

Supporting information

Improved antifouling and antimicrobial efficiency for the ultrafiltration membrane by functional carbon nanotubes

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Antibacterial experiments: The bacterial adhesion on membrane surfaces were investigated by using *Escherichia coli* (*E. coli*, ATCC 6538, Gram negative) and *Staphylococcus aureus* (*S. aureus*, ATCC 25922, Gram positive) as model bacteria. The membrane was incubated in 10^6 colony forming unit (CFU) bacteria suspension for 12 h and the live/dead bacterial cells were stained using LIVE/DEAD[®] BacLight Bacterial Viability Kits as instructed; and the images were obtained on a fluorescence microscopy (DMIRE2, Leica). The average adhered bacterial amounts for the samples were estimated by at least 6 fluorescence images.

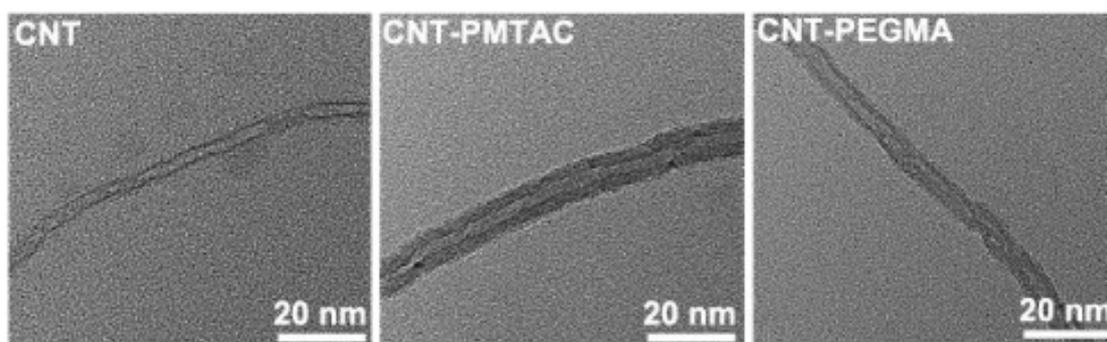


Fig. S1. TEM images for CNT, CNT-PMTAC and CNT-PEGMA, respectively. Scale bar: 20nm.

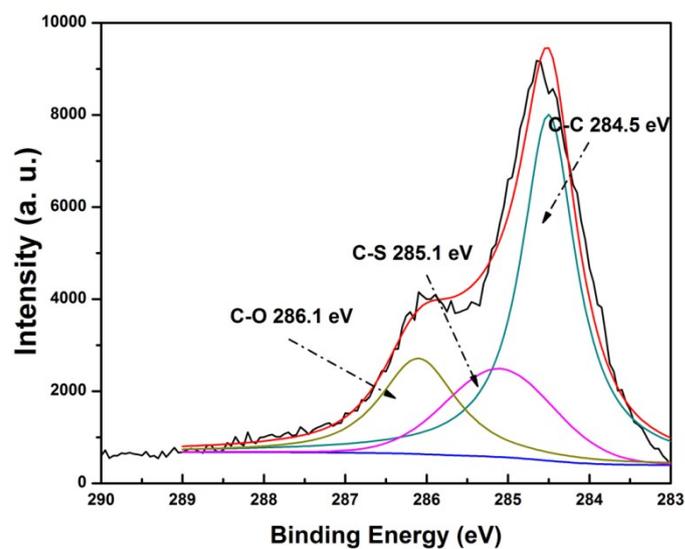


Fig. S2. XPS C1s spectrum for neat PES membrane. Three characteristic peaks were detected: the peak at 284.5 eV was attributed to the carbon skeleton for PES; and the signals around 285.1 eV and 286.1 eV were attributed to the C-S groups and C-O group respectively.

