Supplementary Information

Polyamide amine /aramid nanofiber composite aerogel as an ultra-high capacity adsorbent for Congo red removal

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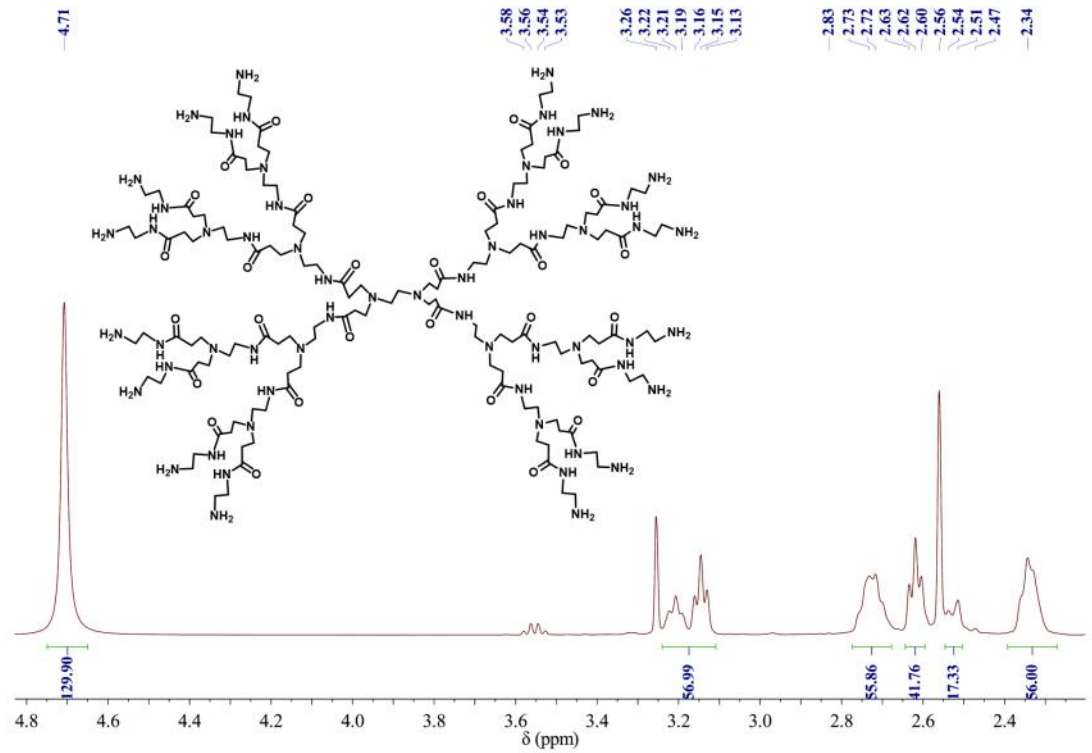

Figure S1 ^{1}H NMR of synthesized 3.0G PAMAM. ^{1}H NMR (400 MHz, D_2O) δ 4.71 (s, 130H), 3.18 (dt, J = 24.7, 6.2 Hz, 57H), 2.72 (d, J = 6.2 Hz, 56H), 2.62 (t, J = 5.9 Hz, 42H), 2.53 (d, J = 9.1 Hz, 17H), 2.34 (s, 56H). Residual ethylenediamine gives rise to the larger integral area than the theoretical result of δ=4.71.

