

Table S1 Nitrogen content on the surface of the resins

Grafting times (h)	N/%	
	PAN-g-PS	PVT-g-PS
1.0	3.57	6.46
3.0	5.06	12.25
5.0	5.23	15.14
7.0	5.36	15.49

Table S2 Parameters of D-R isotherms

	Q_m (mmol g ⁻¹)	K (mol ² kJ ⁻²)	E (kJ mol ⁻¹)	R^2
Pb(II)	1.550	0.001544	17.995	0.98205
Cu(II)	2.436	0.00121	20.328	0.95235
Cr(III)	3.132	0.00102	22.140	0.91437

Table S3 Thermodynamic parameters estimated for adsorption of three metal ions on PVT-g-PS resins

Metal Ions	ΔH (kJ mol ⁻¹)	ΔS (J mol ⁻¹ K ⁻¹)	ΔG (kJ mol ⁻¹)		
			25°C	35°C	45°C
Pb(II)	1.41	34.0	-8.72	-9.06	-9.40
Cu(II)	9.84	64.0	-9.23	-9.86	-10.51
Cr(III)	31.26	139.0	-10.17	-11.53	-12.95

Table S4 Variation in pH for the mixed solution before and after addition of PVT-g-PS

		pH				
Before addition		3.00	4.00	5.00	6.00	7.00
	Pb(II)	2.96	3.94	4.91	5.72	6.12
After addition	Cu(II)	2.93	3.91	4.89	5.63	6.05
	Cr(III)	2.85	3.87	4.84	5.56	5.96

Table S5 Adsorption capacity of the resin after ten adsorption–desorption cycles

Cycle	Adsorption amount (mmol g ⁻¹)		
	Pb(II)	Cu(II)	Cr(III)
1	1.52	2.62	3.36
2	1.49	2.56	3.29
3	1.45	2.50	3.22
4	1.53	2.51	3.33
5	1.56	2.49	3.32
6	1.48	2.50	3.31
7	1.47	2.48	3.30
8	1.48	2.47	3.25
9	1.46	2.48	3.27
10	1.45	2.46	3.28

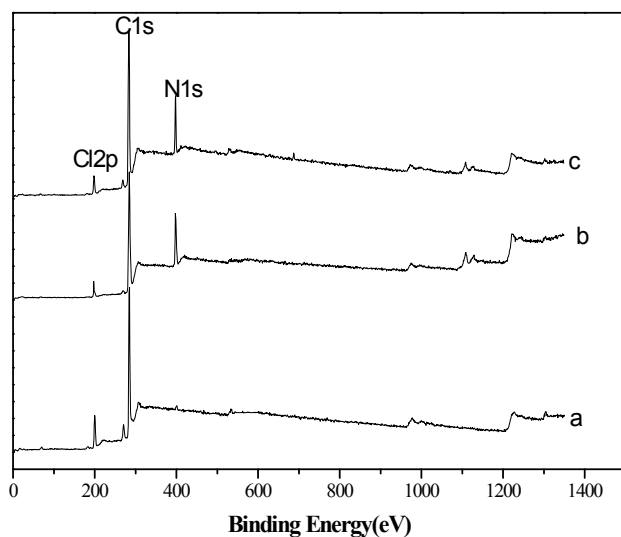


Fig. S1 XPS wide scan of (a) chloromethylated PS, (b) PAN-g-PS, and (c) PVT-g-PS.

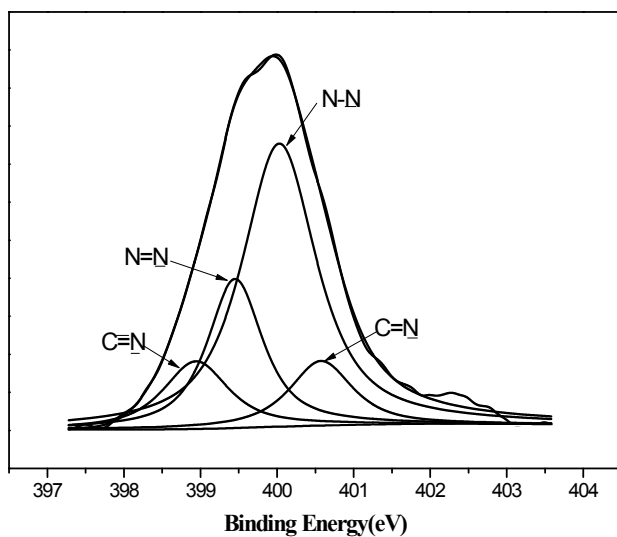


Fig. S2 N 1s core-level spectra of PVT-g-PS resin.

