

**Table S1.** Kinetic parameters of Pb(II), Cd(II), Zn(II), Cu(II) and Ni(II) sorption kinetics on the fabricated resins as determined by fitting with the selected models.

Isotherm model	VBC – D3EI					VBC-D4EI					VBBr-D3EI					VBBr – D4EI				
	Pb(II)	Cd(II)	Zn(II)	Cu(II)	Ni(II)	Pb(II)	Cd(II)	Zn(II)	Cu(II)	Ni(II)	Pb(II)	Cd(II)	Zn(II)	Cu(II)	Ni(II)	Pb(II)	Cd(II)	Zn(II)	Cu(II)	Ni(II)
$q_{\text{exp}}$ (mg/g)	32.8	35.3	26.8	33.0	25.1	32.7	38.8	24.3	33.7	20.5	39.2	43.2	25.4	30.7	21.6	34.8	44.6	22.7	30.8	19.8
Pseudo-first order																				
$k_1$ (min <sup>-1</sup> )	0.023	0.027	0.026	0.035	0.066	0.024	0.037	0.023	0.034	0.055	0.029	0.037	0.031	0.034	0.037	0.022	0.037	0.039	0.027	0.049
$q_e$ (mg/g)	32.8	35.3	26.8	33.0	25.1	32.7	38.7	24.3	33.8	20.6	39.2	43.2	25.4	30.7	21.6	34.8	44.8	22.7	30.8	19.8
$R^2$	0.908	0.837	0.719	0.876	0.854	0.996	0.839	0.981	0.866	0.695	0.936	0.935	0.952	0.855	0.905	0.535	0.661	0.760	0.742	0.693
Pseudo-second order																				
$k_2$ (g/mg min)	0.327	0.152	0.127	0.028	0.018	0.159	0.024	0.096	0.039	0.014	0.024	0.019	0.019	0.046	0.012	0.472	0.037	0.039	0.065	0.016
$q_e$ (mg/g)	32.4	35.2	26.9	33.1	25.7	32.6	38.9	24.2	33.8	20.9	39.2	43.4	25.5	30.8	21.7	34.7	44.8	23.1	30.7	20.1
$R^2$	1.000	1.000	1.000	0.999	1.000	1.000	0.999	0.999	0.999	0.999	0.999	0.999	0.999	0.999	0.999	1.000	0.999	0.999	0.999	0.999
Intra-particle diffusion																				
$k_{ip2}$ (mg/g min <sup>0.5</sup> )	1.74	1.67	1.55	1.96	2.75	1.82	2.31	1.21	2.04	1.37	2.09	2.79	1.96	1.82	2.40	1.69	2.77	1.92	1.77	1.28
C	18.9	20.5	14.5	16.7	4.85	18.3	19.6	14.5	17.0	5.5	21.6	19.8	8.6	15.8	2.6	21.6	21.9	6.6	16.3	5.8
$R^2$	0.502	0.912	0.734	0.835	0.727	0.990	0.782	0.943	0.792	0.687	0.941	0.823	0.713	0.751	0.826	0.610	0.756	0.735	0.674	0.652
Elovich																				
$\alpha$ (mg/g min)	254.0	318.3	125.9	134.9	24.0	195.8	156.5	398.3	127.1	24.2	381.2	105.3	19.8	136.5	14.9	728.8	143.0	13.1	157.4	29.9
$\beta$ (g mg)	0.245	0.231	0.279	0.229	0.229	0.236	0.194	0.372	0.219	0.328	0.220	0.162	0.225	0.248	0.271	0.263	0.163	0.232	0.250	0.345
$R^2$	0.620	0.831	0.929	0.977	0.914	0.951	0.943	0.972	0.958	0.913	0.828	0.936	0.942	0.880	0.957	0.873	0.926	0.931	0.850	0.912

**Table S2.** Isotherms parameters of different models for sorption of Pb(II), Cd(II), Zn(II), Cu(II) and Ni(II) sorption kinetics on the fabricated resins as determined by fitting with the selected models.

Isotherm model	VBC – D3EI				VBC-D4EI				VBBr-D3EI					VBBr – D4EI			
	Pb(II)	Cd(II)	Zn(II)	Ni(II)	Pb(II)	Cd(II)	Zn(II)	Ni(II)	Pb(II)	Cd(II)	Zn(II)	Cu(II)	Ni(II)	Pb(II)	Cd(II)	Zn(II)	Ni(II)
<i>Langmuir</i>																	
Q <sub>m</sub> (mg/g)	117.7	71.7	156.1	39.3	90.9	63.5	201.8	26.0	155.5	83.8	78.6	38.1	37.7	296.4	65.4	34.5	33.7
K <sub>L</sub> (L/mg)	0.02	0.03	0.01	0.06	0.03	0.05	0.01	0.09	0.03	0.02	0.02	0.06	0.04	0.01	0.04	0.06	0.05
R <sup>2</sup>	0.997	0.999	1.000	0.999	0.993	0.999	0.995	0.998	0.999	0.999	1.000	0.992	0.998	0.999	0.997	0.999	0.999
<i>Freundlich</i>																	
K <sub>F</sub> (mg <sup>1-(1/n)</sup> /gL <sup>n</sup> )	7.6	7.4	4.2	13.4	10.2	13.9	2.4	14.1	12.5	6.7	5.7	11.7	9.4	4.6	11.2	12.2	8.8
N	1.95	2.38	1.54	5.08	2.39	3.51	1.37	9.29	1.98	2.16	2.10	4.66	4.01	1.32	3.00	5.29	4.09
R <sup>2</sup>	0.978	0.969	0.994	0.993	0.965	0.987	0.975	0.940	0.966	0.974	0.983	0.985	0.994	0.994	0.962	0.991	0.943
<i>Dubinin-Radushkevich</i>																	
Q <sub>m</sub> (mg/g)	75.2	53.6	77.3	34.7	67.8	52.5	70.7	23.9	99.9	58.0	53.8	33.6	31.8	105.5	53.5	30.7	29.5
K <sub>DR</sub> (mol <sup>2</sup> /kJ <sup>2</sup> )	4.7·10 <sup>-5</sup>	6.6·10 <sup>-5</sup>	7.5·10 <sup>-5</sup>	3.5·10 <sup>-5</sup>	3.9·10 <sup>-5</sup>	3.0·10 <sup>-5</sup>	1.2·10 <sup>-4</sup>	2.3·10 <sup>-5</sup>	2.1·10 <sup>-5</sup>	6.8·10 <sup>-5</sup>	8.0·10 <sup>-5</sup>	4.3·10 <sup>-5</sup>	5.5·10 <sup>-5</sup>	4.7·10 <sup>-5</sup>	4.2·10 <sup>-5</sup>	4.0·10 <sup>-5</sup>	6.3·10 <sup>-5</sup>
R <sup>2</sup>	0.912	0.957	0.920	0.921	0.923	0.919	0.954	0.731	0.937	0.950	0.945	0.928	0.923	0.919	0.942	0.937	0.980