Electronic Supplementary Material (ESI) for Journal of Materials Chemistry A.

Electronic Supplementary information (ESI) for

Electrospun fiber based metal-organic framework composite membrane for fast, continuous, and simultaneous removal of insoluble and soluble contaminants from water

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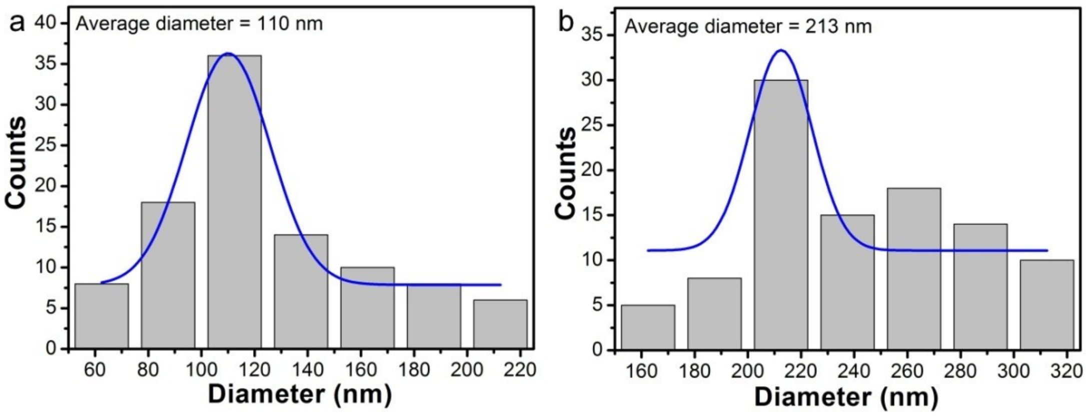


Fig. S1. Diameter distributions of H_3BTC/PAN FM (a) and PAN@MIL-100(Fe) FM (b).

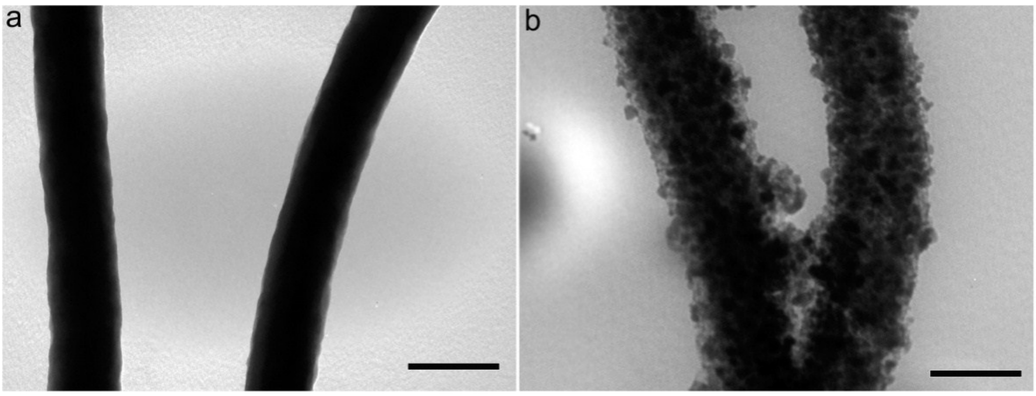


Fig. S2. TEM images of H_3BTC/PAN FM (a) and PAN@MIL-100(Fe) FM (b). The inset bars are 200 nm.