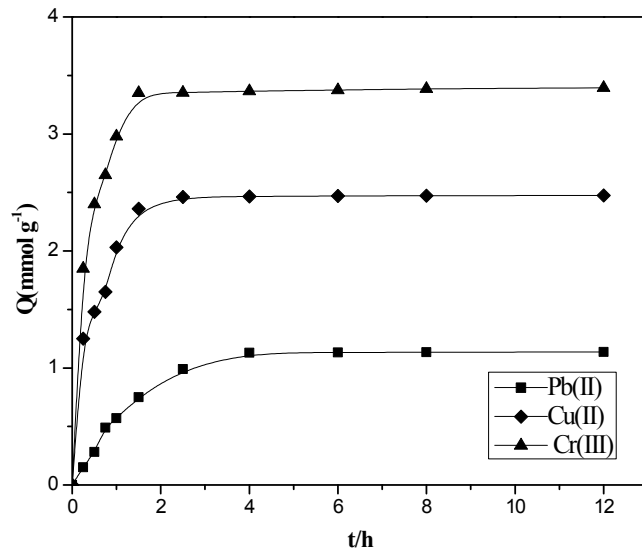


Fig.S3. Adsorption kinetics of PVT resin for Pb(II), Cu(II) and Cr(III) (initial concentration: 4 mmol L^{-1} ; 25°C ; pH 5.0; adsorbent dose: 0.1 g).

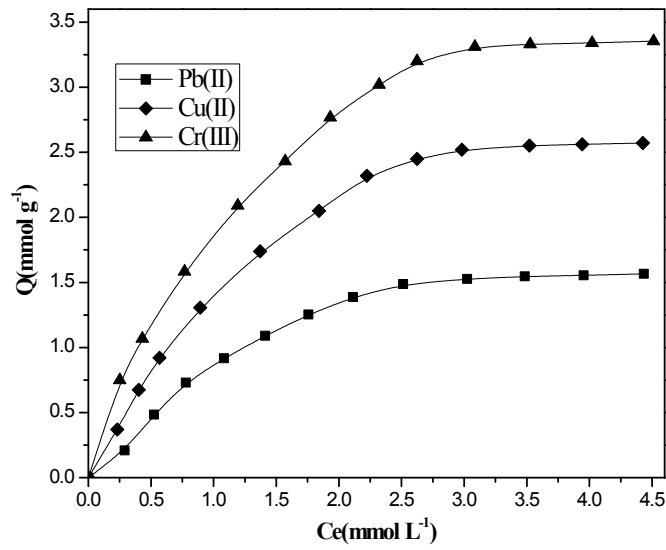


Fig. S4. Adsorption isotherms of PVT resin for Pb(II), Cu(II) and Cr(III) at 25°C (pH 5.0; contact time: 12 h; adsorbent dose: 0.1 g).

