

SUPPLEMENTARY MATERIAL TO
**Efficient one-pot solvothermal synthesis of lanthanum-iron oxide
and its application in tenofovir adsorption**

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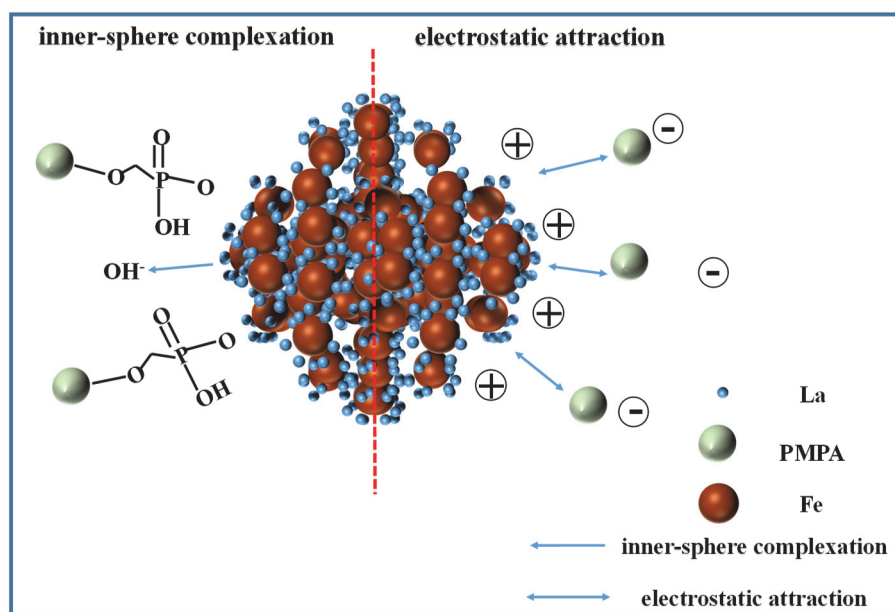


Fig. S-1. Schematic of the plausible mechanism of PMPA removal by lanthanum-iron oxide.

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Adsorption kinetics. The pseudo-first-order and pseudo-second-order kinetic models are shown below:

$$\log(q_e - q_t) = \log q_e - \frac{k_1}{2.303} t \quad (\text{S-1})$$

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

where q_t (mg/g) represents the adsorption amount of PMPA at time t , q_e (mg/g) represents the adsorption amount at equilibrium, while K_1 (min^{-1}) and K_2 ($\text{g}/\text{mg}\cdot\text{min}$) denote the rate constants for the pseudo-first-order and pseudo-second-order reactions, respectively.

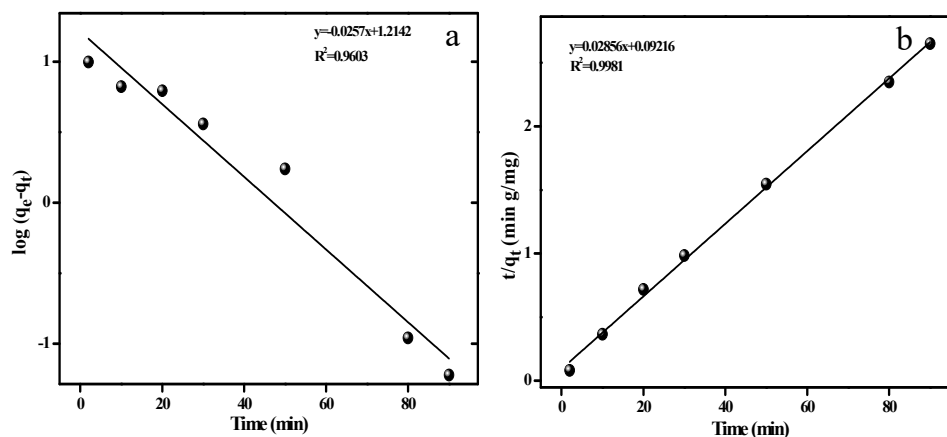


Fig. S-2. (a) Pseudo-first-order and (b) pseudo-second-order kinetic models for PMPA adsorption on lanthanum-iron oxide.

Isothermal adsorption study. Langmuir and Freundlich adsorption isotherm models can be expressed as:

$$\frac{C_e}{q_e} = \frac{1}{k_L q_{\max}} + \frac{C_e}{q_{\max}} \quad (\text{S-3})$$

$$\ln q_e = \frac{1}{n} \ln C_e - \ln k_F \quad (\text{S-4})$$

where C_e (mg/L) represents the equilibrium concentration, $q_{\max}$ (mg/g) represents the maximum adsorption capacity, and n represents the parameter characterizing medium heterogeneity and adsorption intensity. Additionally, k_L (L/mg) and k_F ($(\text{mg/g})/(\text{mg/L})^{1/n}$) denote the Langmuir and Freundlich constants, respectively.

