

Supporting Information

Multistage-Split Ultrafine Fluffy Nanofibrous Membrane for High-Efficiency Antibacterial Air Filtration

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This document included 16 supplementary pictures from S1 to S16

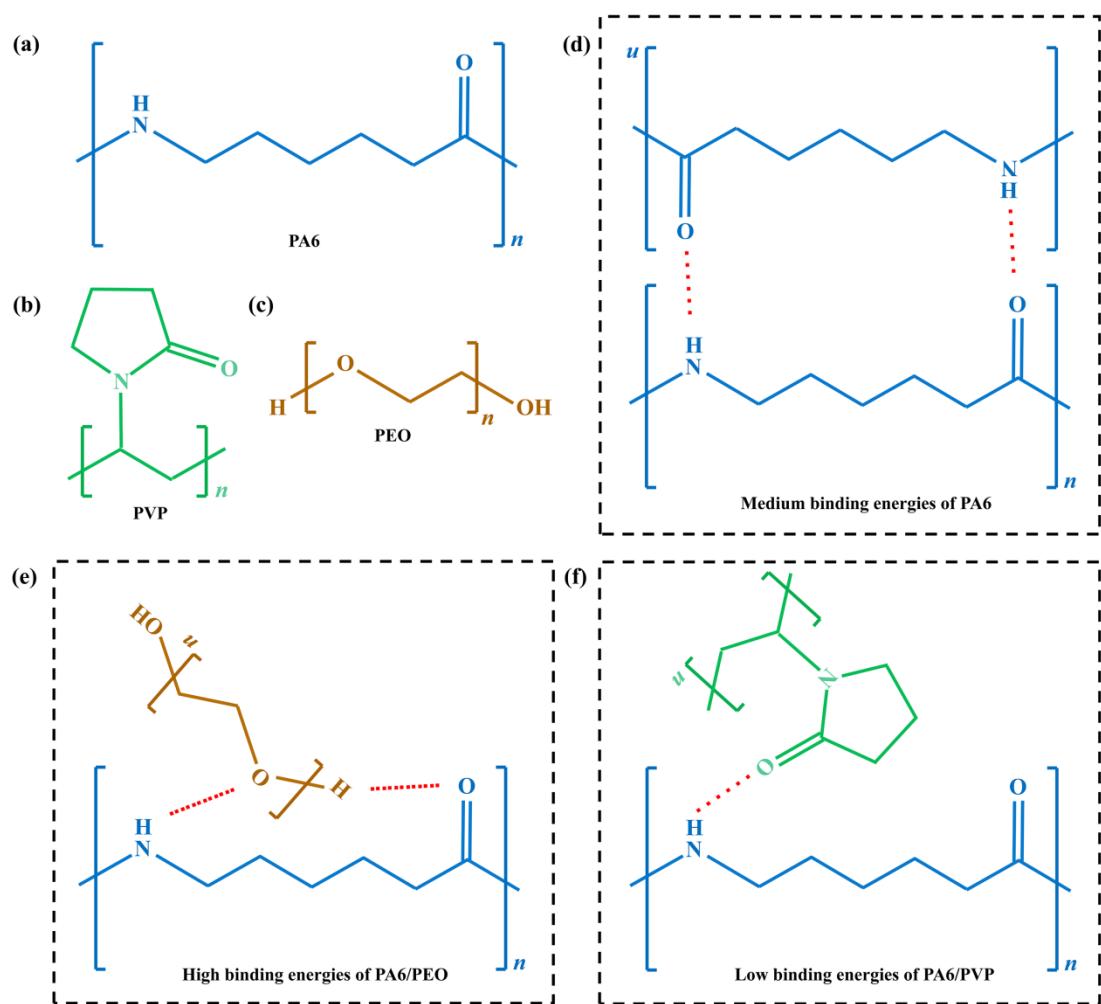


Figure S1. Molecular structures of (a) polyamide 6 (PA6), (b) polyvinyl pyrrolidone (PVP), and (c) polyethylene oxide (PEO). Binding energies between (d) PA6, (e) PA6/PEO, and (f) PA6/PVP molecules.

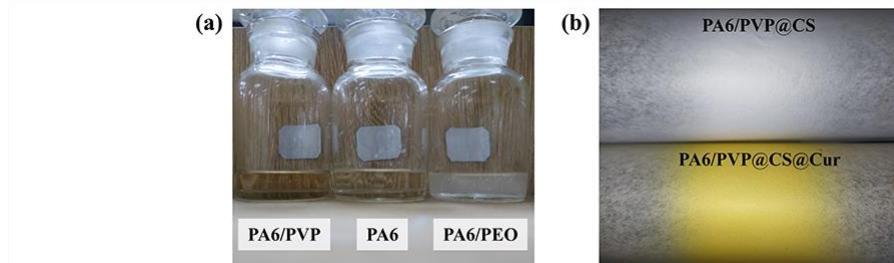


Figure S2. (a) Photo images of the PA6/PVP, PA6 and PA6/PEO solution. (b) Photo images of the PA6/PVP@CS and PA6/PVP@CS@Cur nanofibrous membrane.

