Supplementary Materials

1. Optimization of the Thermal Treatment Parameters

To form a particulate membrane, the deposited particles were thermally treated. The particles generated with 5% PLGA acetone solution were chosen to optimize the thermal treatment parameters. All samples were placed in a fuming cupboard after fabrication for 12 h to evaporate the residual organic solvent. The samples were divided into two groups to determine the influence of baking time and temperature. One group was baked for 10, 30 and 60 min at 50°C in a constant-temperature shaker. After the baking process, the filtration and mechanical properties were measured and shown in Table S1. The pure water flux decreases dramatically while the tensile strength increases from 22.85 ± 1.89 MPa to 32.28 ± 4.51 MPa when the baking time increases from 10 min to 30 min. Increasing baking time after 30 min only results in a slight increase in pure water flux and tensile strength. Hence, the optimal baking time is 30 min.

Table S1. The Influence of Baking Time on the Filtration and Mechanical Properties at 50°C

Baking time (min)	Pure water flux (L m^{-2} h^{-1})	Tensile strength (MPa)
10	11,148.45 ± 421.89	22.85 ± 1.89
30	6,502.63 ± 460.73	32.28 ± 4.51
60	5,979.31 ± 264.85	36.72 ± 3.16

The other group was baked for 30 min at 30, 40, 60 and 70°C in the constant-temperature shaker. After the baking process, the filtration and mechanical properties were measured and shown in Fig. S1. According to the stress-strain curves, the tensile strength increases with the increase of baking temperature. Moreover, the total strain is less than 8% for all the samples, which implies the particulate membrane deforms slightly under tensile stress. The pure water fluxes of these particulate membranes are shown in Fig. S1(b). Moreover, as the filtration is performed in aqueous environment, the tensile strength of the particulate membrane in wet condition was also measured and shown in Fig. S1(b). According to these data, the optimal temperature of the thermal treatment process for PLGA particulate membrane is 50°C.

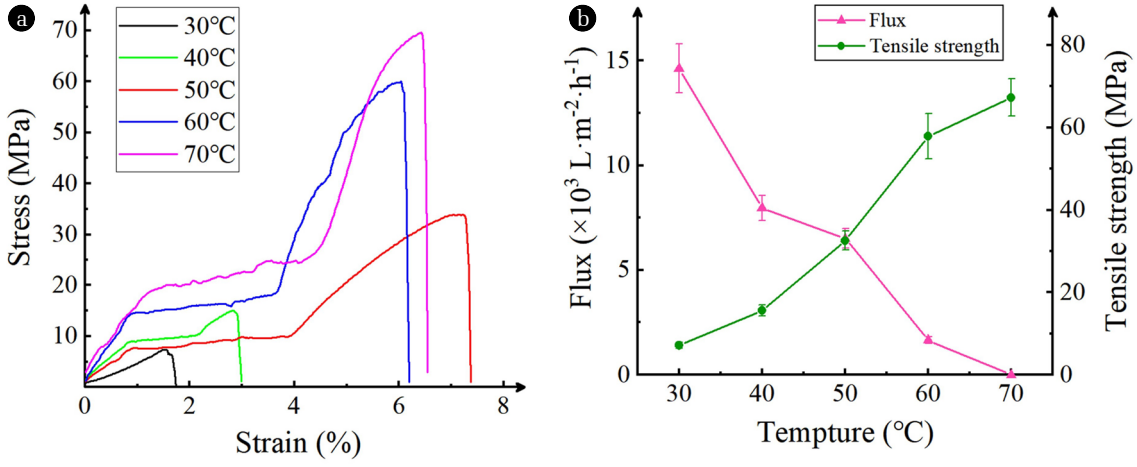

Fig. S1. (a) The stress-strain curve of particulate membranes after thermal treatment at different temperatures. (b) The pure water flux and tensile strength of particulate membranes after thermal treatment at different temperatures.

2. Dead-end Filtration Setup

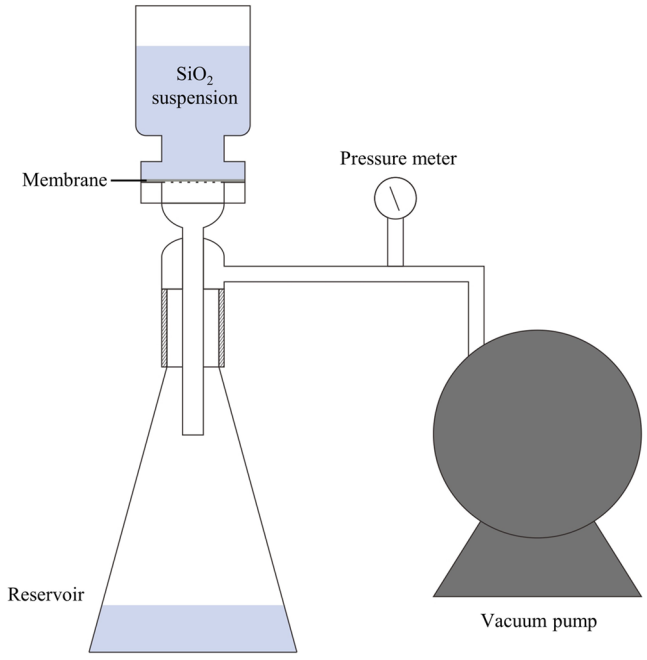

Fig. S2. Schematic of the dead-end filtration system.