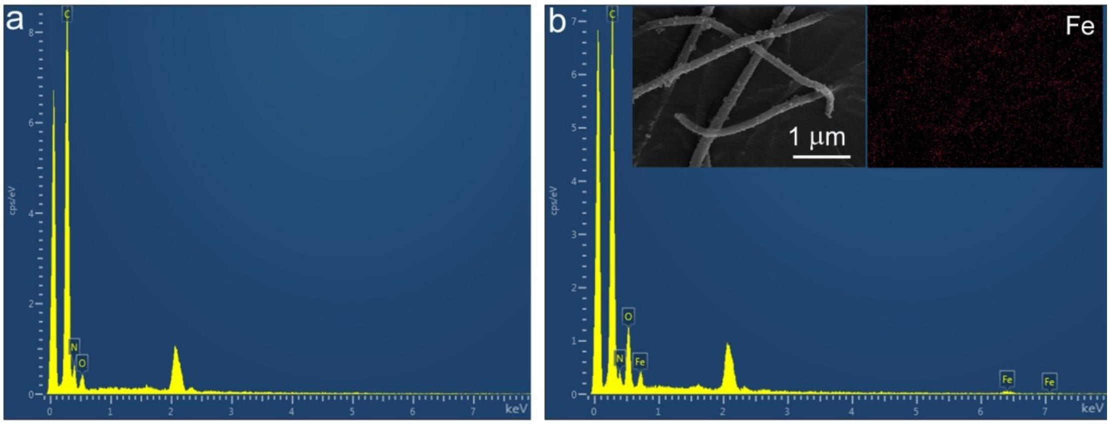


Fig. S3. EDX spectra of H_3BTC/PAN FM (a) and PAN@MIL-100(Fe) FM (b, the inset is its Fe elemental mapping).

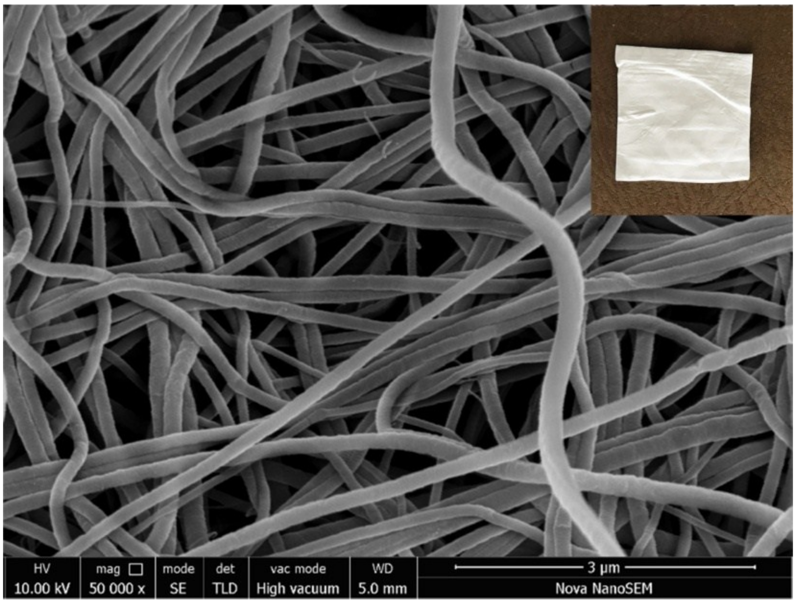


Fig. S4. SEM image of MIL-100(Fe) growth onto electrospun PAN fibers without H_3BTC.

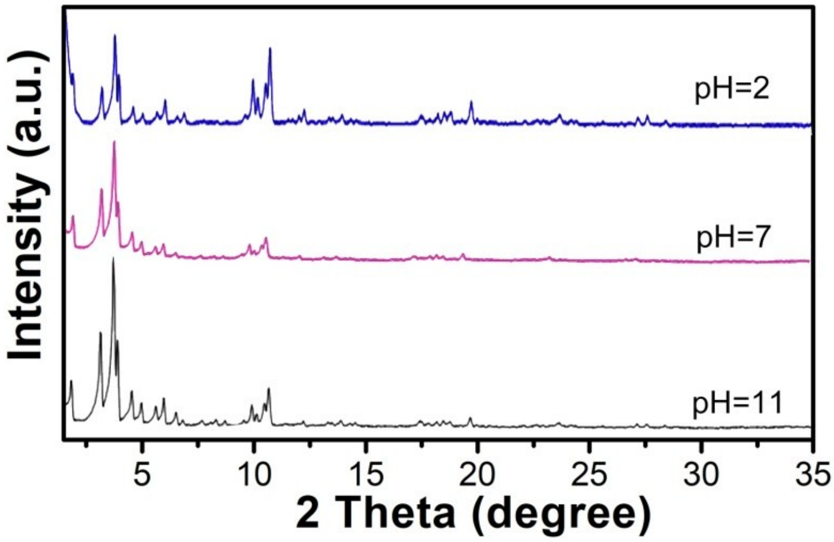


Fig. S5. XRD patterns of PAN@MIL-100(Fe) FM after the treatment in solutions with different pH values for 3 days.

