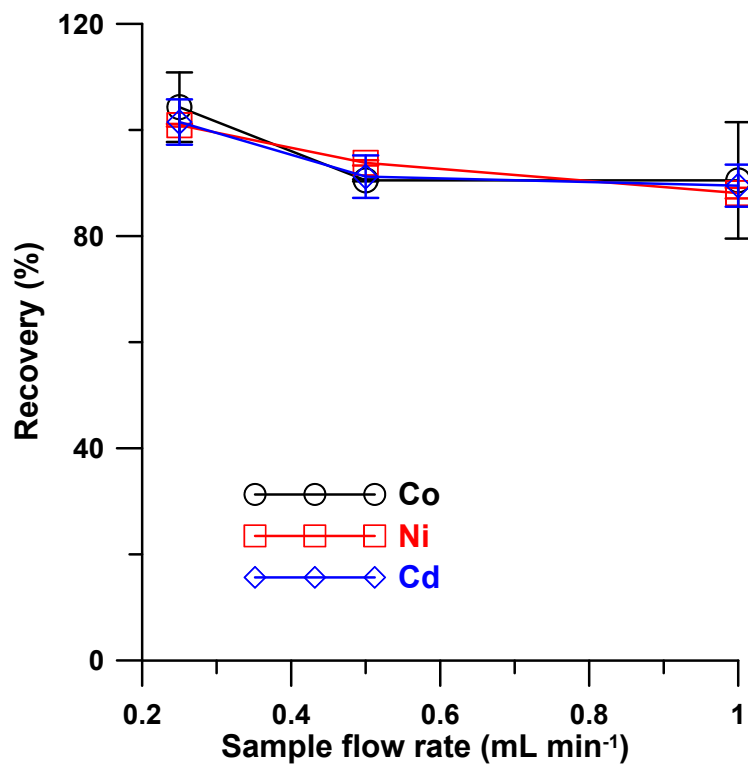


Figure S1. The effects of the sample flow rate on the recoveries of Co²⁺, Ni²⁺ and Cd²⁺ pre-concentrated on the TpDvPa-S-SH micro-column. Sample volume: 5 mL; sample pH: 6; eluent: 0.5 mol L⁻¹ HNO₃, 0.2 mL; Co²⁺ and Cd²⁺: 0.01 μg L⁻¹; Ni²⁺: 0.05 μg L⁻¹.

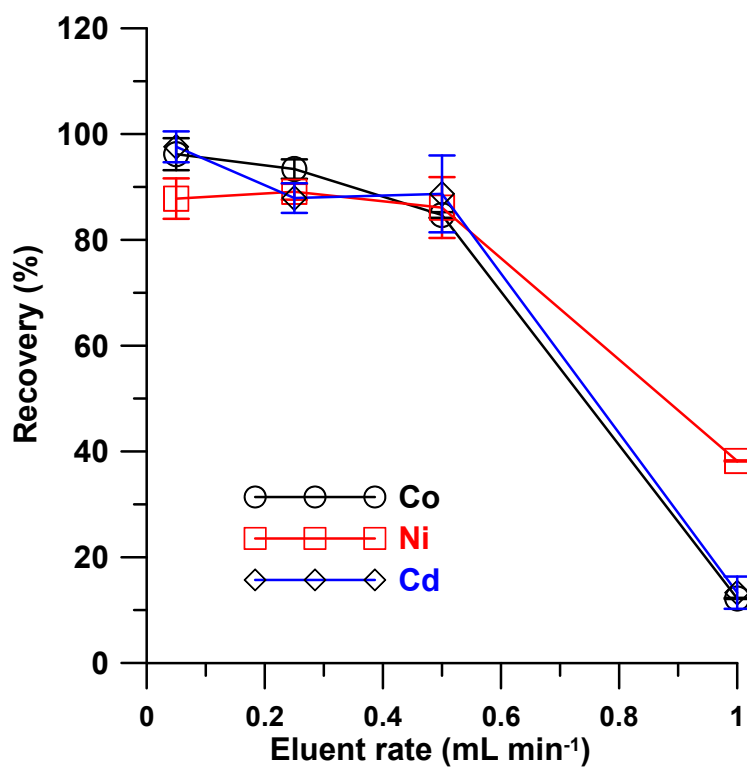


Figure S2. The effects of the eluent rate on the recoveries of Co²⁺, Ni²⁺ and Cd²⁺ preconcentrated on the TpDvPa-S-SH micro-column. Sample volume: 5 mL; sample pH: 6; eluent: 0.5 mol L⁻¹ HNO₃, 0.2 mL; Co²⁺ and Cd²⁺: 0.01 μg L⁻¹; Ni²⁺: 0.05 μg L⁻¹.

