Supplementary Materials

Mg/Fe layered double hydroxide modified biochar for synergistic removal of phosphate and ammonia nitrogen from chicken farm wastewater: Adsorption performance and mechanisms

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Text S1

At adsorption equilibrium, the adsorption capacity (q_e, mg/g) and removal rate (R, %) can be determined using the following equations:

$$\boldsymbol{q_e = \frac{(C_0 - C_e)V}{M}} \quad \text{(S1)}$$

$$\boldsymbol{R = \frac{(C_0 - C_e)}{C_0} \times 100\%} \quad \text{(S2)}$$

Where C_0 is the initial PO_4^{3-}-P or NH_4^+-N concentration (mg/L) in solution, C_e is the equilibrium PO_4^{3-}-P or NH_4^+-N concentration (mg/L) in solution, V is the volume (L) of solution and M is the mass (g) of adsorbent.

Text S2

The equations of pseudo-first-order model and pseudo-second-order model are as follows:

$$q_t = q_e\left(1 - e^{-k_1 t}\right) \quad \text{(S1)}$$

$$q_t = \frac{k_2 q_e^2 t}{1 + k_2 q_e t} \quad \text{(S2)}$$

where q_e and q_t represent the amount of PO_4^{3-}-P or NH_4^+-N (mg/g) adsorbed at equilibrium time and at any time t (h), respectively; k_1 represents the constant of pseudo-first-order kinetic equation (h^{-1}); k_2 is the adsorption rate constant of pseudo-second-order kinetic equation (g/(mg h)).

Text S3

The equations of Langmuir model and Freundlich mode:

Langmuir model: $$q_e=\frac{K_L q_m C_e}{1+K_L C_e} \quad \text{(S5)}$$

Freundlich model: $$q_e=K_F C_e^{1/n} \quad \text{(S6)}$$

where K_L (L/mg) and K_F (mg/g) respectively represent the value for Langmuir constant related to the energy of adsorption and the affinity of the binding sites and the Freundlich affinity coefficient; q_m (mg/g) denotes the Langmuir maximum capacity; C_e (mg/L) is the equilibrium solution concentration of the sorbate, 1/n is the Freundlich linearity constant.

Figure S1

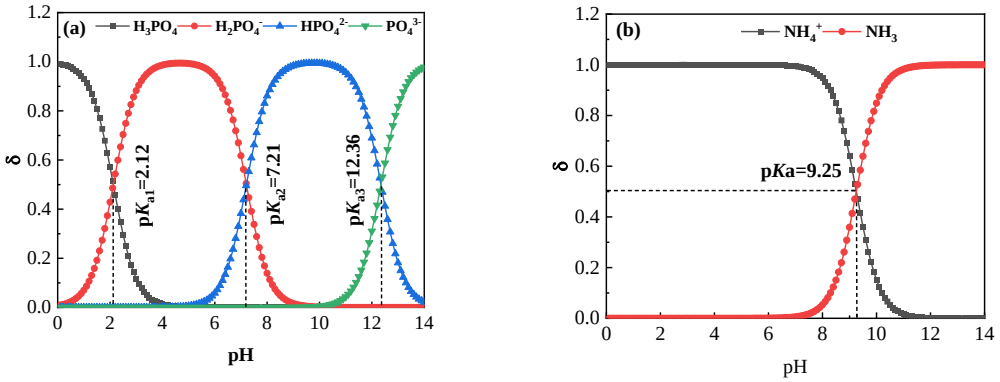


Figure S1 speciation diagrams of P (a) and N (b) in aqueous media at various pH levels.