Supplementary information

Fenton photocatalytic sponges for rapid separation emulsified-oil/dyes

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List of captions:

Text S1. Evaluation of dye adsorption

Adsorption of aqueous solutions of MB was carried out to assess the adsorption performance. The following 0, 40, 80, 120, 150, 200, 240 mg weight of powder (HNTs, HNTs/β-FeOOH-x) were filled into a beaker containing 90 ml of 50 mg/L methylene blue solution. The beakers were then shaken on a shaker for 2 h. The beakers were then allowed to stand to allow the powder to sink, and the absorbance of the solution in each beaker was determined by taking the upper layer of the clear solution. Langmuir isothermal adsorption was used to evaluate the adsorption process.

$$q_e = \frac{q_m k_l c_e}{1 + k_l c_e} \quad (1)$$

$$y = \frac{abx^{1-c}}{1 + bx^{1-c}} \quad (2)$$

where q_m is the maximum adsorption capacity, q_e is the equilibrium adsorption capacity, C_e is the solute mass concentration (mg/L), and k_l is the Langmuir equilibrium constant.

Text S2. Fenton photocatalytic evaluation

An aqueous solution of MB was degraded to evaluate the photo-Fenton catalytic performance.AM/MAA/HNTs/β-FeOOH-x was immersed in a beaker containing 100mL of dye solution (30mg/L). The beaker was then placed under an LED lamp. 20 cm from the light source and kept 1.5 cm below the level of the solution. Stirring was done under dark conditions until AM/MAA/HNTs/β-FeOOH-x adsorption equilibrium. The hydroxyl radicals (H_2O_2 concentration of 10 mmol/L) were then introduced into the dye solution.Turn on the LED and irradiate for 60 minutes, taking a sample of 5mL each time.The removal rate of MB was calculated using Equation (3).

$$R = \left(1 - \frac{c_t}{c_0}\right) \times 100\% \quad (3)$$

where c_0 denotes the aqueous dye solution's initial concentration and c_t represents the concentration of the aqueous solution at time t of degradation.

Table S1 Powder Structure Parameters

Sample	BET Surface Area（m^2/g）	Micropore volum（cm^3/g）	Average pore size（nm）
HNTs	20.0516	0.113862	22.7138
HNTs/β-FeOOH-1	31.8392	0.001182	19.8842
HNTs/β-FeOOH-0.8	43.9528	0.000698	19.2949
HNTs/β-FeOOH-0.6	48.8510	0.001193	17.3687
HNTs/β-FeOOH-0.4	61.5435	0.000329	17.2245
HNTs/β-FeOOH-0.2	55.6181	0.001148	19.1425

Table S2 Zeta potential at different pH values

Sample	pH				
	2.4	4.6	6.8	8.5	10.2
HNTs	13.400	-23.967	-29.400	-37.933	-54.500
HNTs/β-FeOOH-1	-5.500	-32.533	-36.000	-39.200	-51.700
HNTs/β-FeOOH-0.8	-5.310	-21.467	-33.667	-42.033	-54.200
HNTs/β-FeOOH-0.6	-6.730	-29.967	-31.433	-42.567	-52.333
HNTs/β-FeOOH-0.4	-4.490	-37.600	-39.133	-41.333	-49.933
HNTs/β-FeOOH-0.2	0.030	-31.133	-34.500	-42.500	-50.267

Table S3 Langmuir adsorption isotherm fitting parameters

Sample	Langmuir fitting parameters		
	qm/$mg\cdot g^{-1}$	Kl/$L\cdot mg^{-1}$	R^2
HNTS	38.014±4.039	0.083±0.024	0.892
HNTS/β-FeOOH-0.4	32.581±3.471	0.149±0.059	0.784