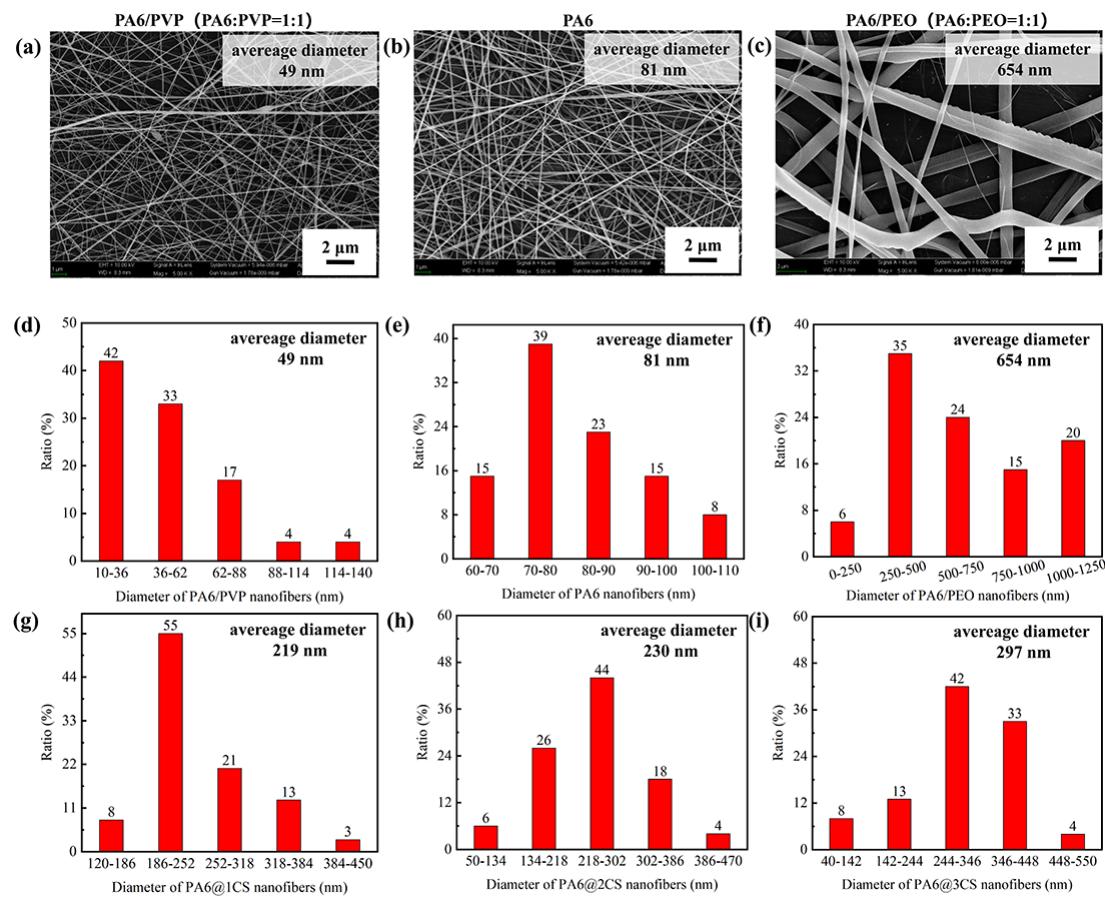


Figure S3. Scanning electron microscopy (SEM) images of (a) PA6/PVP, (b) PA6, and (c) PA6/PEO nanofibers. The diameter distributions of the nanofibrous membrane: (d) PA6/PVP; (e) PA6; (f) PA6/PEO; (g) PA6@1CS; (h) PA6@2CS; and (i) PA6@3CS.