3. Calibration Curve

The calibration curve of SiO_2 suspension is presented in Fig. S3. The stock solution was prepared by adding 200 nm SiO_2 nanoparticles into distilled water at a concentration of 500 ppm. Then, the stock solution was further diluted into 200 ppm, 100 ppm, 50 ppm, 20 ppm and 10 ppm. The UV/Vis absorbance of the SiO_2 suspensions was measured using a UV/Vis spectrophotometer.

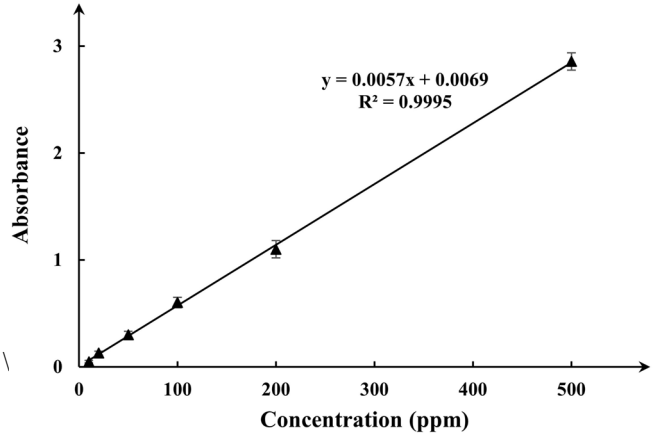

Fig. S3. The standard calibration curve of SiO_2 suspension.

4. SEM of Microparticles

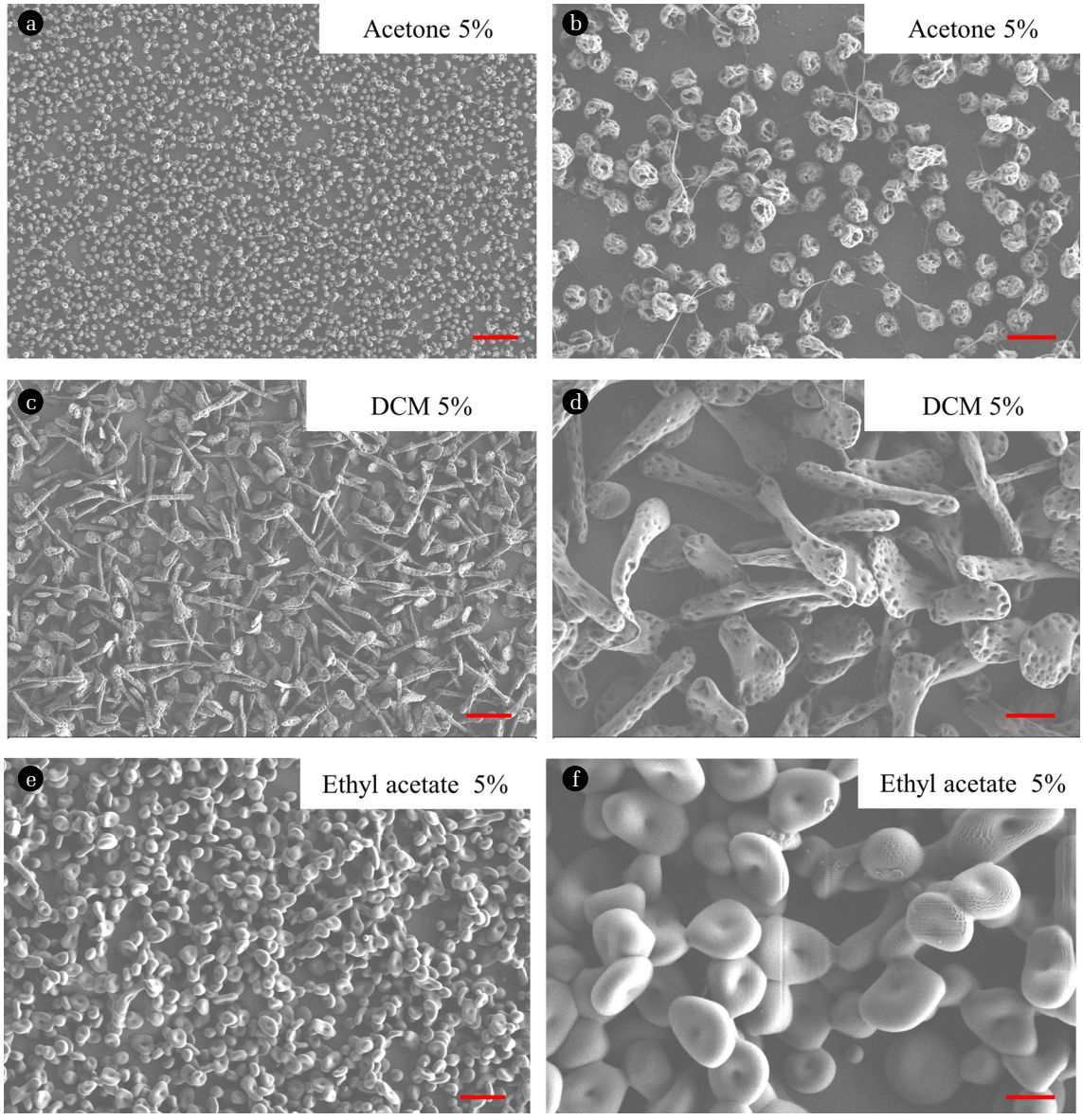

Fig. S4. (a), (c), (e) Various morphologies of microparticles fabricated with electrospray using different solutions. Scale bar: 20 µm. (b), (d), (f) Zoomed-in SEM images corresponding to (a), (c), (e). Scale bar: 5 µm.