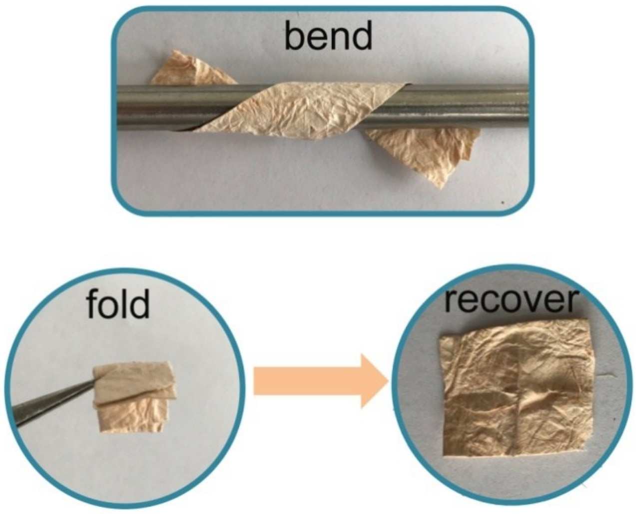


Fig. S6. Optical images of PAN@MIL-100(Fe) FM which show its good mechanical strength and flexibility.

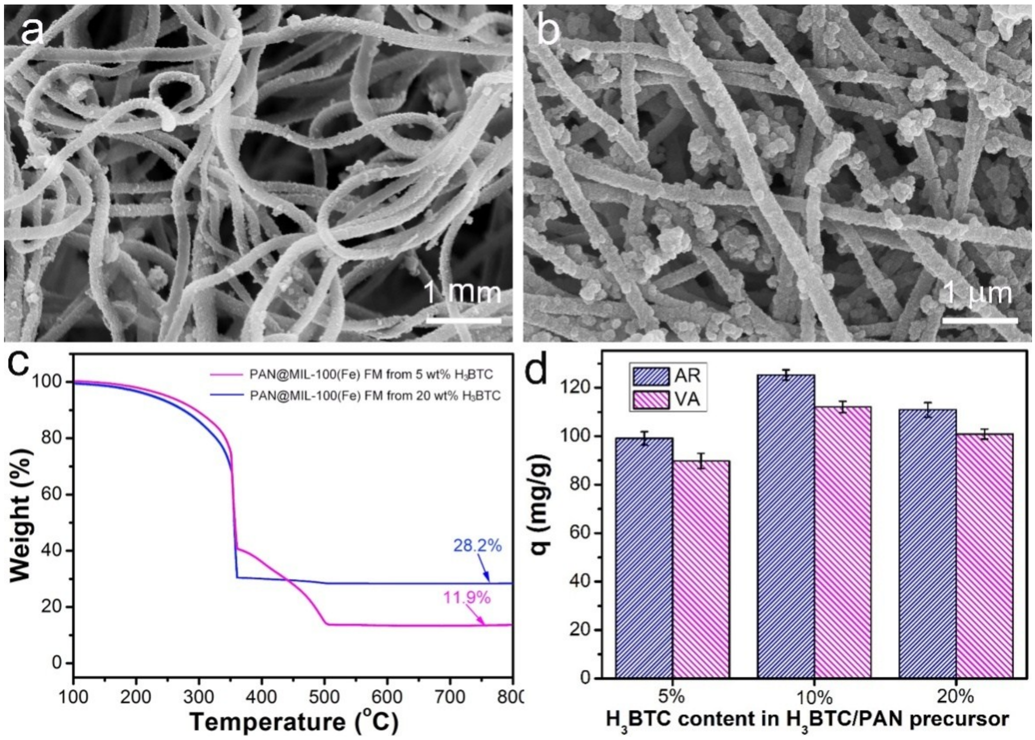


Fig. S7. SEM images of PAN@MIL-100(Fe) FM from H_3BTC/PAN FM with 5 wt% H_3BTC (a) and 20 wt% H_3BTC (b). (c) Their TGA curves. (d) The adsorption toward AR and VA by PAN@MIL-100(Fe) FM from H_3BTC/PAN FM with different amounts of H_3BTC.