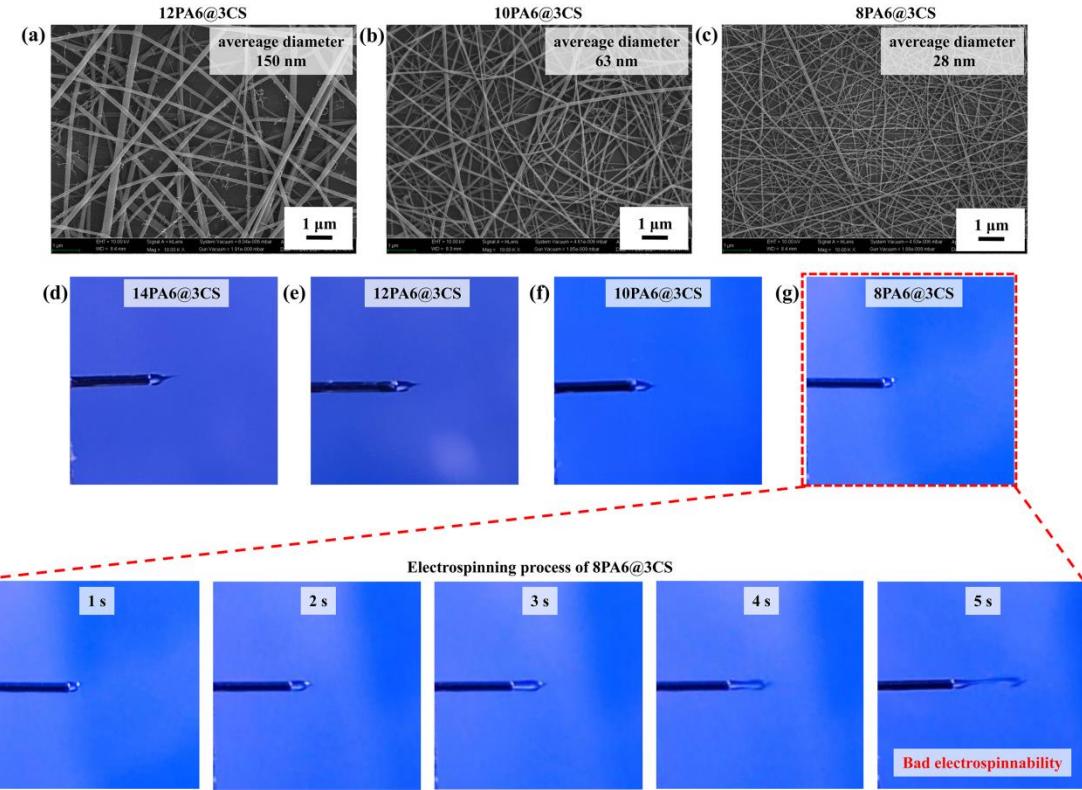


Figure S4. SEM images of PA6@3CS nanofibers with different PA6 contents: (a) 12 wt%, (b) 10 wt%, and (c) 8 wt%. Photo images of electrospinning process: (d) 14PA6@3CS; (e) 12PA6@2CS; (f) 10PA6@3CS and (g) 8PA6@3CS solution.

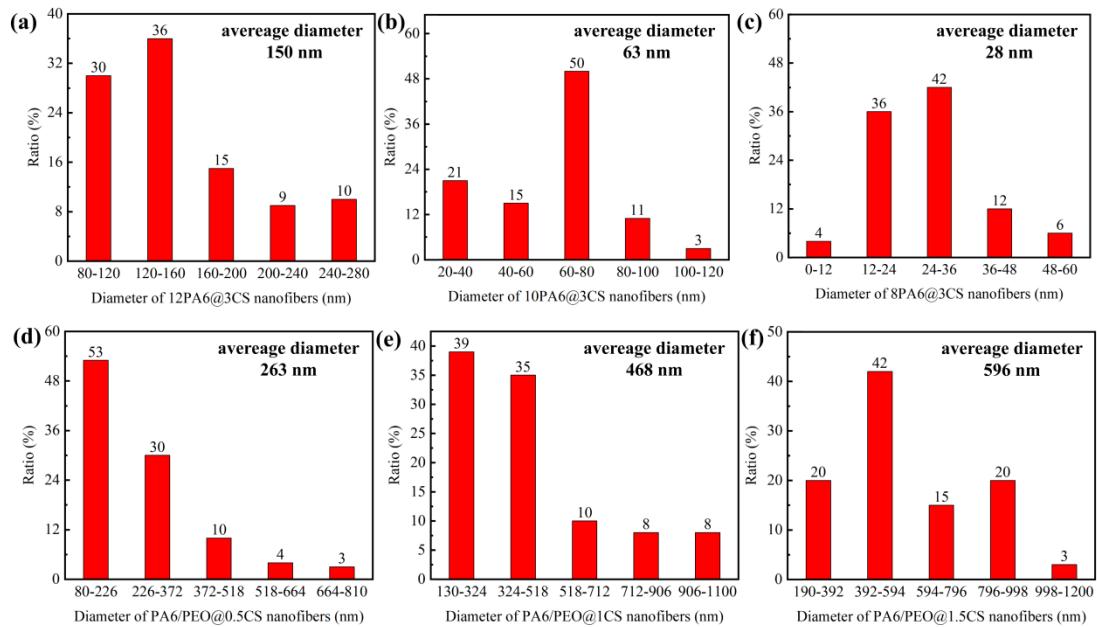


Figure S5. The diameter distributions of the nanofibrous membrane: (a) 12PA6@3CS; (b) 10PA6@3CS; (c) 8PA6@3CS; (d) PA6/PEO@0.5CS; (e) PA6/PEO@1CS; and (f) PA6/PEO@1.5CS.

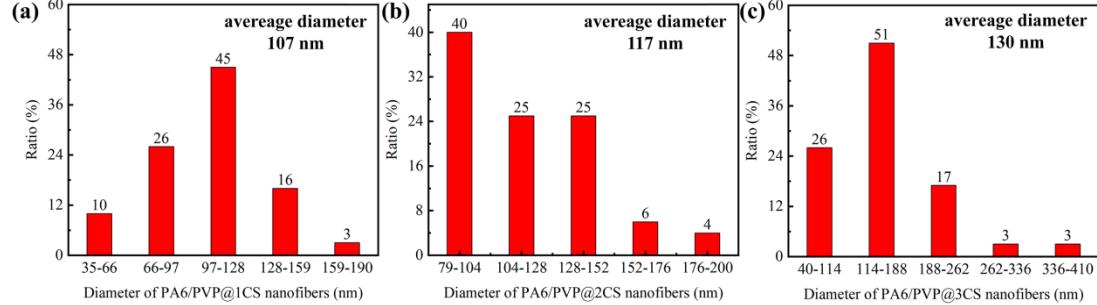


Figure S6. The diameter distributions of the nanofibrous membrane: (a) PA6/PVP@1CS; (b) PA6/PVP@2CS; and (c) PA6/PVP@3CS.

