Supplementary Data

In situ cyclodextrin metal-organic framework/electrospun composite fibers with biosafety for volatile organic compounds removals

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Preparation of CD-MOF

The hydrothermal method (50 °C) combined with the vapor diffusion method (methanol) was introduced for the in situ growth of β-CD-MOF [1]. Using K_2CO_3 as the potassium source, β-CD and K^+ were dissolved in 10 mL of water at a ratio of 0.5:4 mmol at 60 °C to obtain β-CD-MOF precursor solution. Placed the bottles with β-CD-MOF precursor solution into a large jar with 75 v/v% methanol solution. The jar was sealed and the samples reacted in a water bath at 50 °C for 24 h. After the reaction, CTAB (8 mg mL^{-1}) was added to trigger the synthesis of the CD-MOF rapidly. The solution was left at room temperature for 24 h. The precipitated crystal particles were collected, washed three times with DMF and once with methanol, dried and collected to obtain white CD-MOF powders.

Preparation of PCL

Added PCL to DCM/DMF (6/4 v/v) mixed solvent system in a certain proportion, and mixed them uniformly to obtain a spinning solution. PCL electrospun membrane was prepared by electrospinning. The process parameters of PCL electrospun membrane were: the voltage was 9 kV, the receiving distance was 12 cm, the feeding rate was 1 mL/h, the drum speed was 1000 rpm, a 22-gauge needle was used, and the spinning time was 5 h.

Surface area and pore size distribution analysis

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The surface area and pore size distribution of the samples were determined by low-temperature nitrogen sorption experiments using a specific surface area and pore size analyzer (BET, Beishide, Beijing, China). The N_2 adsorption-desorption isotherms and pore size distributions of the samples were shown in Fig. S1. Compared with PCL-CD (0.75 m^2/g), the BET surface area of CD-MOF/PCL loaded with β-CD-MOF was still very low (3.41 m^2/g), indicating poor adsorption of N_2 by β-CD-MOF. For this phenomenon, Xiong et al. [2] believed that the phase transition or framework collapse of β-CD-MOF occurred during the N_2 adsorption process. Volkova [3] and Shao [4] et al. believed that the 2D layers in β-CD-MOF are stacked in a parallel staggering fashion, and the vacancies in the layers are covered by the β-CD of the adjacent layers, which is not conducive to N_2 absorption. In addition, Xu et al. [5] believed that this phenomenon is because there is no special interaction between β-CD-MOF and N_2. In conclusion, it is currently impossible to confirm the surface area of β-CD-MOF by low-temperature nitrogen sorption experiment.

Calculation of CD-MOF content in CD-MOF/PCL [6]

The remaining mass data from TGA curves, the remaining mass for CD-MOF is 24.78%, for PCL-CD is 1.78%, for CD-MOF/PCL is 13.53%, suppose the content of CD-MOF in the membrane is x, and x = 51.09% is calculated from the following formula.

$$24.78\,x + 1.78(1 - x) = 13.53 \times 100\%$$

Fracture Analysis of PCL-CD

SEM images for tensile-fractured surfaces and freeze-fractured surfaces of PCL-CD were shown in Fig. S2. In the SEM of tensile-fractured zone, the fibers obviously stretched, which means plastic deformation happened. In the frozen-fractured zone, the fractured appearance was relatively smooth, confirming its brittle fracture.