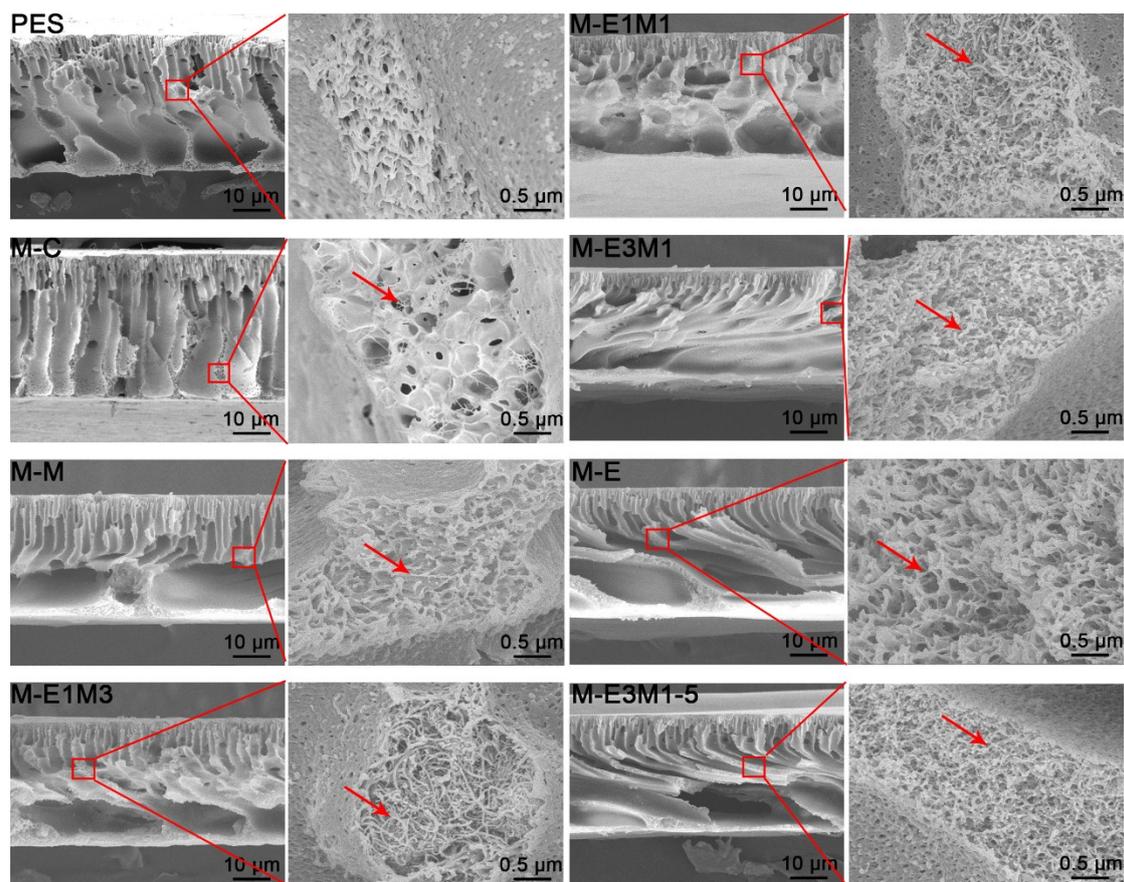


Fig. S3. Cross-sectional SEM images for the pristine and composite PES membranes, for which the microstructures of the p-CNTs were pointed with red arrows.

