Supplementary material

1 Preparation of B/LHDs nanocomposites

In the first-step, the powder of soybean straw (1.0 g), Mg $(OH)_2$ (3.48 g or 0.06 mol) and $Al(OH)_3$ (1.56 g or 0.01 mol) with a Mg/Al molar ratio of 3:1 were milled for 1 h under ambient conditions in air using a planetary ball mill (QM3STC, Nanjing Nanda Instrument Plant, China) with four stainless-steel mill pots (500 mL inner volume each) and 10 mm diameter steel-balls. The mill speed was constant at 480 rpm with a ball/mixture mass ratio of approximately 49. In the second-step, the milled mixture of soybean straw, $Mg(OH)_2$ and $Al(OH)_3$ was placed in a 100 mL Teflon-lined stainless-steel autoclave with 80 mL H_2O. After the vessel had been sealed and shaken thoroughly, it was placed in an oven under static conditions and treated hydrothermally at 120°C for 24 h. The resulting dispersion was centrifuged, and the solid precipitate was washed with water and dried at 60°C, yielding the B/LDHs nanocomposite sample. This sample was abbreviated as 10%-B/LDHs.

The pseudo-second order kinetic equation can be expressed as:

$$t/\Gamma_t = 1/(k_2\Gamma_e^2) + t/\Gamma_e,$$

where Γ_t is the sorption amount at time t, k_2 is the rate constant of pseudo-second-order kinetics, and Γ_e is the equilibrium sorption amount.

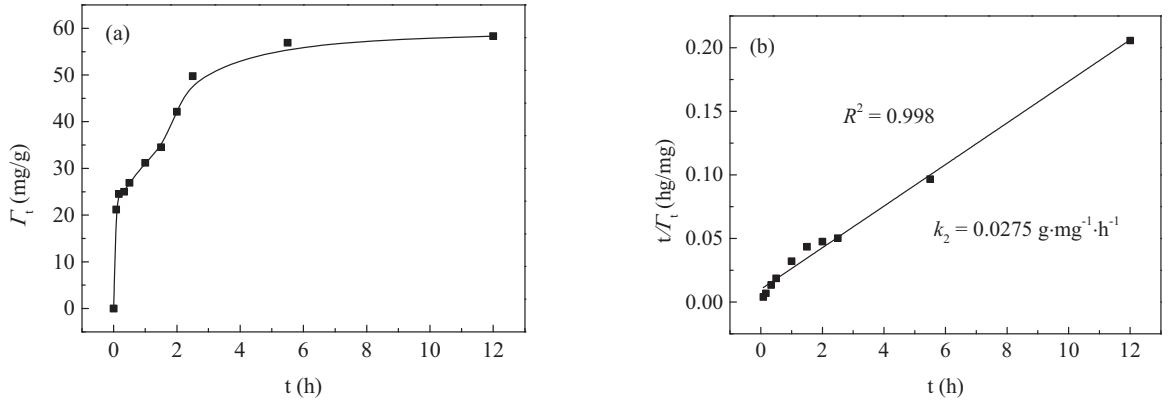

Figure S1: (a) Kinetic profiles and (b) pseudo-second-order kinetic model fits of Pb(II) (C_0 = 100 mg/L, pH 6.0) sorption on the 50%-B/LDHs sample at C_s = 1 g/L and 25ºC.

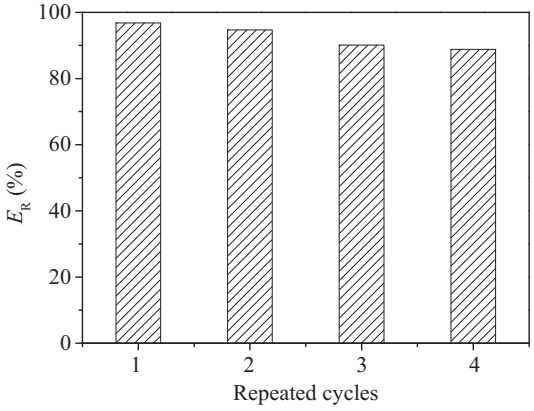

Figure S2: Removal efficiencies of 50%-B/LDHs composites for Pb(II) in different cycles. C_0 = 50 mg/L, pH = 6.0, C_s = 1.0 g/L, 25 °C and C_{NaNO_3} = 0.010 M.

