RSC Advances Supporting Information

Development of in-situ synthesized Y-based nanoparticle/ polyethersulfone adsorptive membranes by adjusting the composition of coagulation bath for enhanced removal of fluoride

Anan Cui[a], Fan Ni[b], Shihuai Deng[a,*], Jinsong He[a,*], Fei Shen[a], Gang Yang[a], Chun Song[a], Dong Tian[a], Lulu Long[a], and Jing Zhang[a]

[a]*Institute of Ecological and Environmental Sciences, Sichuan Agricultural University, Chengdu, Sichuan, 611130, China.*
[b]*Department of Chemical Engineering, Northwest University for Nationalities, Lanzhou, Gansu, 730030, China.*
[*] Corresponding author: Jinsong He,Shihuai Deng
Email addresses: hejinsong@sicau.edu.cn, shdeng8888@163.com

The pH effect on the leakage of Y-based NPs

The pH effect on the leakage of Y-based NPs in batch adsorption was also studied by measuring the Y^{3+} concentration via an inductively coupled plasma mass spectrometer (ICP-MS, Agilent 7900).

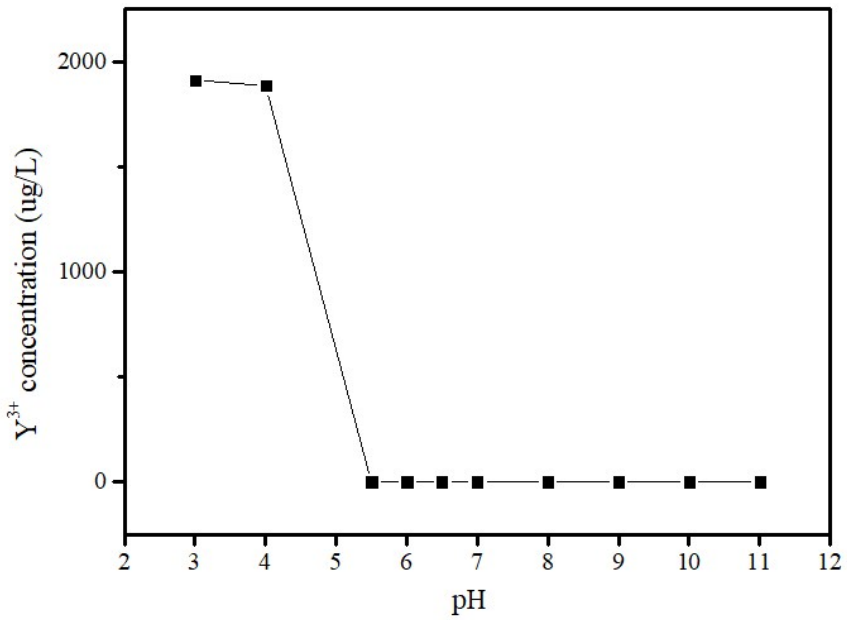


Fig. S1 pH effect on the leakage of Y-based NPs

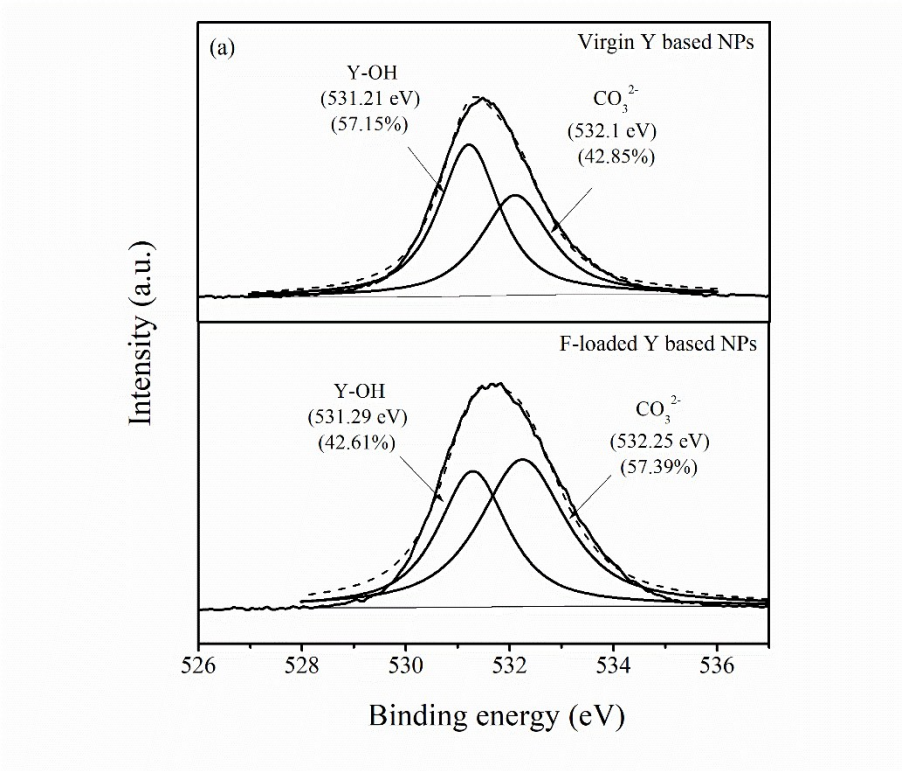
The XPS analysis

The surface chemistry of Y-based NPs before and after adsorption of F^- was studied by

the X-ray photoelectron spectroscopy (XPS) (ESCALAB 250Xi, Thermo Scientific, USA), with a monochromatic Al Kα X-ray source (1486.8 eV). The high resolution scans were conducted according to the peak being examined with a pass energy of 30 eV and step size of 0.10 eV. To compensate for the charging effects, all spectra were calibrated with graphitic carbon as the reference at a binding energy (BE) of 284.8 eV. The XPS results were collected in binding energy forms and fit using a nonlinear least-square curve fitting program (XPSPEAK41 software).