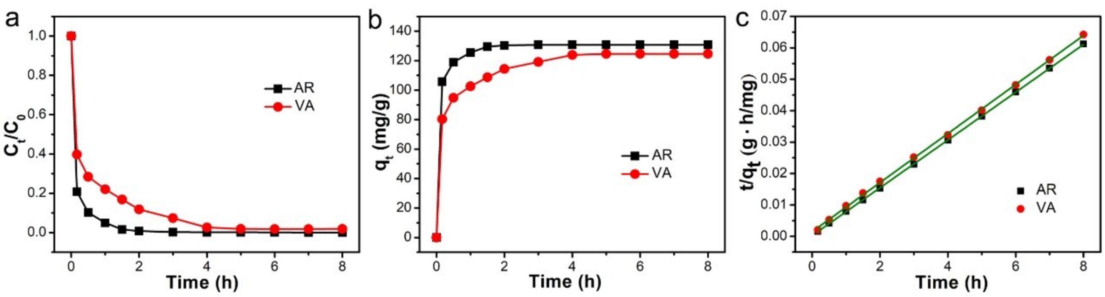


Fig. S8. (a) Removal efficiency, (b) adsorption kinetic curves and (c) the pseudo-second-order kinetic fitting plots toward AR and VA by MIL-100(Fe) powders.

Table S1 Adsorption kinetic parameters of AR and VA adsorption by MIL-100(Fe) powders.

pollutant	Pseudo-second-order model		
	q_e (mg/g)	k_2 (g/mg•h)	R^2
AR	131.58	0.23	0.9999
VA	128.21	0.040	0.9996

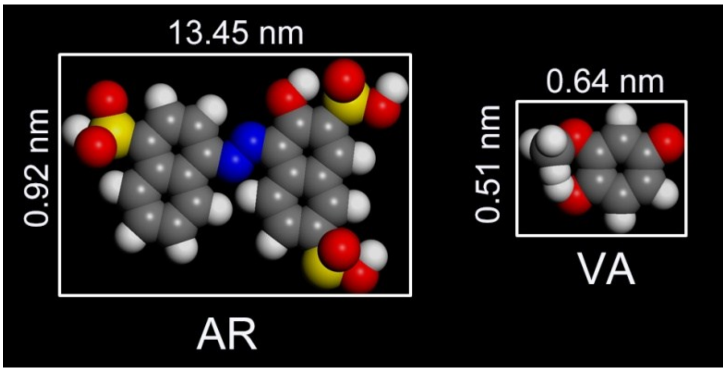


Fig. S9. Molecule sizes of AR and VA from Materials Studio 8.0.

Table S2 Adsorption isotherm parameters of AR and VA adsorption by PAN@MIL-100(Fe) FM.

pollutant	Langmuir isotherm			Freundlich isotherm		
	q_{max} (mg/g)	b (L/mg)	R^2	K_F	n	R^2
AR	386.05	0.0942	0.9987	148.60	6.06	0.9235
VA	321.81	0.1377	0.9914	119.86	5.65	0.8929

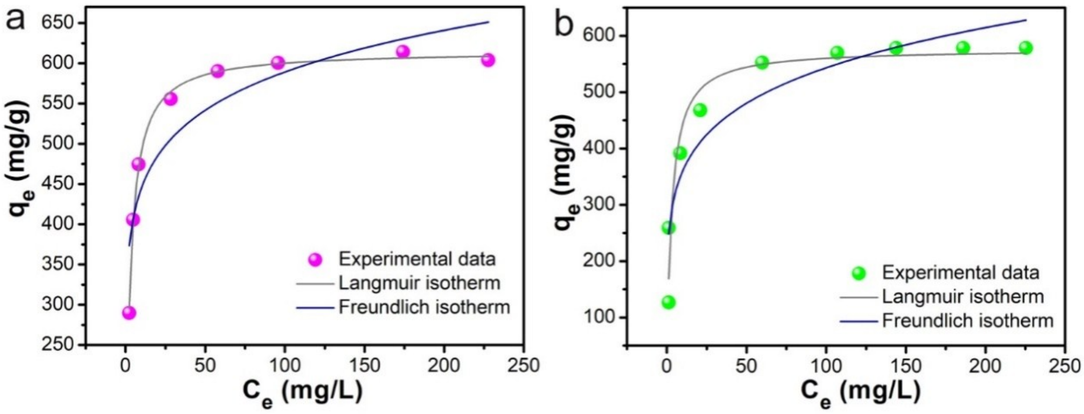


Fig. S10. Adsorption isotherms of MIL-100(Fe) powder toward AR (a) and VA (b).