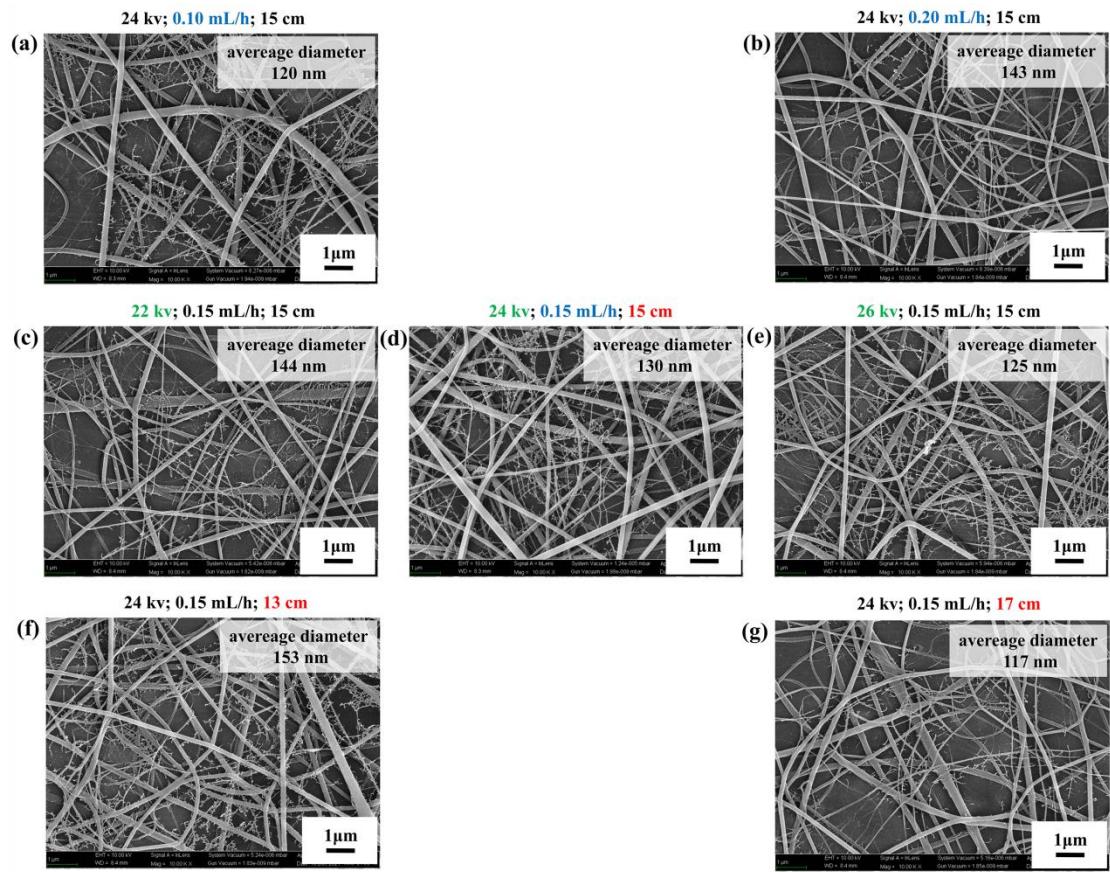


Figure S7. The SEM images of the PA6/PVP@3CS nanofibrous membrane with different electrospinning parameters (voltage, supply rate of solution and distance between electrode and collector): (a) 24 kv, 0.1 mL/h, 15 cm; (b) 24 kv, 0.3 mL/h, 15 cm; (c) 22 kv, 0.15 mL/h, 15 cm; (d) 24 kv, 0.15 mL/h, 15 cm; (e) 26 kv, 0.15 mL/h, 15 cm; (f) 24 kv, 0.15 mL/h, 13 cm; and (g) 24 kv, 0.15 mL/h, 17 cm.