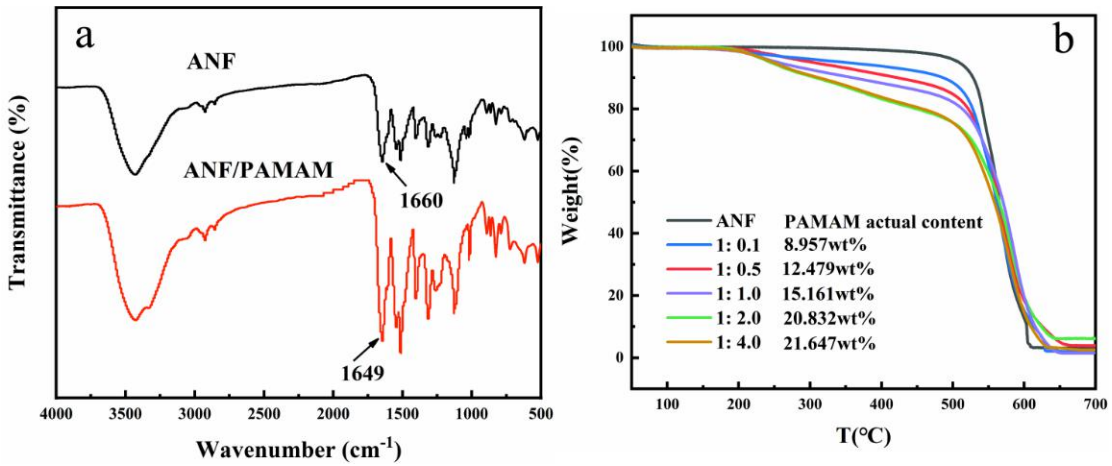

Figure S2 FTIR spectra a) of ANF and ANF/PAMAM aerogels and TG curves b) of ANF aerogels and ANF/PAMMA aerogels with different mass ratios (ANF: PAMAM). From Figure 2b, PAMAM actual content of ANF/PAMAM increases with the increase of added PAMAM, but actual weight percentages are less than expected values. In consideration of efficiency and economy, composite aerogels with mass ration of 1:1.0 were used for following experiments.

