



Supplementary Materials

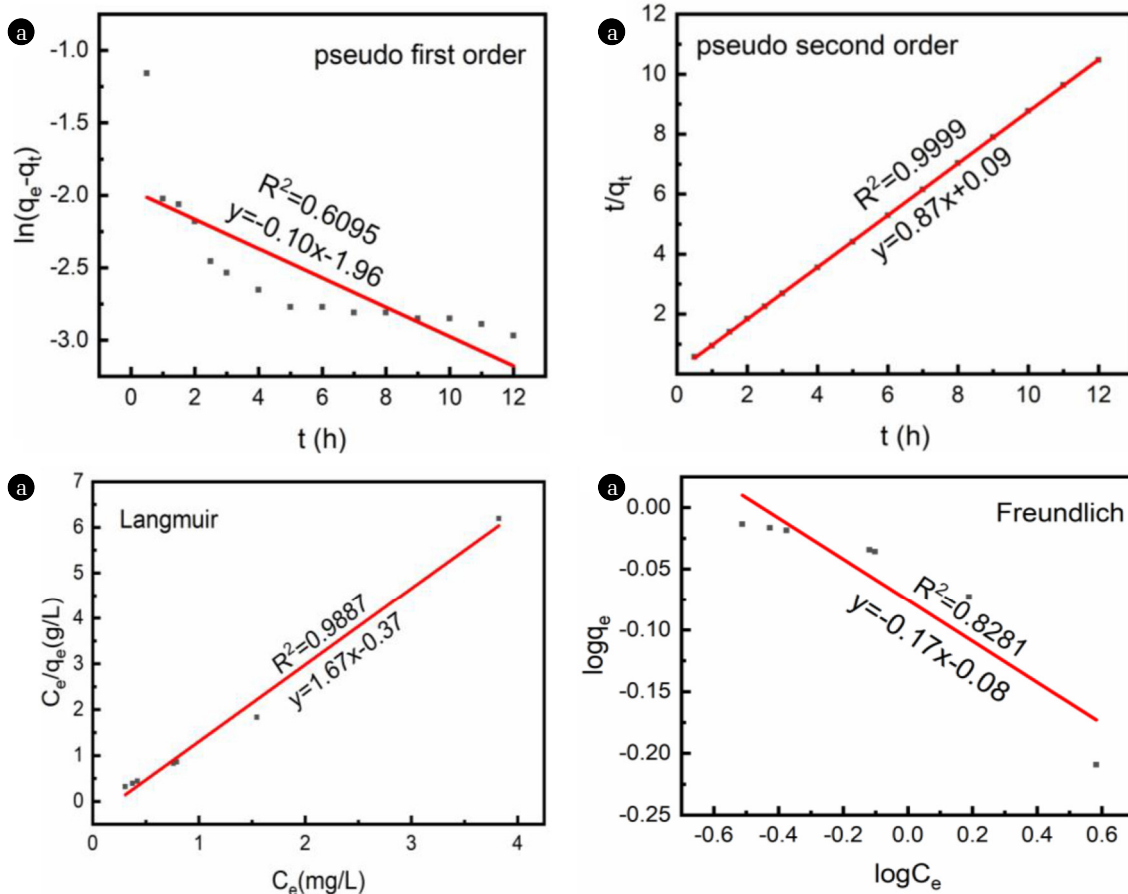


Fig. S1. The adsorption kinetics and isotherms of F⁻ adsorption by Fe-Zr-Zeolite.

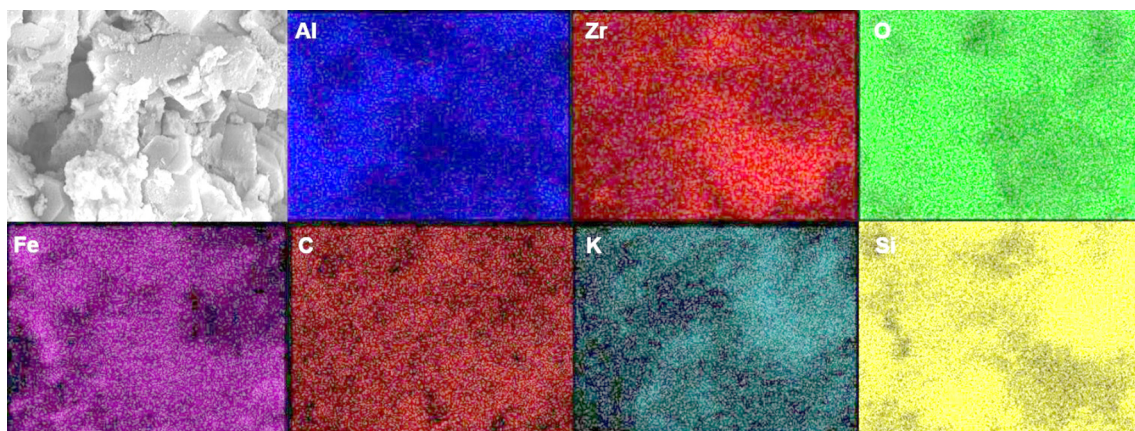


Fig. S2. The SEM image of saturated Fe-Zr-Zeolite and the element mapping.

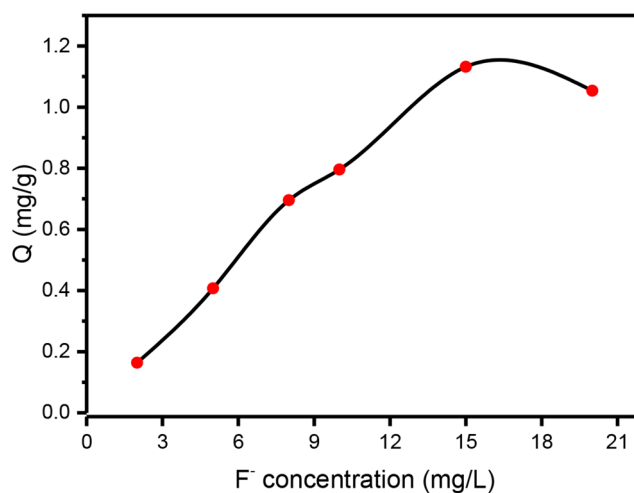


Fig. S3. The adsorption capacity of Fe-Zr-zeolite under different F⁻ concentration.

Table S1. Levels of variables used in the experimental design

Variable	level		
Code	-1	0	1
X ₁ = pH	5	7	9
X ₂ = m _{Zeolite} : m _(Fe+Zr) (dry mass ratio)	1/3	1/2	1/1
X ₃ = Fe : Zr (dry mass ratio)	1/2	1/1	2/1

Table S2. Adsorption kinetic parameters of pseudo-first-order and pseudo-second-order adsorption model

Kinetic model	Parameter	Value
Pseudo-first order model	q _e , (mg/g)	1.1008
	a ₁ (min ⁻¹)	-0.8659
	R ²	0.9999
Pseudo-second order model	R ²	0.6095

Table S3. Adsorption isotherm parameters of Langmuir and Freundlich

Model	Langmuir		Freundlich	
R ²	0.9906		0.8281	
Constant	Q	0.5966 mg/g	Z	2.17
	K	-4.5069 L/mg	K _F	3.23 L/g