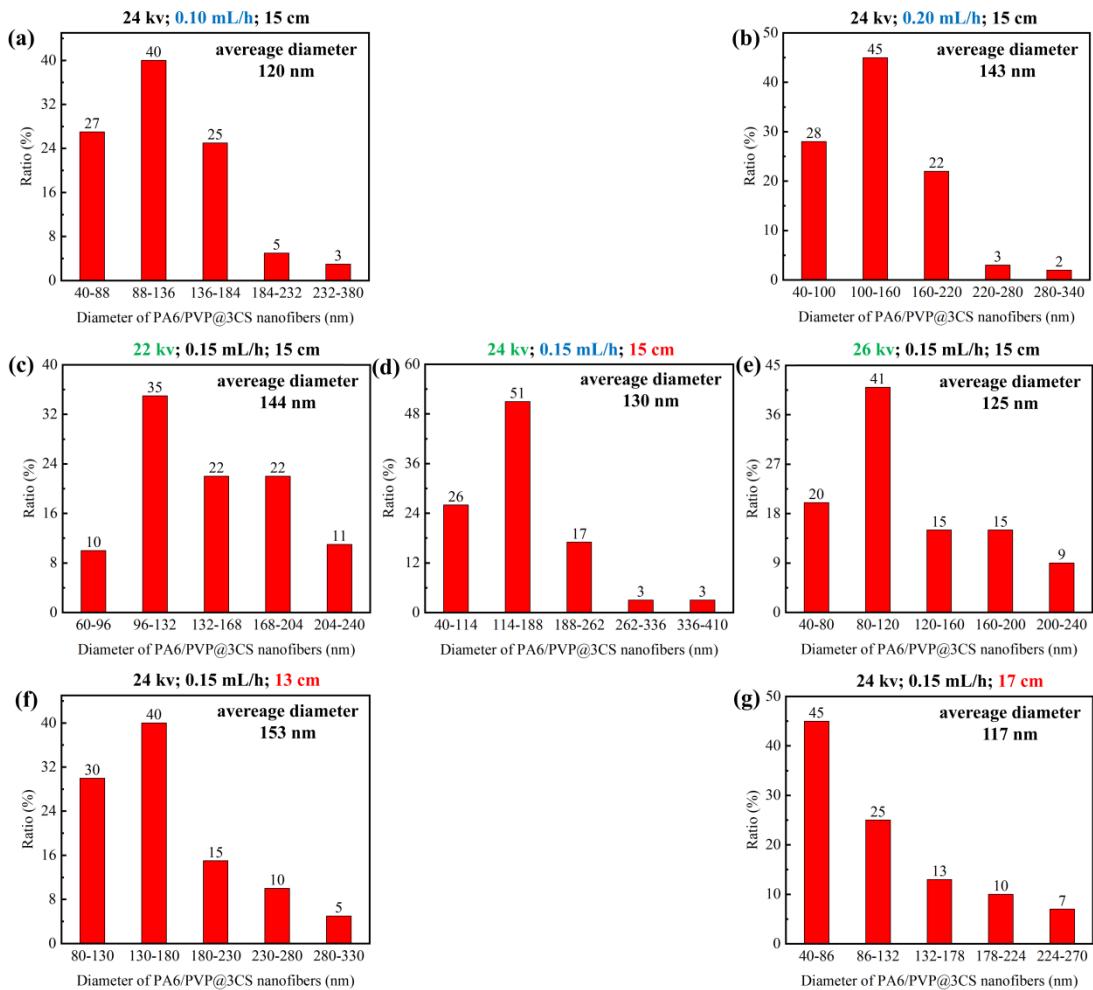


Figure S8. The diameter distributions of the PA6/PVP@3CS nanofibrous membrane with different electrospinning parameters (voltage, supply rate of solution and distance between electrode and collector): **(a)** 24 kv, 0.1 mL/h, 15 cm; **(b)** 24 kv, 0.3 mL/h, 15 cm; **(c)** 22 kv, 0.15 mL/h, 15 cm; **(d)** 24 kv, 0.15 mL/h, 15 cm; **(e)** 26 kv, 0.15 mL/h, 15 cm; **(f)** 24 kv, 0.15 mL/h, 13 cm; and **(g)** 24 kv, 0.15 mL/h, 17 cm.

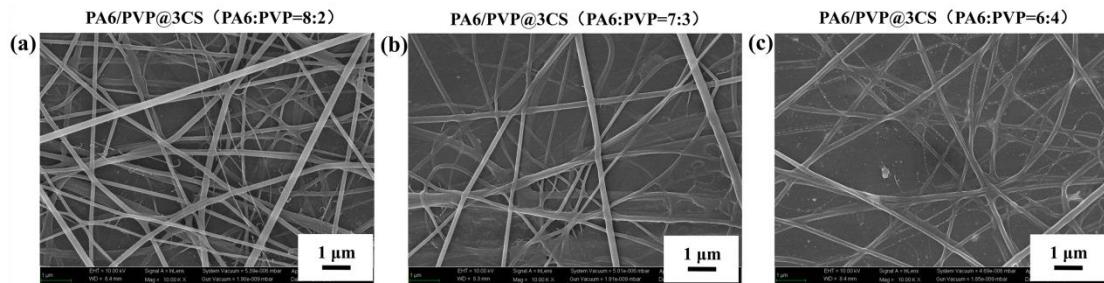


Figure S9. SEM images of PA6/PVP@3CS nanofibers with different PA6 and PVP ratios: (a) PA6/PVP=8:2, (b) PA6/PVP=7:3, and (c) PA6/PVP=6:4.

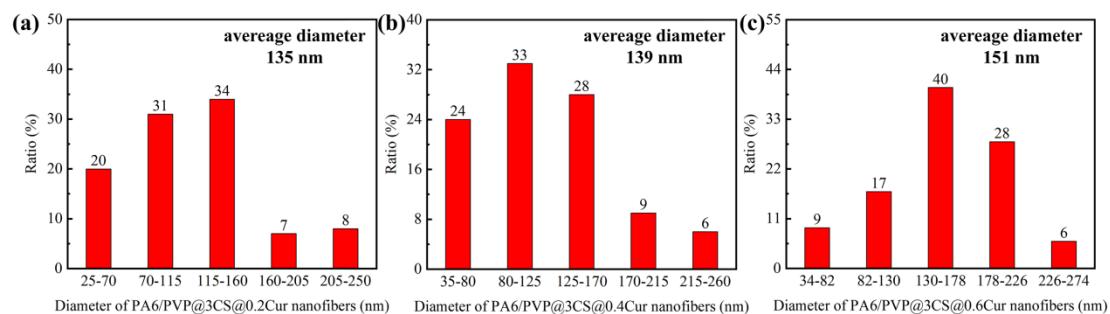


Figure S10. The diameter distributions of the PA6/PVP@3CS@Cur nanofibrous membrane with different concentration of the Cur: (a) 0.2 wt%; (b) 0.4 wt%; and (c) 0.6 wt%.