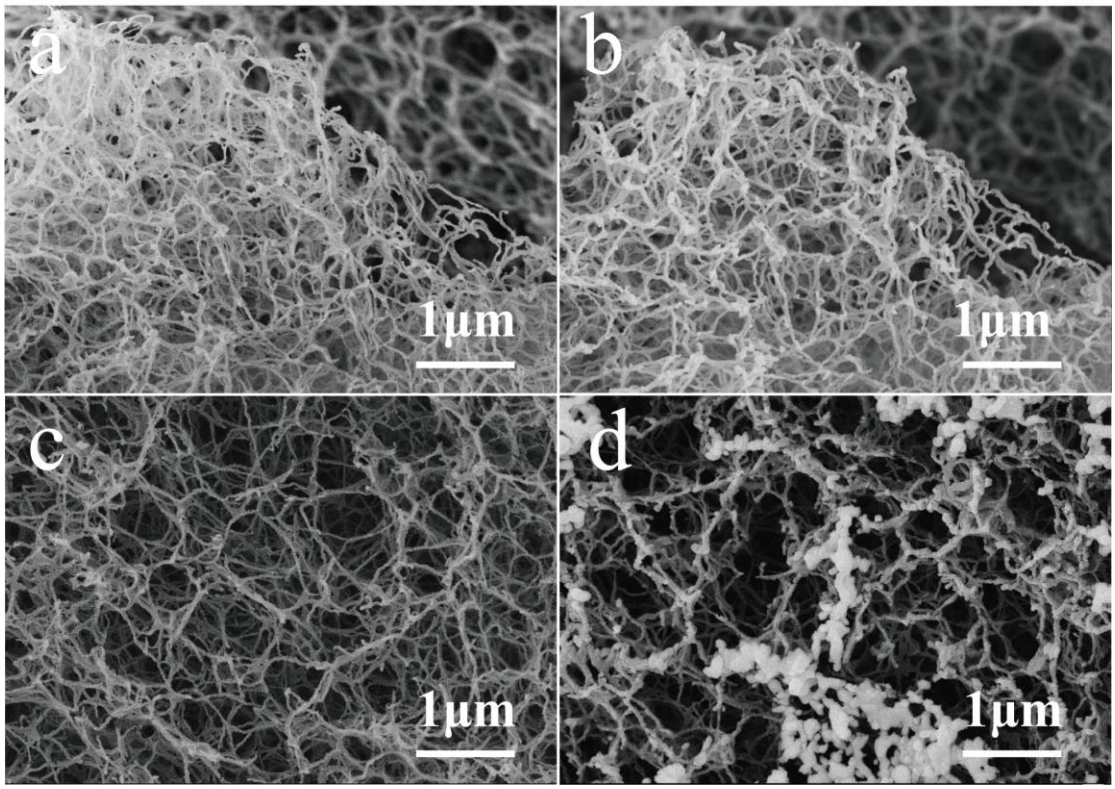

Figure S3 SEM images of ANF aerogels a) before and b) after thermal treatment at 250 ℃ for 2 hours; SEM images of ANF/PAMAM aerogels c) before and d) after thermal treatment at 400 ℃ for 2 hours.

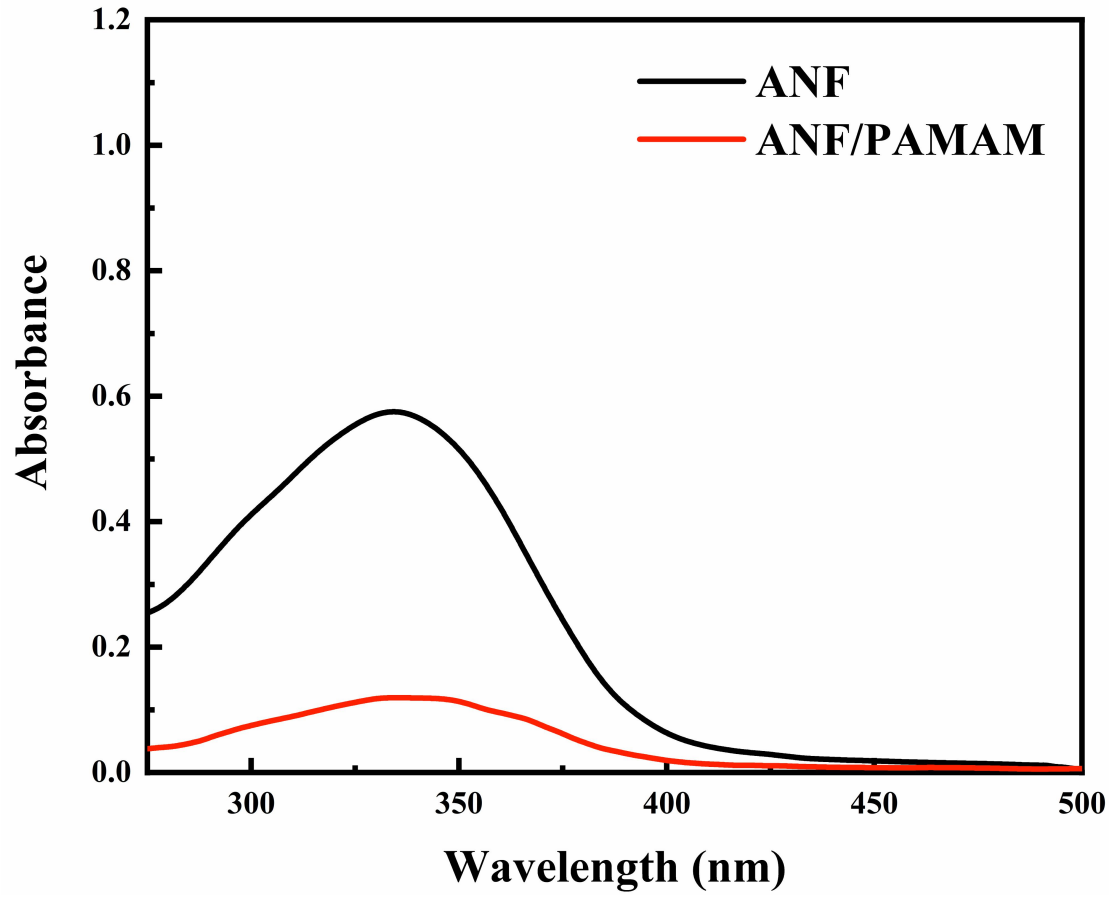

Figure S4 UV-vis spectra of ANF and ANF/PAMAM aerogels(dilute aqueous solutions). There is a function between the absorbance at 335nm and the amount of ANF[1], and after blending of PAMAM, the absorbance decreases dramatically, demonstrating ANF are coated by PAMAM.