Table S3 Adsorption isotherm parameters of AR and VA adsorption by MIL-100(Fe) powders.

pollutant	Langmuir isotherm			Freundlich isotherm		
	q_{max} (mg/g)	b (L/mg)	R^2	K_F	n	R^2
AR	615.40	0.3947	0.9970	336.69	8.23	0.8155
VA	576.70	0.3354	0.9919	239.47	5.62	0.8601

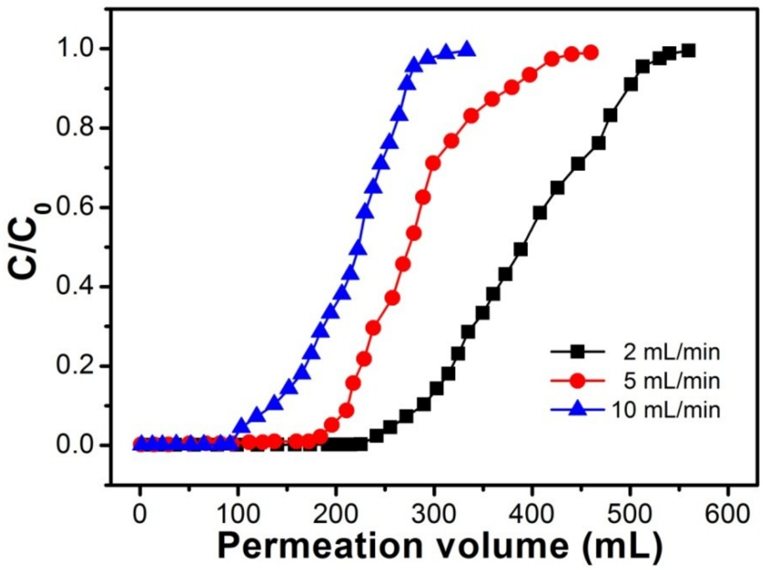


Fig. S11. Breakthrough curves of PAN@MIL-100(Fe) FM for VA solution with different flow rates.

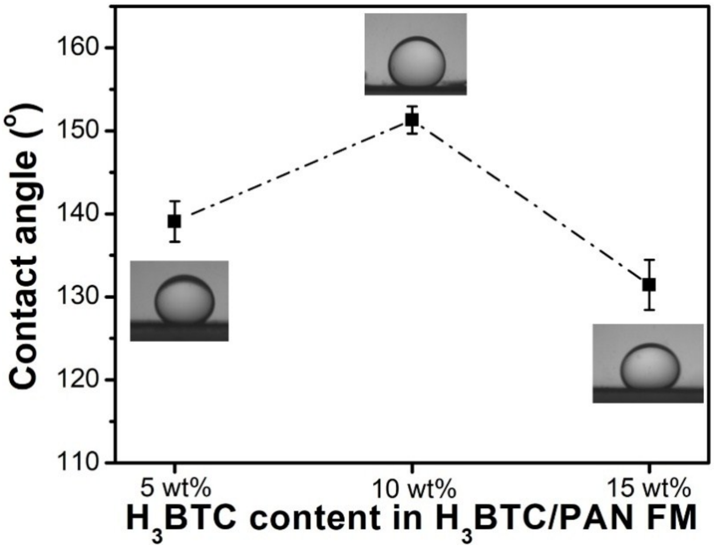


Fig. S12. Underwater oil contact angles of PAN@MIL-100(Fe) FM from H_3BTC/PAN FM with different amounts of H_3BTC.

