

Article

Food Waste (Beetroot and Apple Pomace) as Sorbent for Lead from Aqueous Solutions—Alternative to Landfill Disposal

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Table S1. Models used for evaluation of lead sorption onto AP and BR.

Model	Equation	Parameter	Reference
Isotherm model			
Langmuir	$q_e = \frac{q_{max} K_L C_e}{1 + K_L C_e}$	q_e (mg/g): sorption capacity at equilibrium	[1]
	$R_L = \frac{1}{(1 + K_L C_0)}$	q_{max} (mg/g): maximum sorption capacity K_L (L/mg): Langmuir constant C_e (mg/L): equilibrium concentration R_L : dimension less separation factor C_0 (mg/L) - the highest initial metal concentration	
Freundlich	$q_e = K_f C_e^{1/n}$	K_f (mg/g)(L/mg) ^{1/n} : Freundlich constant n : heterogeneity factor	[2]
Sips	$q_e = \frac{q_{max} K_s C_e^s}{1 + C_e K_s^s}$	K_s (L/g): Sips constant s : heterogeneity factor	[3]
Redlich and Peterson	$q_e = \frac{k_{RP} C_e}{1 + a_{RP} C_e^{\beta}}$	k_{RP} (L/g): Redlich-Peterson isotherm constant a_{RP} (L/mg): Redlich-Peterson isotherm constant β : Redlich-Peterson isotherm exponent	[4]
Kinetic model			
Pseudo-first order	$q_t = q_e (1 - e^{-k_1 t})$	q_t (mg/g): sorption capacity at time t k_1 (1/min): the pseudo-first order rate constant	[5]
Pseudo-second order	$q_t = \frac{t}{\left(\frac{1}{k_2 q_e^2}\right) + \left(\frac{1}{q_e}\right)}$	k_2 (g/mg/min): the pseudo-second order rate constant	[6]
	$t_{1/2} = 1/k_2 q_t$	$t_{1/2}$ (min): half-life of adsorption process	
Intra-particle diffusion model	$q = K_{id} t^{0.5} + C$	K_{id} (mg/(min ^{1/2} g)): the intra-particle diffusion parameter C (mg/g): intercept	[7]

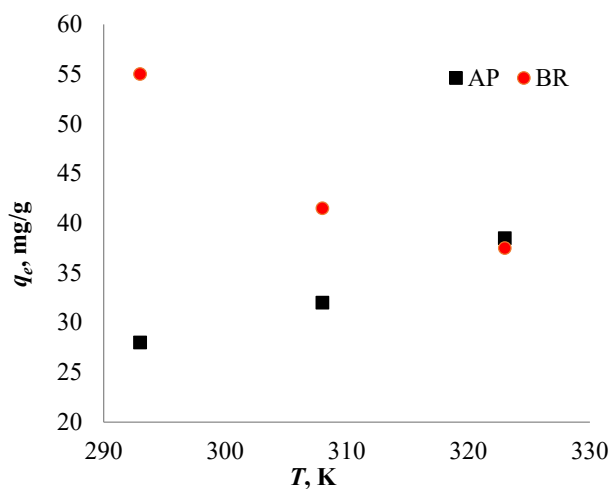


Figure S1. Effect of temperature on sorption capacity (pH 5.0, contact time 120 min, sorbent concentration 2 g/L and initial Pb^{2+} concentration 200 mg/L, temperature 293–323 K).

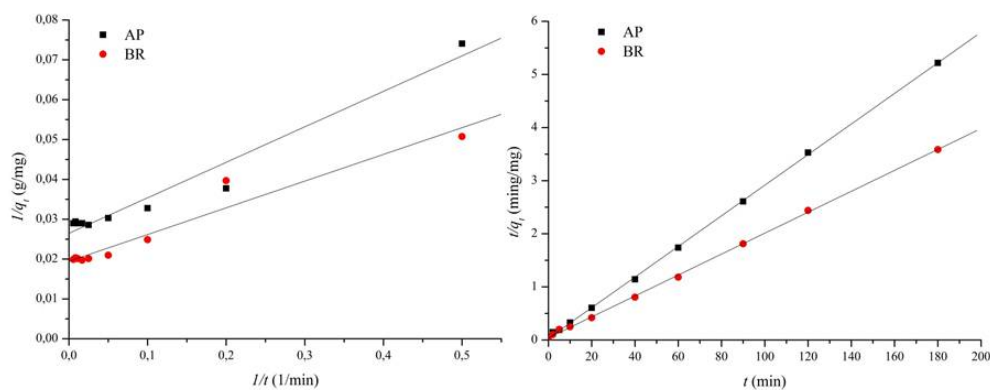


Figure S2. Pseudo-first (left) and pseudo-second order (right) kinetics plots of Pb^{2+} onto AP and BR (pH 5.0, contact time 1–120 min, sorbent concentration 2 g/L and initial Pb^{2+} concentration 200 mg/L, 293 K).