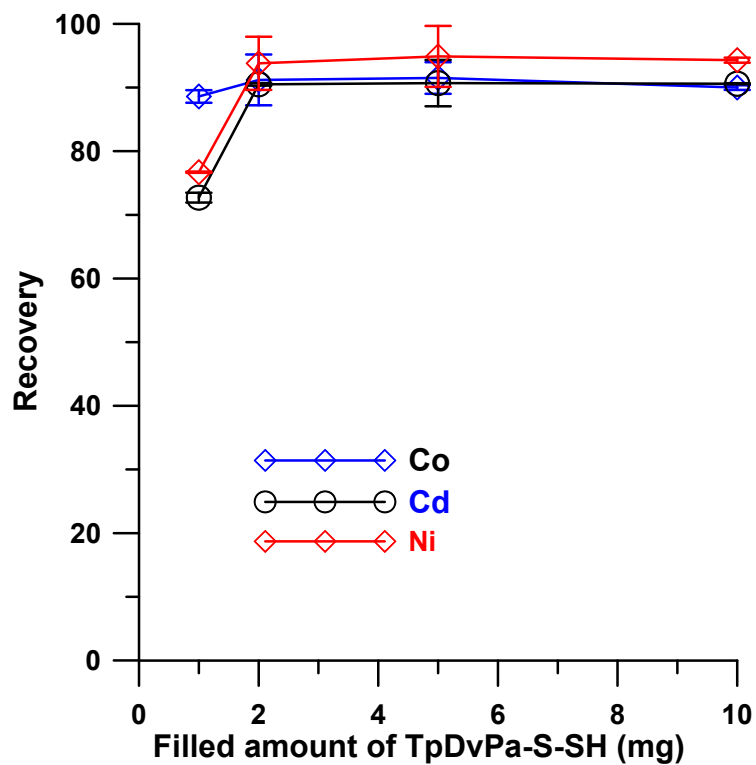


Figure S3. The effects of the filled amount of TpDvPa-S-SH on the recoveries of Co^{2+} , Ni^{2+} and Cd^{2+} pre-concentrated on the TpDvPa-S-SH micro-column. Sample volume: 5 mL; sample pH: 6; eluent: $0.5 \text{ mol L}^{-1} \text{ HNO}_3$, 0.2 mL; Co^{2+} and Cd^{2+} : $0.01 \mu\text{g L}^{-1}$; Ni^{2+} : $0.05 \mu\text{g L}^{-1}$.

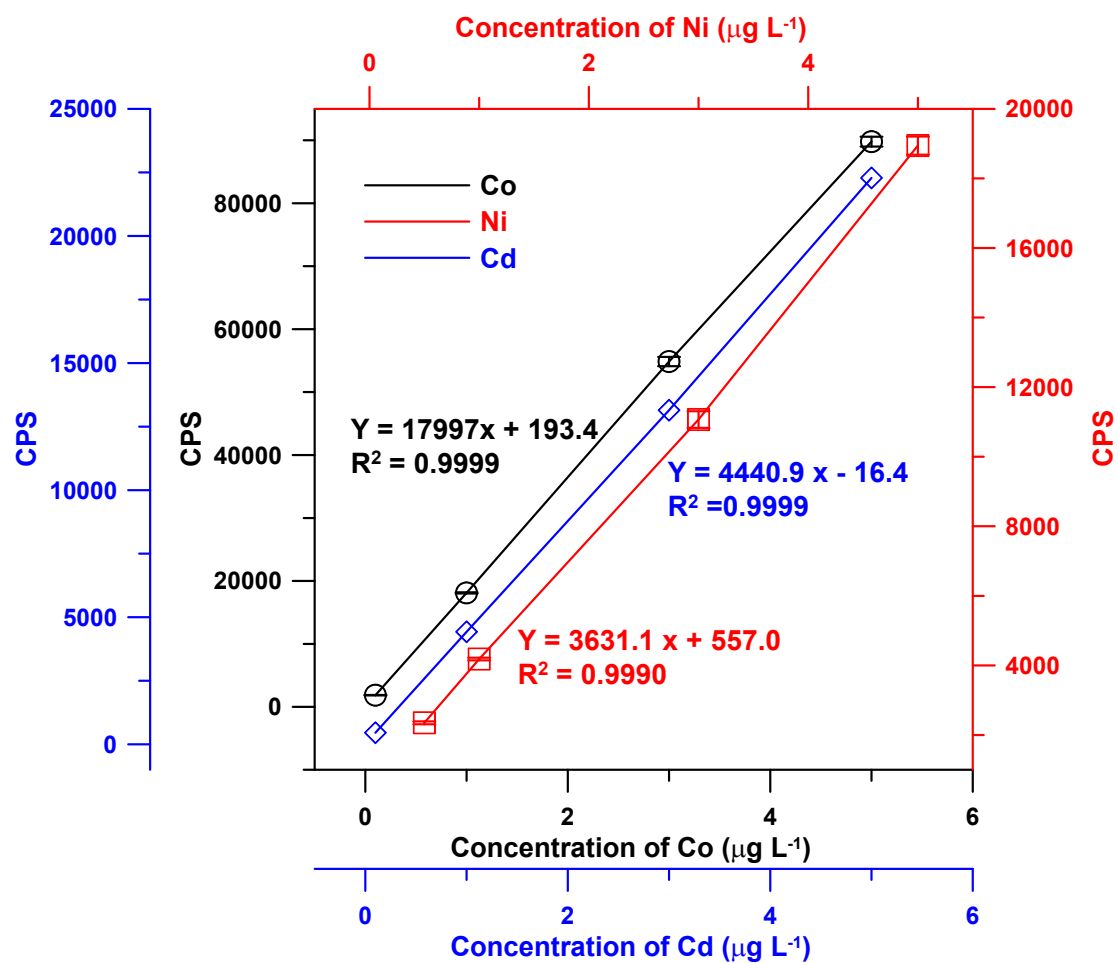


Figure S4. The detected signals of Co^{2+} , Ni^{2+} and Cd^{2+} measured by ICP-MS directly.

Table S1. The operation parameters of ICP-MS.

ICP-MS	
Nebulizer	MicroMIST
RF power	1500 W
Sampling depth	10 mm
Sample uptake speed	1.5 ml min ⁻¹
Sample stabilization time	20 s
Spray chamber temperature	2 °C
Plasma gas flow rate	15 L min ⁻¹
Auxiliary gas flow rate	1 L min ⁻¹
Nebulizer gas flow rate	1 L min ⁻¹
Dilution gas flow rate	1 L min
Carrier gas flow rate	0.8 L min ⁻¹
Analytical masses	⁵⁹ Co, ⁶⁰ Ni, ¹¹¹ Cd