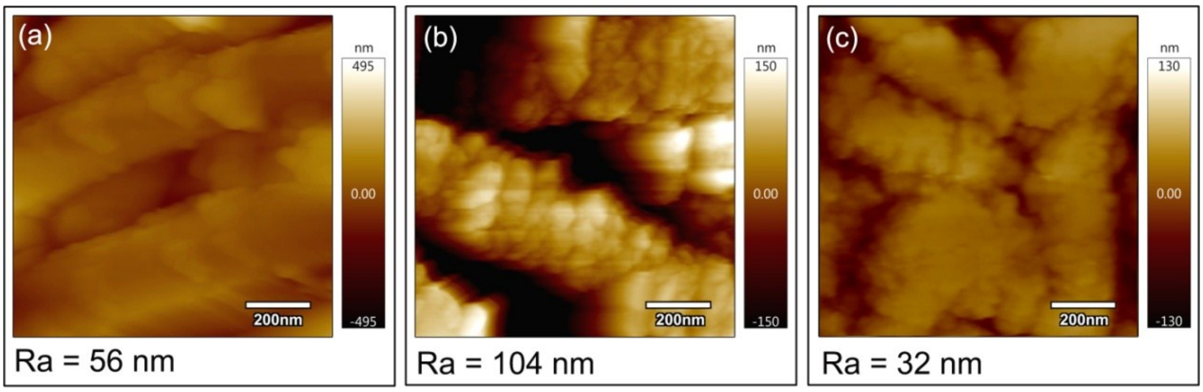


Fig. S13. AFM images of PAN@MIL-100(Fe) FM from H_3BTC/PAN FM with 5 wt% H_3BTC (a), 10 wt% H_3BTC (b) and 20 wt% H_3BTC (c). The value of Ra from AFM image can represent the surface roughness.

Table S4 Specific values for Fig. 5f.

Separation cycle	Removal efficiency (%)
1	99.8
2	99.8
3	99.8
4	99.8
5	99.7

Table S5 Specific values for Fig. 6b.

Permeation volume (mL)	Removal for AR (%)	Removal for VA (%)	Oil separation (%)
10	99.9	99.9	99.9
20	99.8	99.9	99.9
30	99.8	99.7	99.7
40	99.7	99.6	99.4
50	99.8	99.5	99.4
60	99.6	99.4	00.3
70	99.6	99.3	99.3
80	99.5	99.3	99.3
90	99.5	99.2	99.2
100	99.4	99.2	99.1

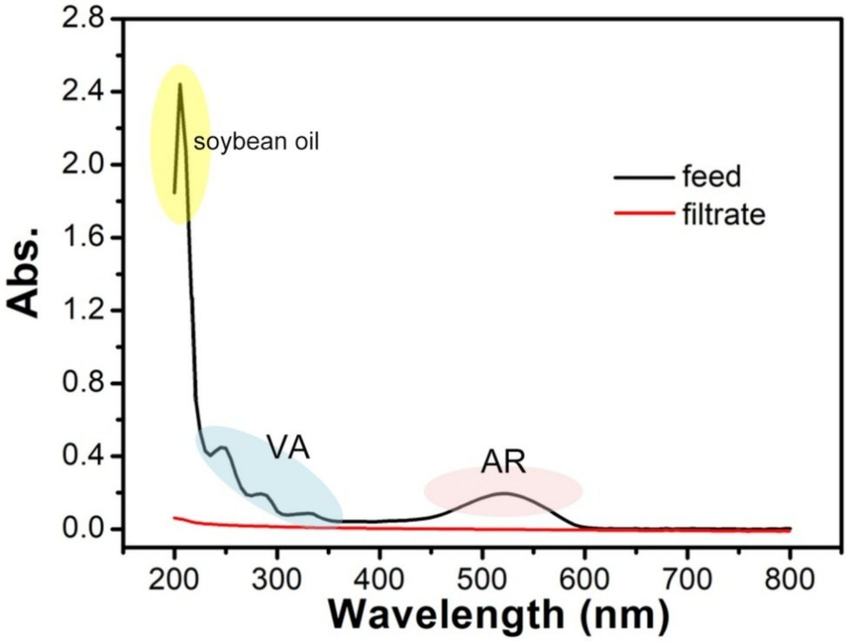


Fig. S14. UV-Vis spectra of the simulated food wastewater containing 5 mg/L AR, 5 mg/L VA and 1 vol% soybean oil before and after filtration.