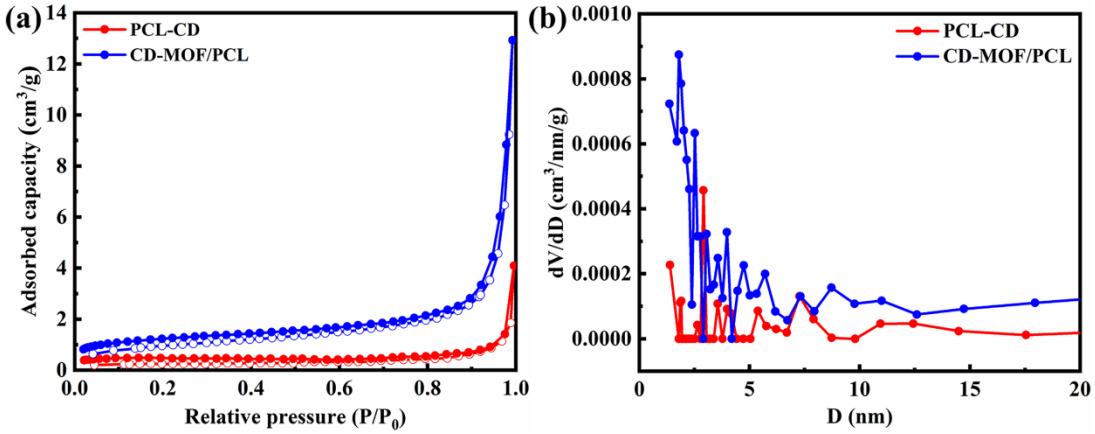

Fig. S1 (a) N_2 adsorption−desorption isotherm linear plot, (b) pore size curve of samples

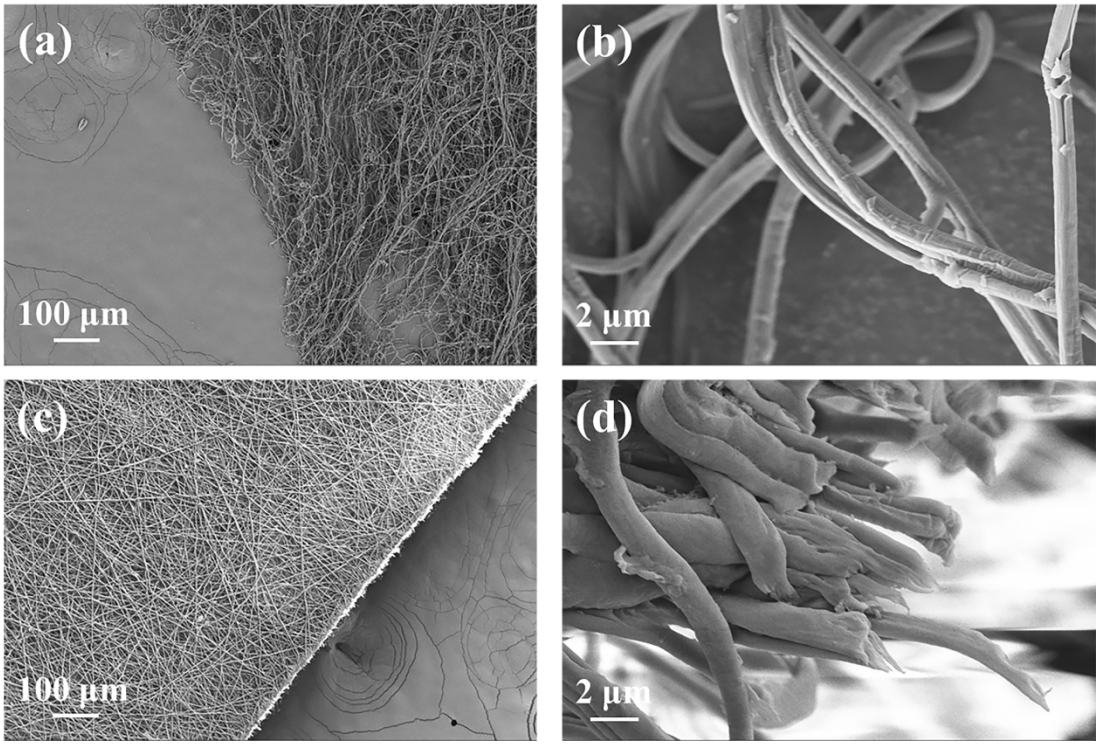

Fig. S2 SEM images of (a) the tensile-fractured zone; (b) the fibers at the tensile-fractured zone; (c) the frozen-fractured zone; (d) the fibers at the frozen-fracture zone of PCL-CD

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