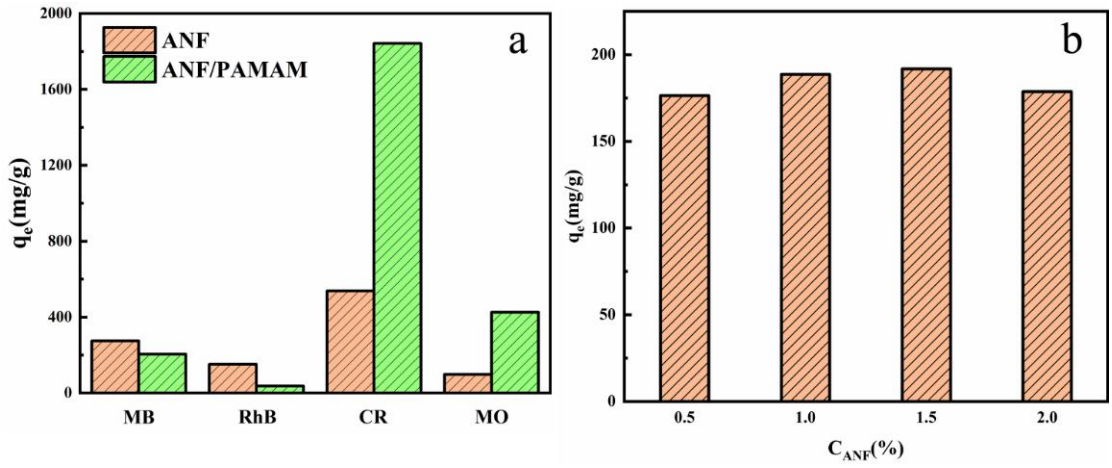

Figure S5 Adsorption toward different dyes a); Adsorption capacities of ANF aerogels with different concentration at equilibrium b).

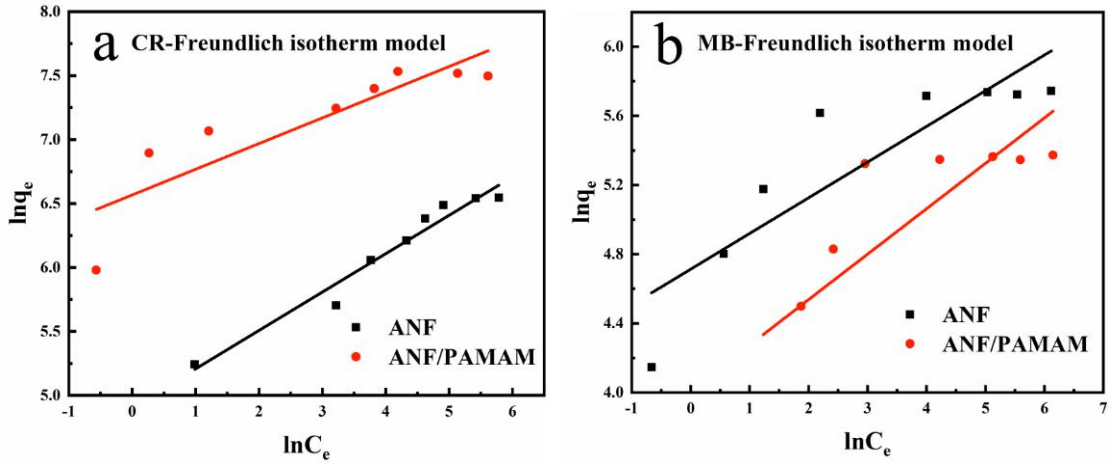

Figure S6 Fits of Freundlich isotherms for adsorption of CR a) and MB b).