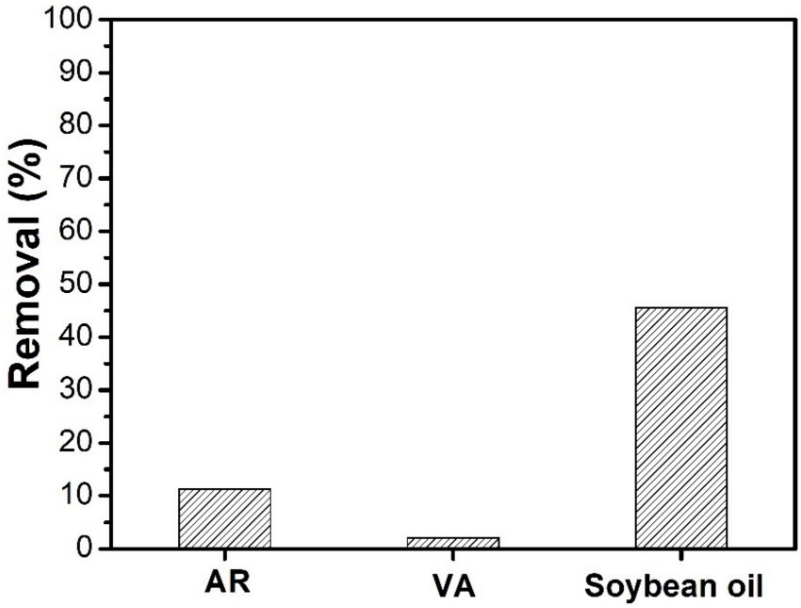


Fig. S15. Simultaneous removal performance toward AR, VA and soybean oil by H_3BTC/PAN FM.

Table S6 Specific values for Fig. 6c.

Number of cycles	Removal for AR (%)	Removal for VA (%)
1	99.4	99.2
2	99.4	99.2
3	99.3	99.1
4	99.3	99.1
5	99.3	99.1

Table S7 Specific values for Fig. 6d.

Number of cycles	Removal for AR (%)	Removal for VA (%)
1	99.4	99.2
2	99.4	99.2
3	99.3	99.1
4	99.3	99.1
5	99.3	99.1

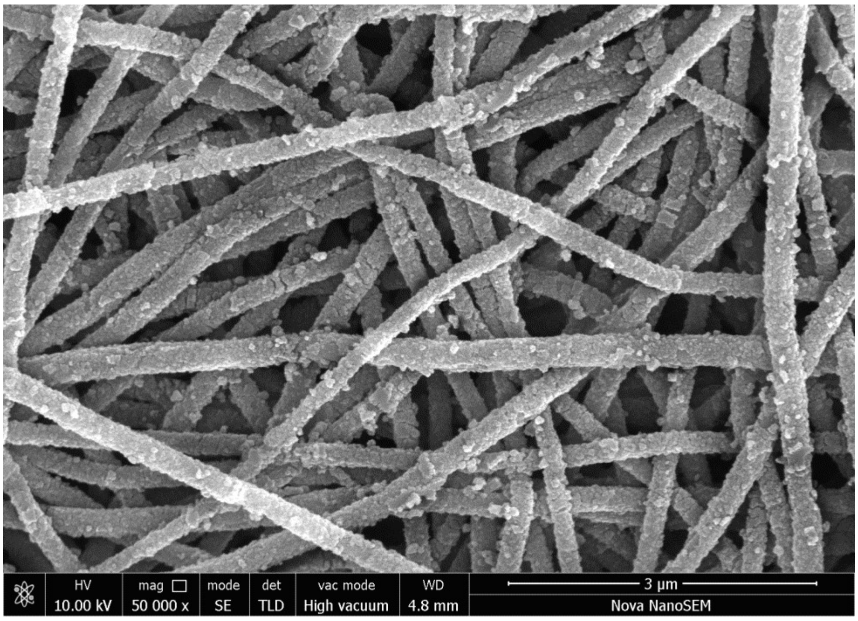
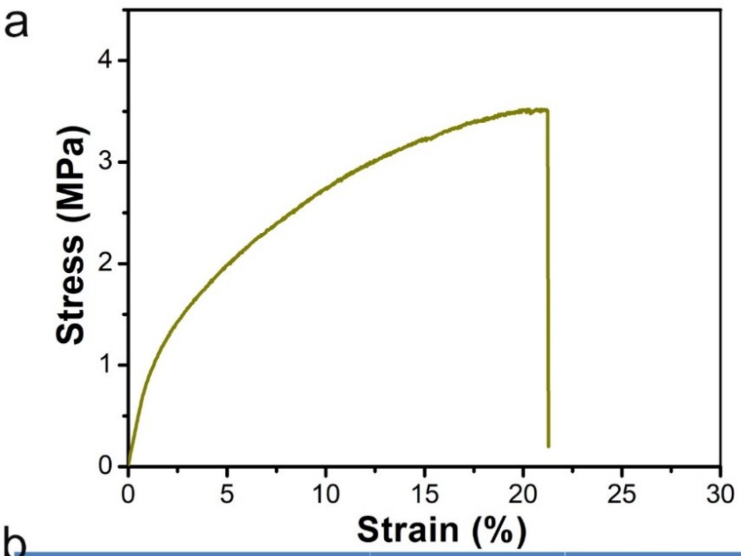


Fig. S16. SEM image of PAN@MIL-100(Fe) FM after five purification-regeneration cycles.



b

Sample	Tensile strength (MPa)	Elongation at break (%)
Original membrane	3.73±0.68	25.32±2.07
Membrane after filtration cycles	3.50±1.26	21.23±3.76

Fig. S17. (a) Mechanical properties of PAN@MIL-100(Fe) FM after filtration cycles and (b) summarized parameters.