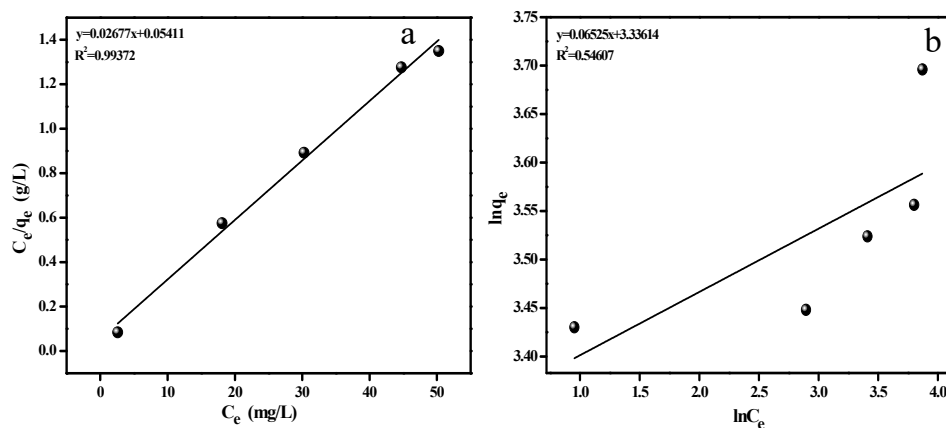


Fig. S-3. (a) Langmuir and (b) Freundlich isotherm models for the adsorption of PMPA on lanthanum-iron oxide.

Adsorption thermodynamics. The thermodynamic parametric equations are shown in Eqs. (Eq(S5), Eq(S6)):

$$\Delta G^0 = -RT \ln K_c \quad (\text{S-5})$$

$$\ln K_c = \frac{\Delta S^0}{R} - \frac{\Delta H^0}{RT} \quad (\text{S-6})$$

where ΔS^0 (J/(mol·K)), ΔH^0 (kJ/mol) and ΔG^0 (kJ/mol) are the entropy, enthalpy and Gibbs free energy changes, respectively. R (8.314 J/(mol·K)) is the ideal gas constant and K_c (L/g) is the adsorption equilibrium constant, $K_c = q_e/C_e$.

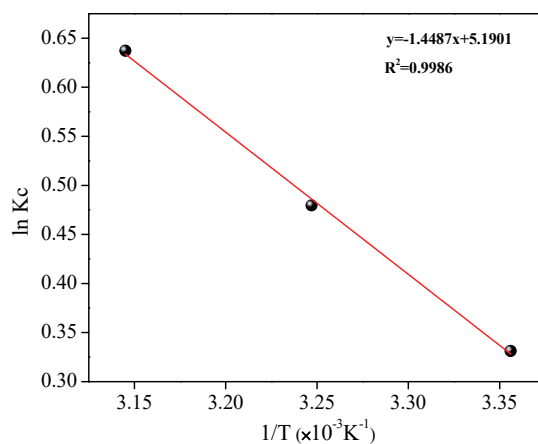


Fig. S-4. Van't Hoff's plot for PMPA uptake on lanthanum-iron oxide.

Table S-I. Comparison of lanthanum-iron oxide with other adsorbent for the treatment of pharmaceutical wastewater.

Adsorbent	Preparation method conditions	Pollutant	Adsorbent dose (g/L)	Time (min)	Adsorption capacity (mg/g)	Refs.
Lanthanum-iron oxide (magnetic)	One-pot (200 °C)	Tenofovir (50 mg/L)	0.9	50	34.06	This work
Activated carbon (non-magnetic)	Thermochemical activation with phosphoric acid (H ₃ PO ₄ , 700 °C)	Tenofovir (0.1 mM)	1.0	20	27	29
Ni@Zn-MOF (non-magnetic)	hydrothermal method	Norfloxacin (NOR) (50 mg/L)	4.0	300	11.65	20
MIL101(Fe)·Fe ₃ O ₄ (magnetic)	two-step solvothermal method	TC, DC and CFX (20 mg/L)	2.0	240	45.33, 33.20 and 31.30	42
CA-LaFeNPs	pH8.6, 200 °C combined with sol-gel	As(III)(500 mg/L)	7.0	1440	91	43