Table S1 The atomic content of vingin and F-loaded Y based NPs [1]

Atomic content (%)	C1s	Y3d	O1s	F1s
Y based NPs	34.09	14.46	51.45	0
F-loaded Y based NPs	35.05	14.14	43.86	6.95



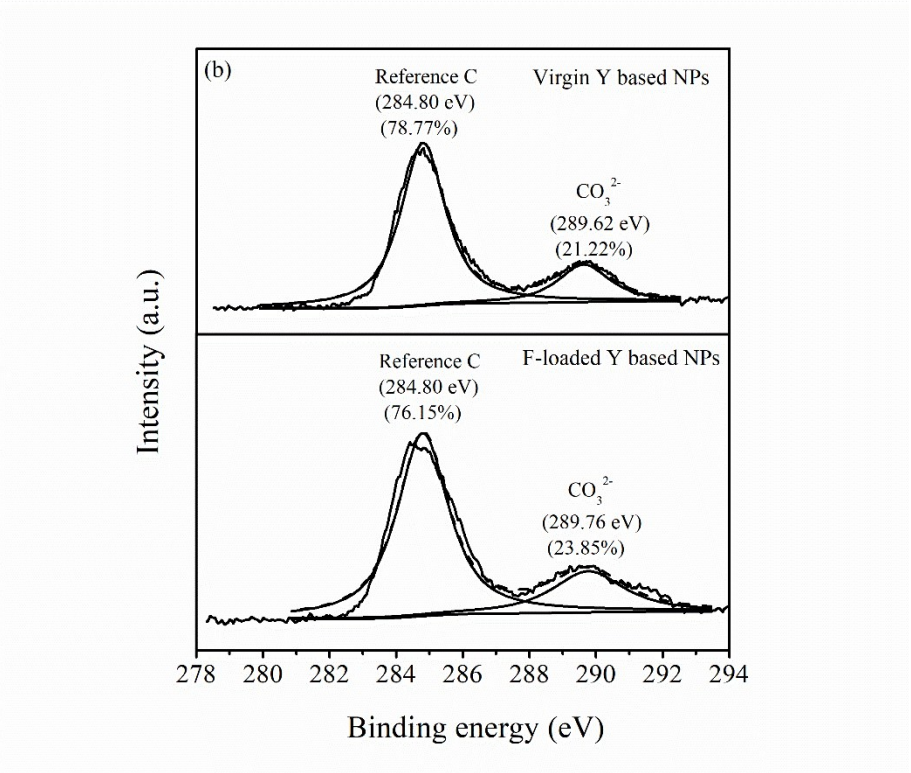


Fig. S2 High resolution XPS spectra of (a) O1s and (b) C1s of Y-based NPs before and after adsorption[1].

Regeneration Experimental

0.05 g membrane M10-2 was first added into 100 mL of 50 mg/L fluoride solution for 24 h. After the adsorption, the used membrane was collected and desorbed into 100 mL of 0.01 M NaOH solution for 12 h. The regenerated membrane was then washed by DI water several times and reused for the subsequent adsorption experiment. Three adsorption-desorption cycles were conducted to evaluate the membrane reusability. The adsorption capacity in each cycle was determined and the regeneration rate was calculated.

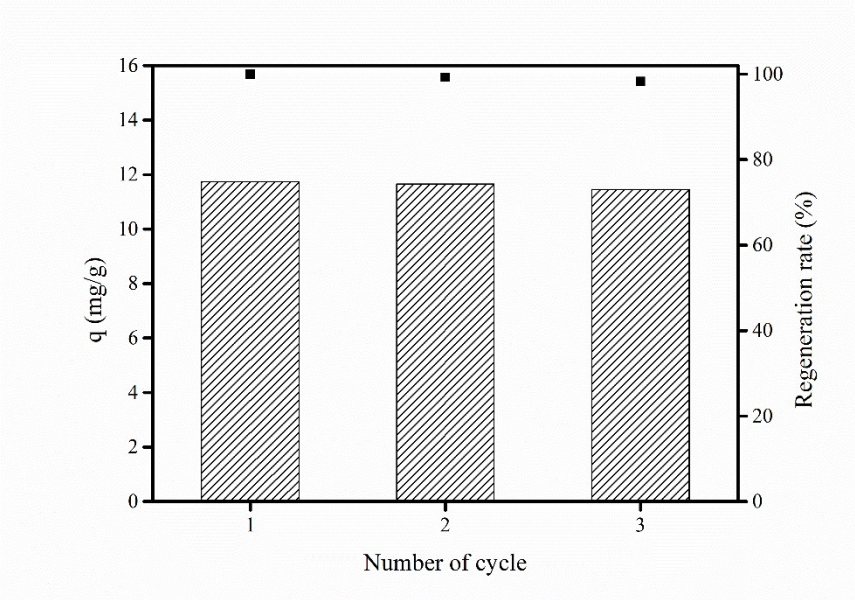


Fig. S3 Regeneration performance of M10-2 for fluoride removal.

References

1. J. He, A. Cui, F. Ni, S. Deng, F. Shen, C. Song, L. Lou, D. Tian, C. Huang and L. Long, Journal of Colloid and Interface Science, 2019, 536, 710-721.