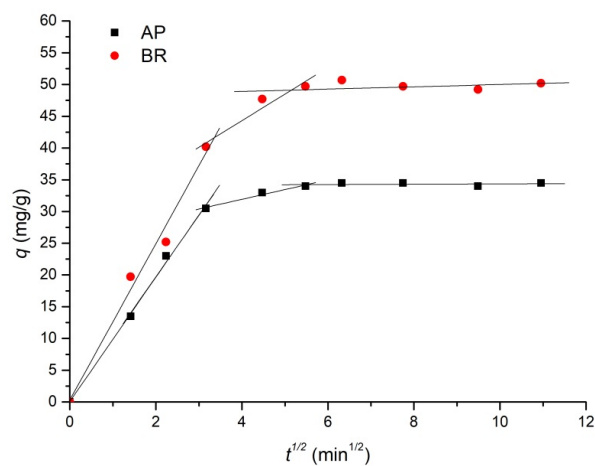


Figure S3. Weber-Morris diffusion plots of Pb^{2+} onto AP and BR (pH 5.0, contact time 1–120 min, sorbent concentration 2 g/L and initial Pb^{2+} concentration 200 mg/L, temperature 293 K).

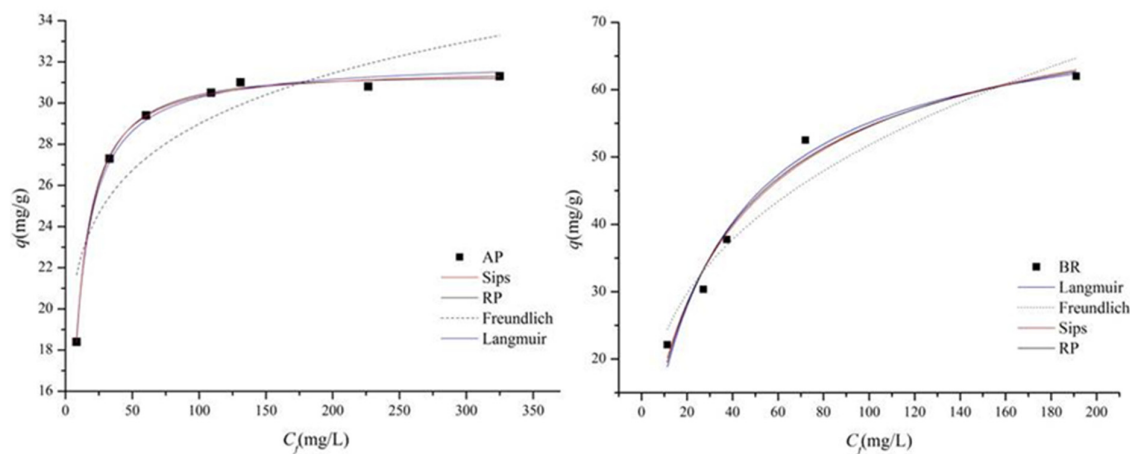


Figure S4. Isotherm models of Pb^{2+} sorption onto AP and BR (pH 5.0, contact time 120 min, sorbent concentration 2 g/L and initial Pb^{2+} concentration in range from 10–200 mg/L, temperature 293 K).

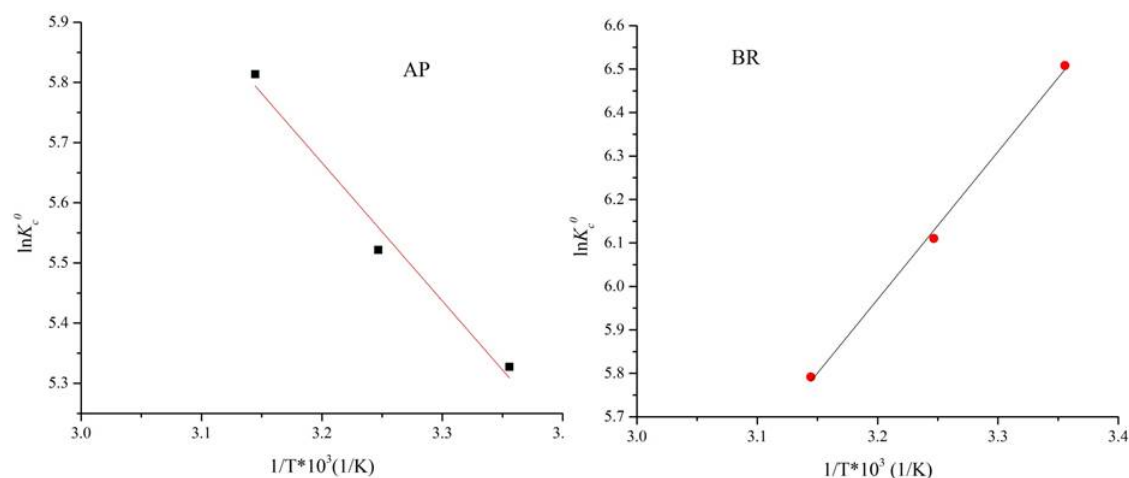


Figure S5. Van't Hoff plots for the adsorption of Pb^{2+} onto AP and BR (pH 5.0, contact time 120 min, sorbent concentration 2 g/L and initial Pb^{2+} concentration in range from 10–200 mg/L, temperature 293–323 K).

References

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