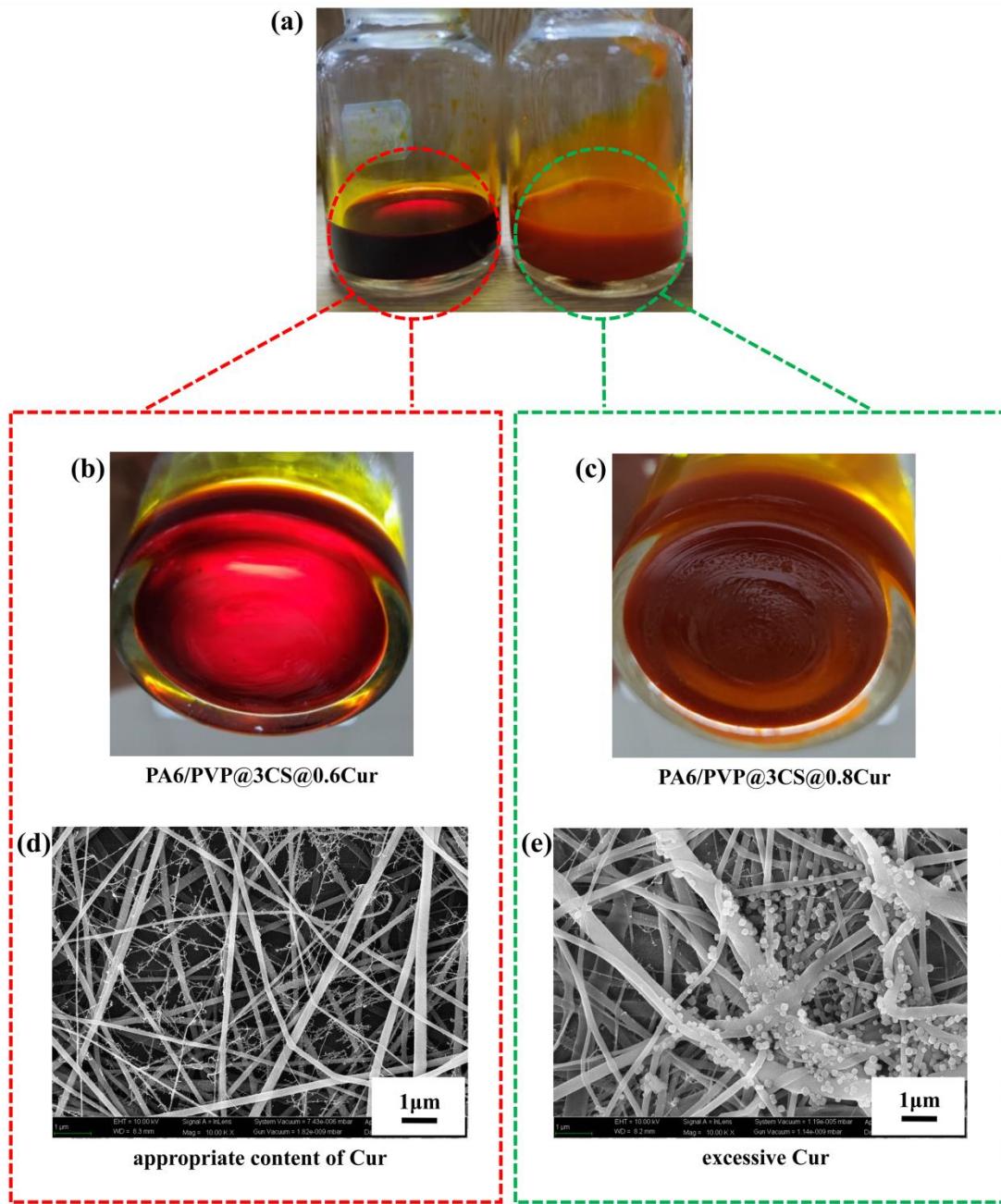


Figure S11. (a) Photo images of the PA6/PVP@3CS@0.6Cur and PA6/PVP@3CS@0.8Cur solution. (b) Photo image of the PA6/PVP@3CS@0.6Cur solution. (c) Photo image of the PA6/PVP@3CS@0.8Cur solution. (d) SEM image of the PA6/PVP@3CS@0.6Cur nanofibers. (e) SEM image of the PA6/PVP@3CS@0.8Cur nanofibers.