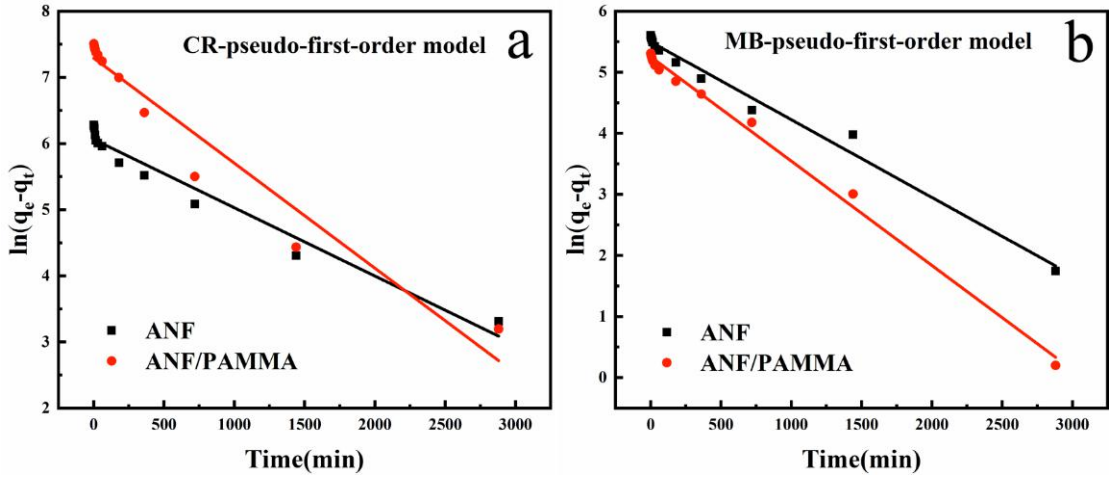

Figure S7 Fits of pseudo-first-order model for adsorption of CR by ANF a) and ANF/PAMAM b).

