



Supplementary Materials:

Facile Synthesis of Ce-MOF for the Removal of Phosphate, Fluoride, and Arsenic

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Text S1

All reagents were of analytical grade. The reagents used included sodium phosphate ($\text{NaH}_2\text{PO}_4 \cdot 2\text{H}_2\text{O}$, AR, Tianjin Fengchuan Chemical Technologies Co., Ltd), sodium fluoride (NaF , AR, Chongqing Chuandong Chemical Group Co., Ltd), arsenic(V) (H_5AsO_4 , AR, Chongqing Chuandong Chemical Group Co., Ltd), 1,3,5-Benzenetricarboxylic acid (H_3BTC , Sinopharm Chemical Reagent Co., Ltd, $\geq 99\%$), terephthalic acid (H_2BDC , Sinopharm Chemical Reagent Co., Ltd, $\geq 99\%$), cerium nitrate ($\text{Ce}(\text{NO}_3)_3 \cdot 6\text{H}_2\text{O}$, Tianjin Guangfu Fine Chemical Research Institute, $\geq 99\%$), cerium chloride ($\text{CeCl}_3 \cdot 6\text{H}_2\text{O}$, Tianjin Guangfu Fine Chemical Research Institute, $\geq 99\%$), cerium sulfate ($\text{Ce}_2(\text{SO}_4)_3 \cdot 8\text{H}_2\text{O}$, Tianjin Guangfu Fine Chemical Research Institute, $\geq 99\%$), N,N-dimethyl-formamide (DMF, AR, Xilong Chemical Co., Ltd), and ethanol (AR, Xilong Chemical Co., Ltd).

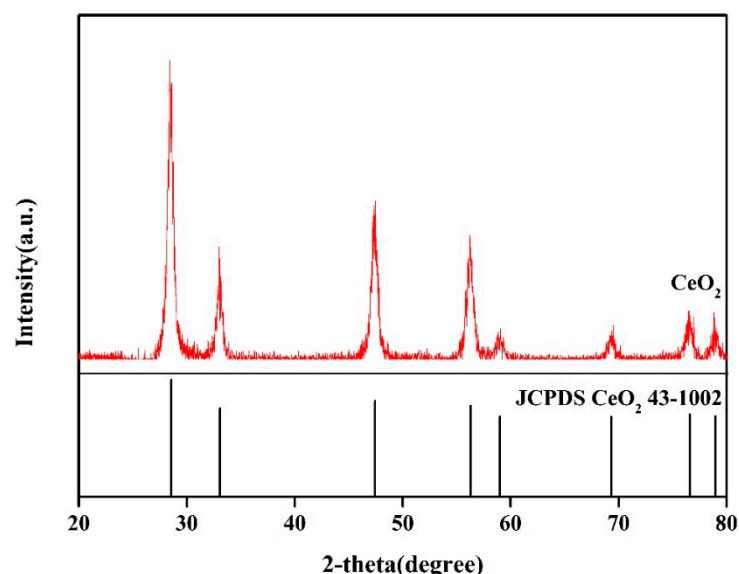


Figure S1. XRD patterns for CeO_2 .

Table S1. Optimization and screening of solvent amount.

DMF (mL)	Phosphate removal rate after 1 h
100	77.7%
80	89.8%

60	92.5%
40	78.9%

Table S2. Screening of reaction temperature.

Temperature °C	Phosphate removal rate after 1 h
200	87.9%
180	97.5%
150	91.7%
100	67.2%

Table S3. Optimization of reaction time and screening.

Time	Phosphate removal rate after 1 h
4d	96.8%
3d	97.9%
2d	89.8%
1d	77.2%

Table S4. Comparison of adsorption capacity of some conventional adsorbents for fluoride, arsenate, and phosphate according to the literature.

Adsorbents	Adsorption capacity (mg g ⁻¹)			Reference
	Phosphate	Fluoride	Arsenic	
Mg–Al–Fe layered double hydroxide/polyether sulfone-mixed matrix membranes	5.61	1.61	—	[1]
Modified saxaul ash	—	—	4.203	[2]
Magnetic particles sprayed with gelatin with embedded hydrotalcite composite Fe ₃ O ₄ @GelHT	32.73	—	—	[3]
Calcined La-doped layered double hydroxides	—	62.33	87.3	[4]

Ce-MOF	41.2	101.8	33.3	This study
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Table S5. Phosphate adsorption capacity of various materials.

Adsorbent	pH	Adsorption capacity (mg g ⁻¹)	Ref.
Fe ₃ O ₄ @NH ₂ -MIL-101(Fe)	7.0	36.6	[5]
Ce-MOF	7.0	41.2	This study

Table S6. Fluoride adsorption capacity of various materials.

Adsorbent	pH	Adsorption capacity (mg g ⁻¹)	Ref.
Ce-MIL-96	3-10	52.1	[6]
MOF-801	2.0	13.6	[7]
UiO-66	6.8	33.4	[8]
Ce-MOF	7.0	101.8	This study

Table S7. Arsenic(V) adsorption capacity of various materials.

Adsorbent	pH	Adsorption capacity (mg g ⁻¹)	Ref.
Fe-BTC	2-10	12.3	[9]
MOF-808	4.0	13.6	[10]
MIL-53(Fe)	5.0	21.3	[11]
Ce-MOF	7.0	33.3	This study

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