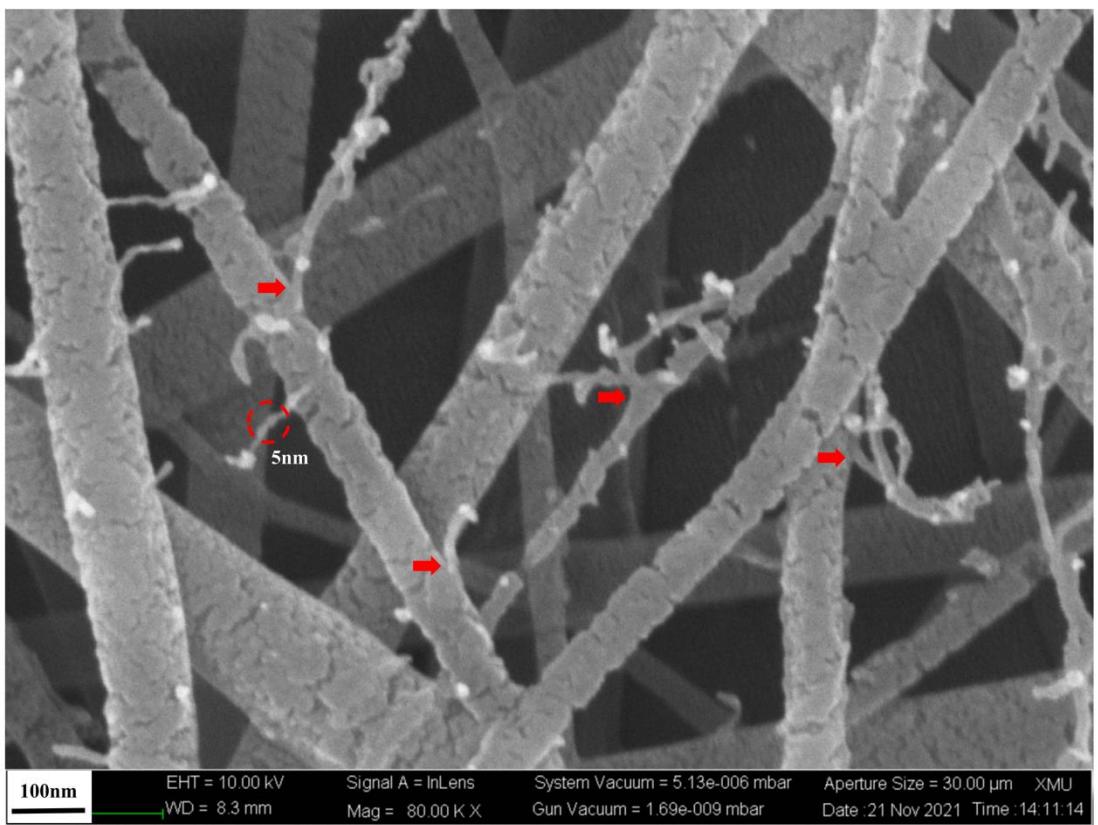


Figure S12. SEM image of the PA6/PVP@3CS nanofibers with the magnification of 80,000 \times .

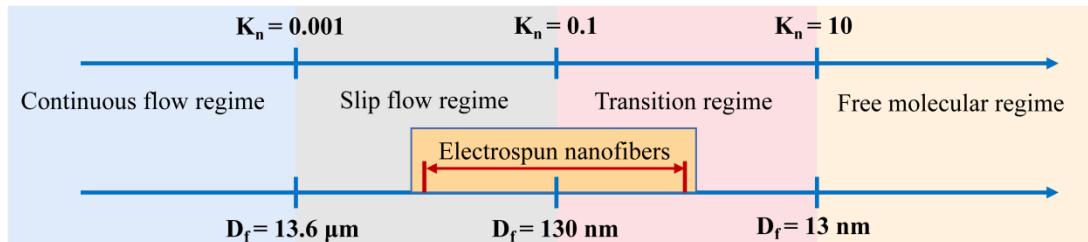
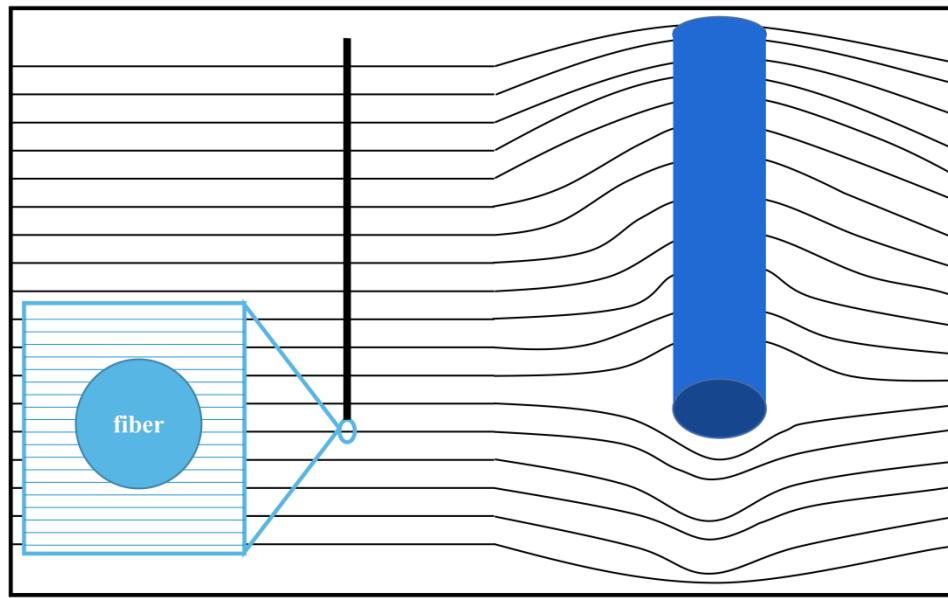


Figure S13. Theoretical diagram of slip effect of single fiber. The air streamline will not be affected when the fiber diameter is less than 13 nm. Where, K_n and D_f stands for Knudsen Number and the diameter of fibers, respectively.

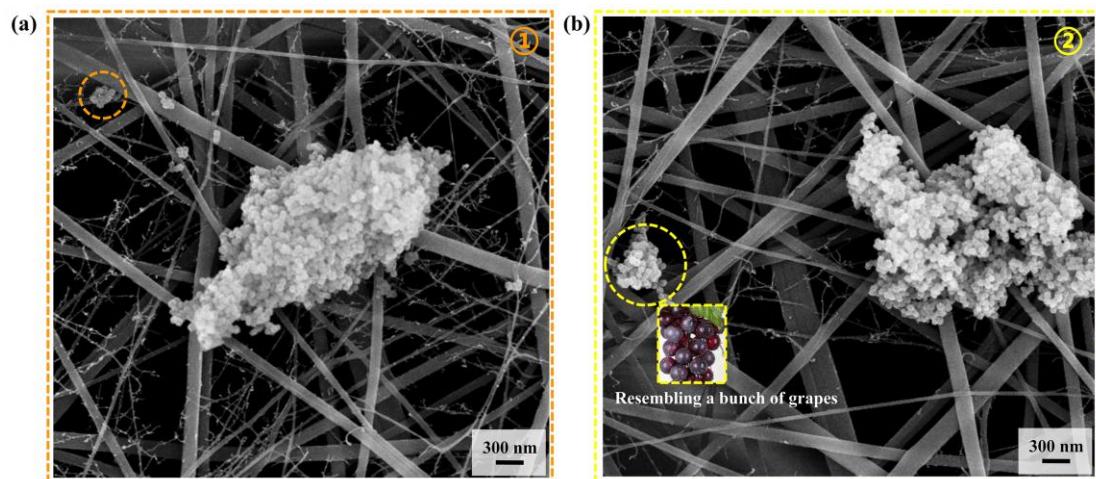


Figure S14. Partial enlarged view of (a) area 1 and (b) area 2 in Figure 9c.