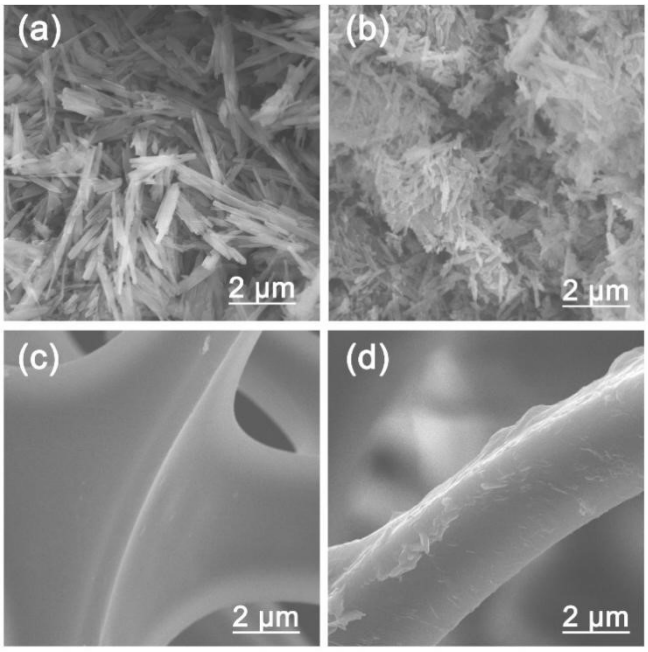

Figure S1. SEM of (a) HNTs, (b) HNTs/β-FeOOH, (c) original sponge and (d) AM/MAA/HNTs/β-FeOOH.

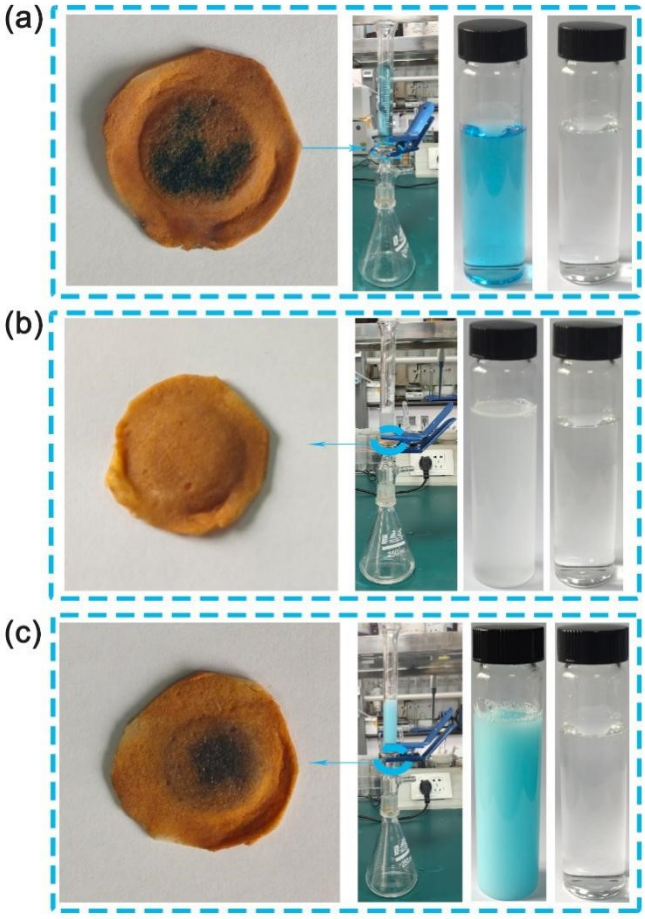

Figure S2. Separation process of (a) MB, (b) Oil-in-water emulsion and (c) MB solution emulsions.

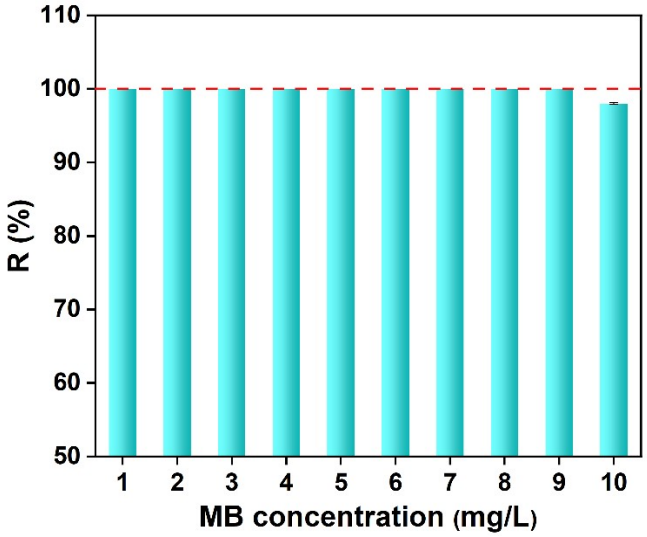

Figure S3. The removal rate of MB by the separation membrane.