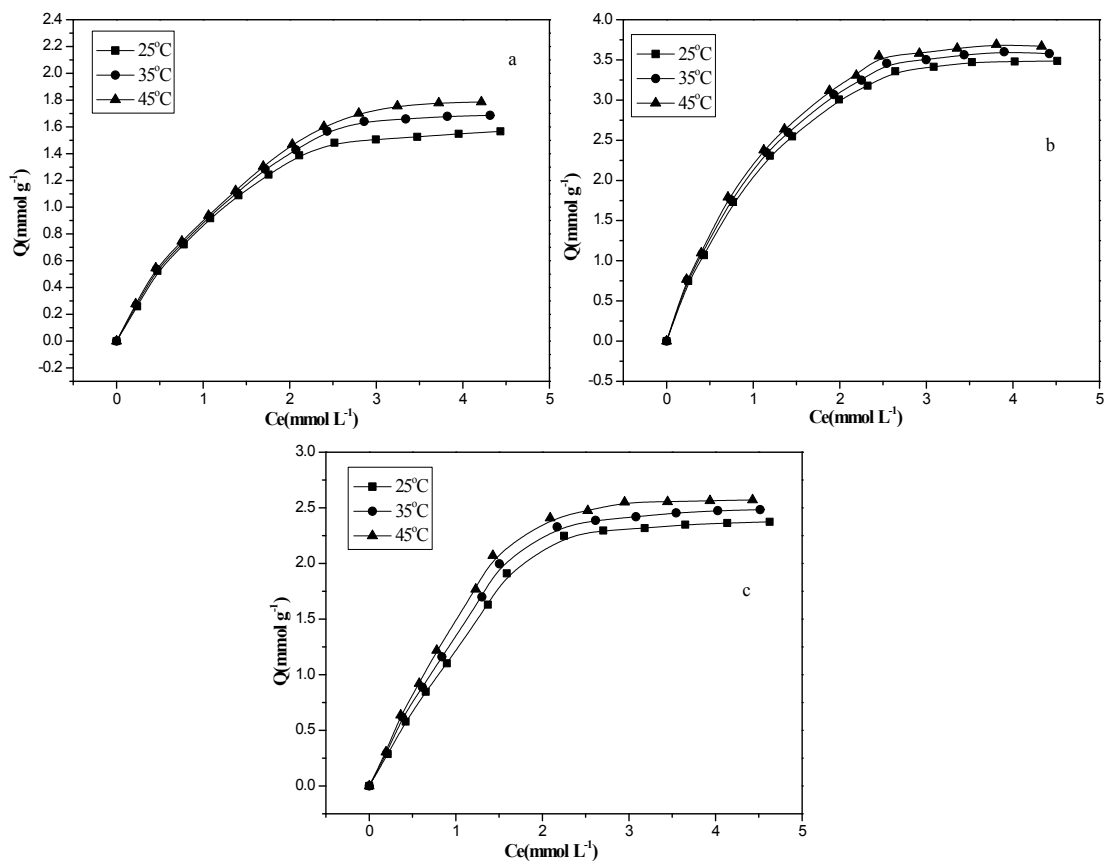


Fig. S5. Adsorption isotherms of PVT-g-PS resin for (a) Pb(II), (b) Cu(II) and (c) Cr(III) at different temperatures (pH 5.0; contact time: 12 h; adsorbent dose: 0.1 g).

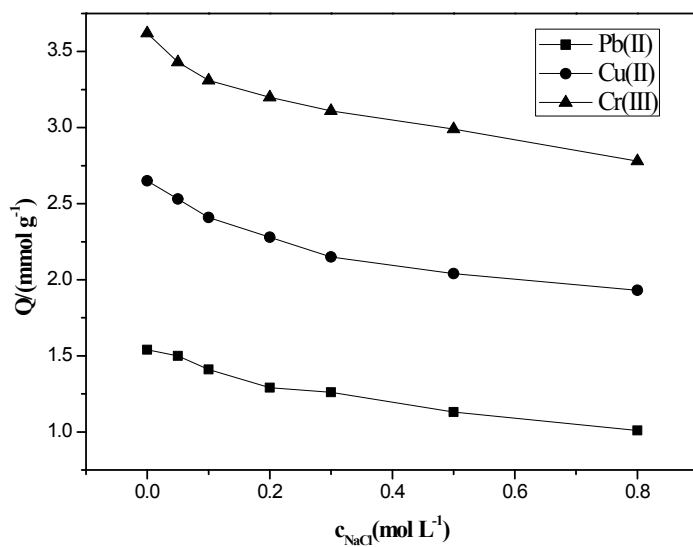


Fig.S6. Effect of NaCl concentration on the adsorption capacity.