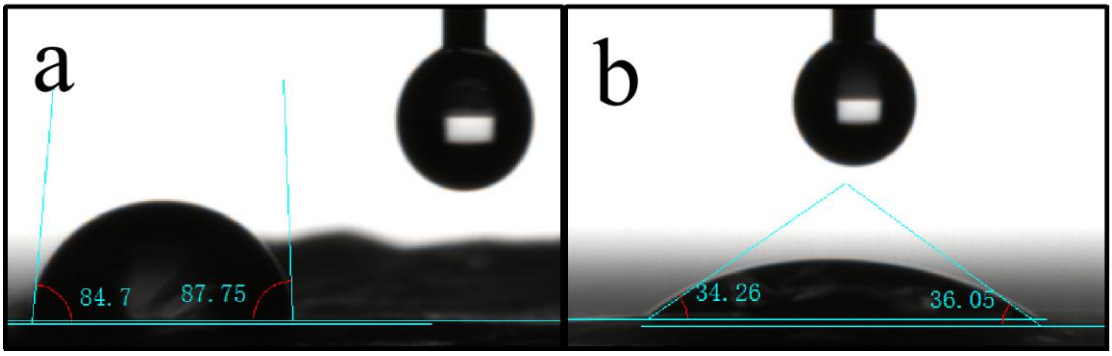

Figure S8 hydrophilicity before a) and after b) blending of PAMAM

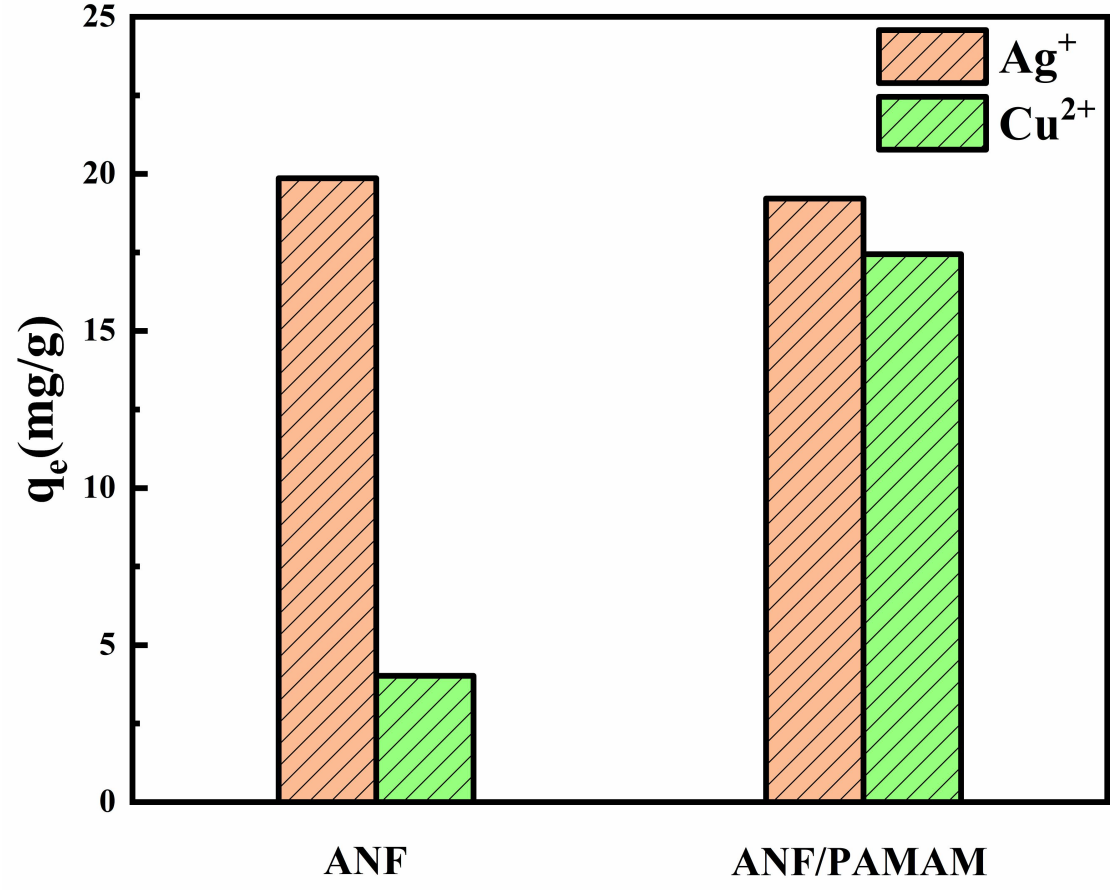

Figure S9 Adsorption performance toward metal ions of adsorbents

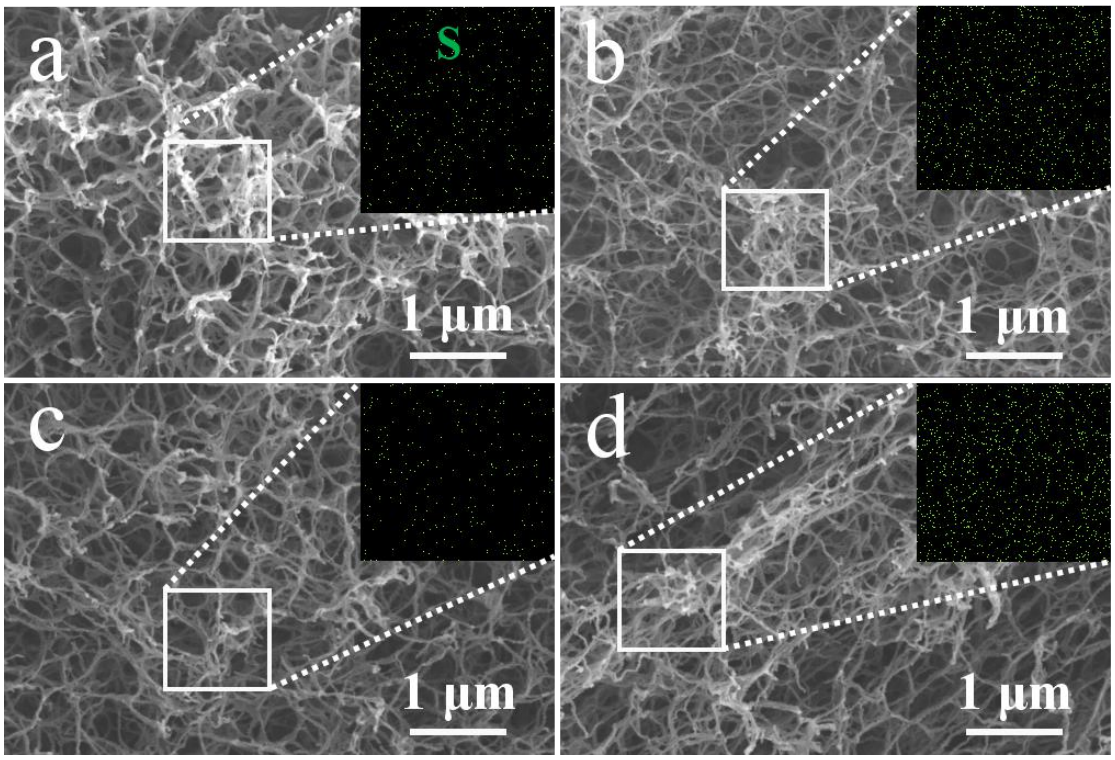

Figure S10 EDS results of a) ANF-MB, b) ANF-CR, c) ANF/PAMAM-MB and d) ANF/PAMAM-CR. The existence of sulfur demonstrates that MB and CR were adsorbed successfully, and after blending PAMAM, adsorbents adsorbed much more CR molecules obviously.