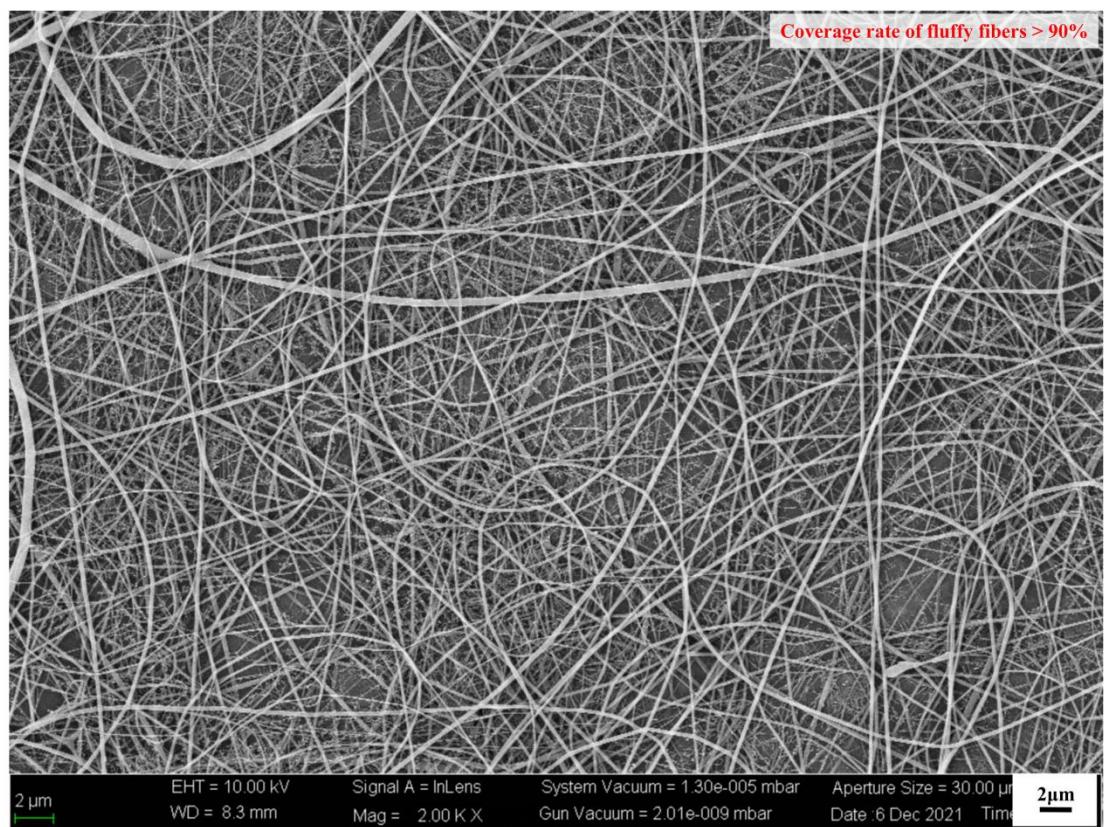


Figure S15. The SEM image of the PA6/PVP@CS@Cur fluffy nanofibrous membrane, which the coverage rate of fluffy nanofibers was more than 90%. The magnification is 2,000 \times .

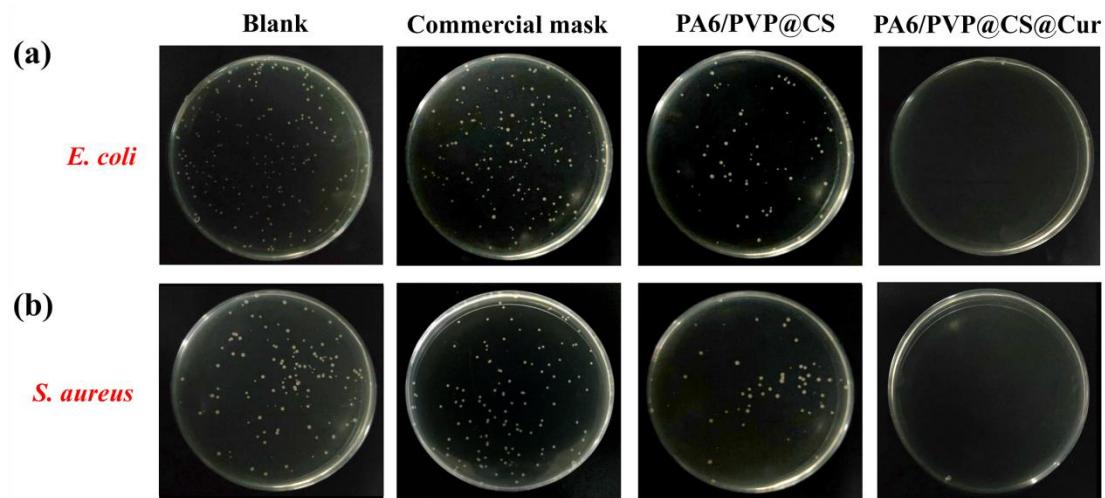


Figure S16. Photo images of plate incubation of (a) *E. coli* and (b) *S. aureus*.