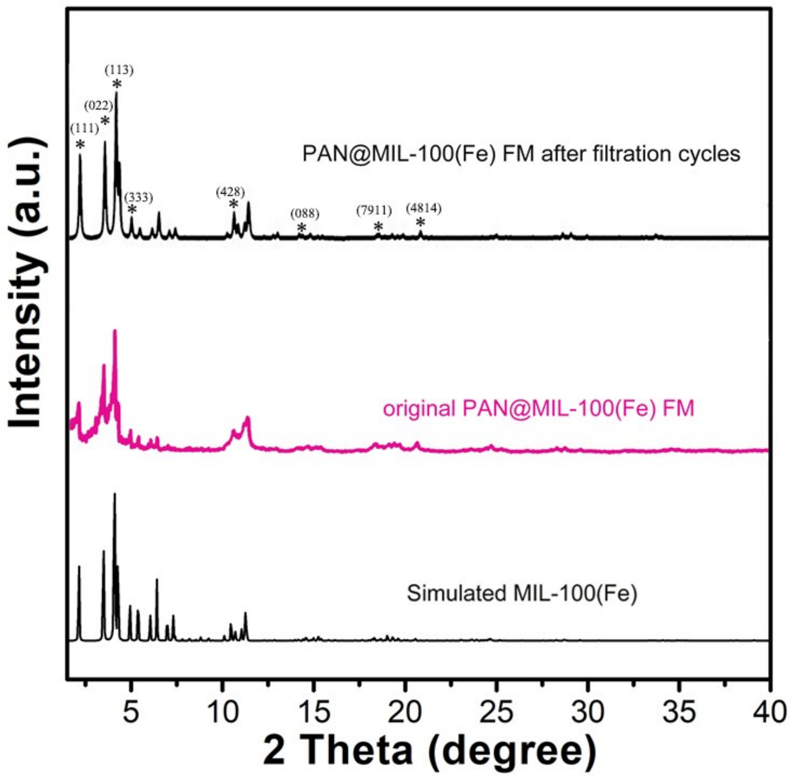


Fig. S18. XRD patterns of PAN@MIL-100(Fe) FM before and after filtration cycles.

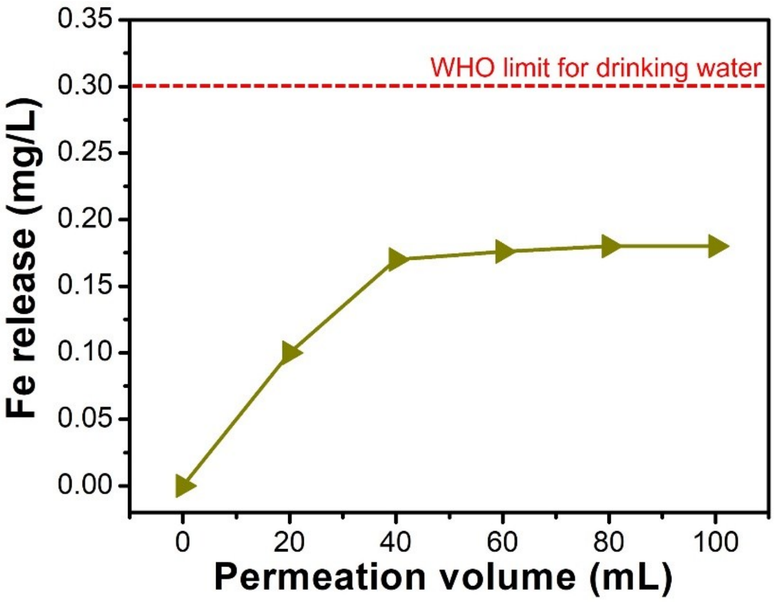


Fig. S19. The accumulated Fe ion release concentration in the filtrate during the filtration process.