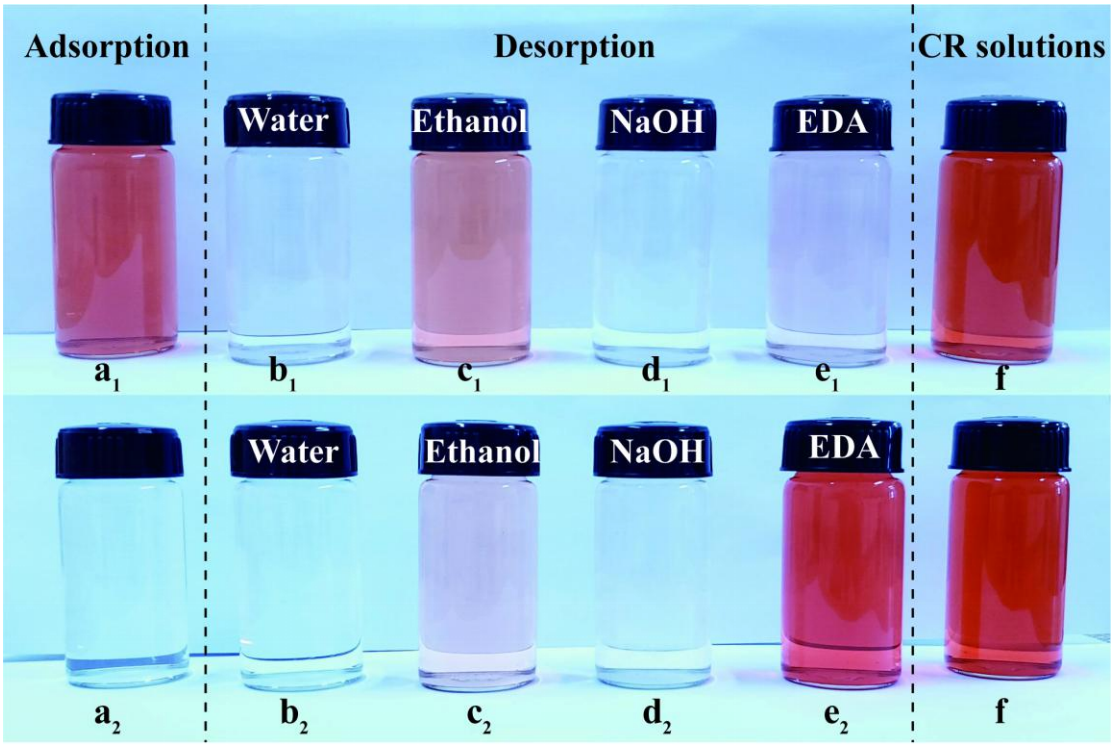

Figure S11 a1), a2) Solutions after adsorption by ANF and ANF/PAMAM respectively; b) c) d) e) Desorption by different solvents; f) CR solution before adsorption.

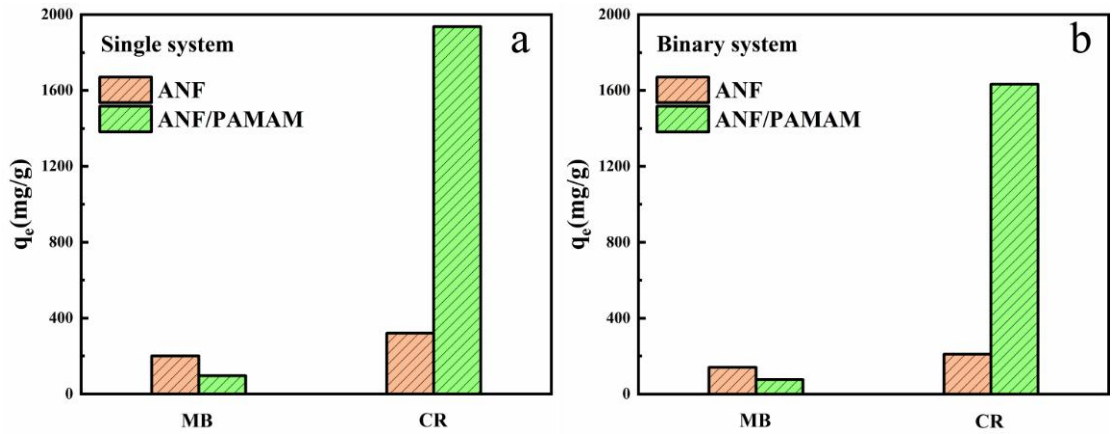

Figure S12 Adsorption capacities toward MB or CR single system a); Adsorption capacities toward MB and CR binary system b).

Table S1 Cost of materials for fabrication of aerogel adsorbents.

Chemicals	Purchase link	Price(￥)	Dosage	Cost(￥)
Kevlar	https://detail.1688.com/offer/42101163354.html?spm=a261b.2187593.0.0.66dd59631NnFxh	283/kg	1g	0.28
EDA	https://www.inno-chem.com.cn/search.php?searchkey=ethylene+diamine	809/2.5L	14.43g	4.67
MA	https://www.inno-chem.com.cn/search.php?searchkey=Methyl+acrylate	40/500mL	2.21	0.18
KOH	https://www.inno-chem.com.cn/search.php?searchkey=Potassium+hydroxide	969/2500g	1g	0.39
Methanol	https://www.inno-chem.com.cn/search.php?searchkey=methanol	180/4L	24mL	1.08
DMSO	https://www.inno-chem.com.cn/search.php?searchkey=Dimethyl+sulfoxide	178/L	48g	8.54
Total cost				15.14

References

[1] J.U. Lee, B. Park, B.-S. Kim, D.-R. Bae, W. Lee, Electrophoretic deposition of aramid nanofibers on carbon fibers for highly enhanced interfacial adhesion at low content, Composites Part A: Applied Science and Manufacturing 84 (2016) 482-489.