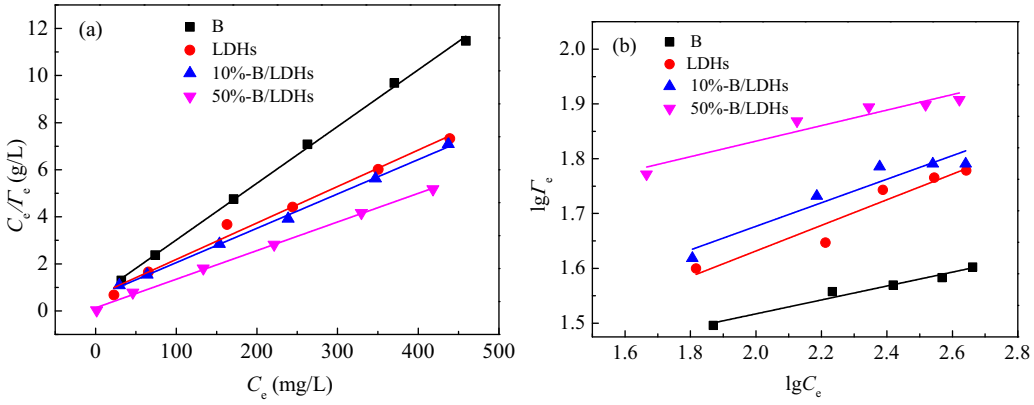

Figure S3: Linear correlation plots of (a) Langmuir and (b) Freundlich isotherms for Pb(II) on B, LDHs and B/LDHs samples.

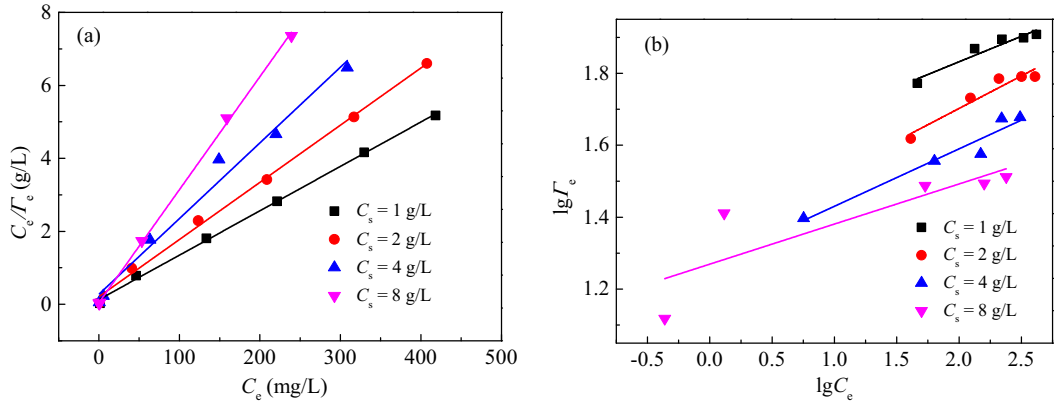

Figure S4: Linear correlation plots of (a) Langmuir and (b) Freundlich isotherms for Pb(II) sorption on 50%-B/LDHs at different sorbent dosages.

Table S1: Linear fitted model parameters for Pb(II) sorption on B, LDHs and B/LDHs samples

Sample	Langmuir isotherm			Freundlich isotherm		
	Γ_m (mg/g)	K_L (L/mg)	R^2	K_F (L^{n_F} mg^{1-n_F}/g)	n_F	R^2
B	41.5	3.99×10^{-2}	0.999	18.3	0.127	0.963
LDHs	64.6	2.43×10^{-2}	0.985	14.6	0.234	0.905
10%-B/LDHs	68.5	2.47×10^{-2}	0.998	17.7	0.215	0.889
50%-B/LDHs	82.2	9.34×10^{-2}	0.998	35.4	0.142	0.903

Table S2: Linear-fit model parameters for Pb(II) sorption on 50%-B/LDHs at different C_s

C_s (g/L)	Langmuir isotherm			Freundlich isotherm		
	Γ_m (mg/g)	K_L (L/mg)	R^2	K_F (L^{n_F} mg^{1-n_F}/g)	n_F	R^2
1.00	82.0	0.0938	0.998	35.4	0.142	0.903
2.00	63.7	0.0755	0.997	21.9	0.181	0.910
4.00	48.1	0.0759	0.980	18.6	0.160	0.929
8.00	32.3	0.729	0.999	18.6	0.111	0.626