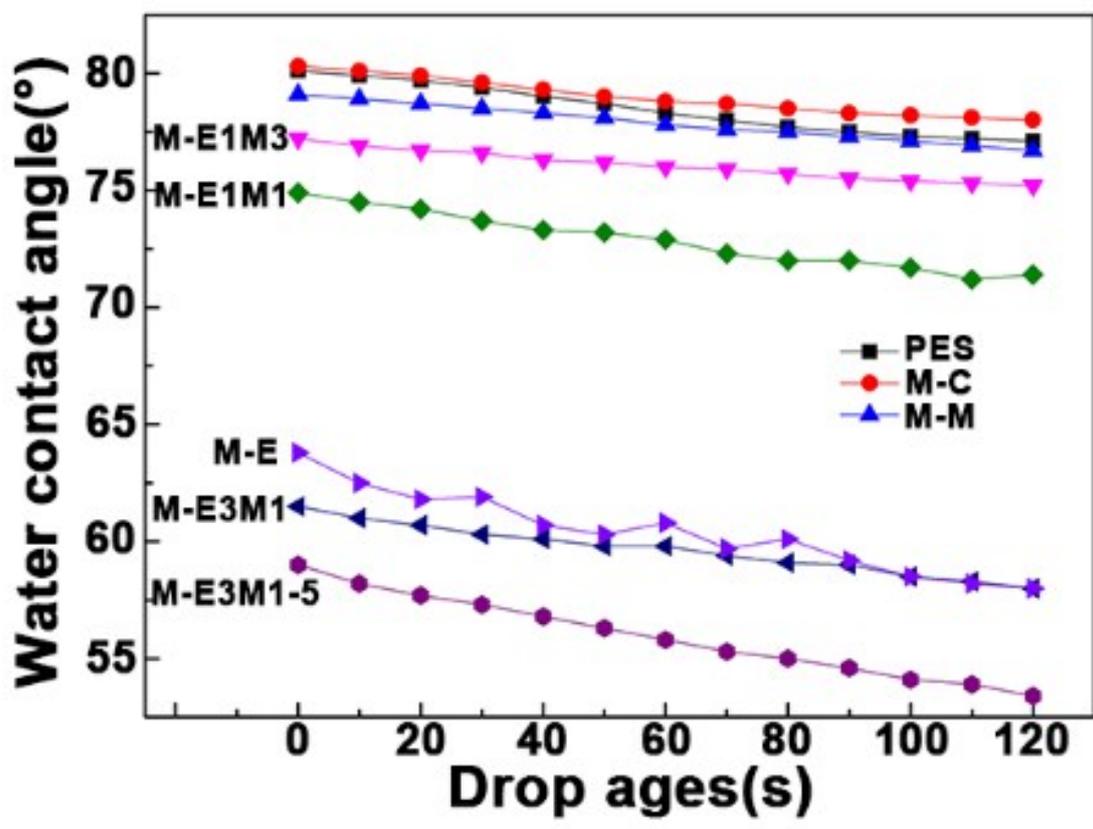


Fig. S4. Water contact angle changes with prolonging the contacting time.

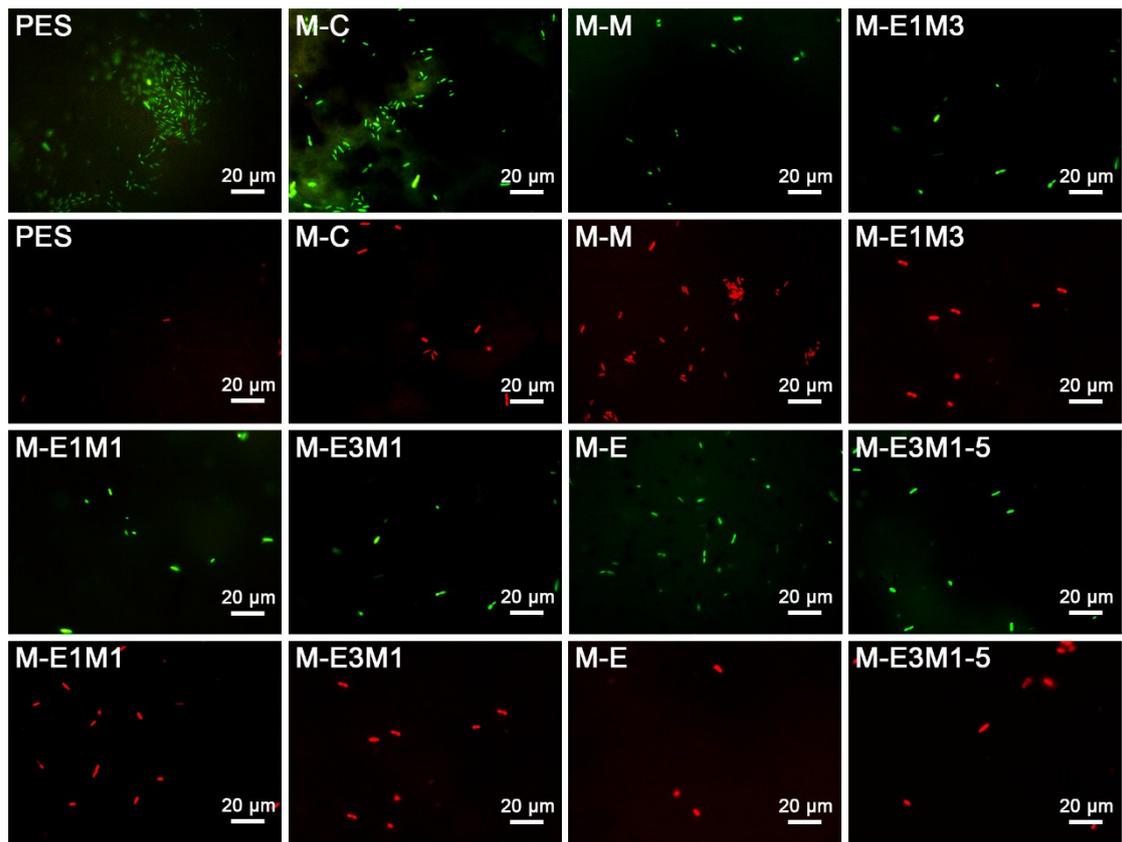


Fig. S5. Fluorescence microscopy images for the adhered *E. coli* (green staining shows live bacteria, while red staining shows dead bacteria).

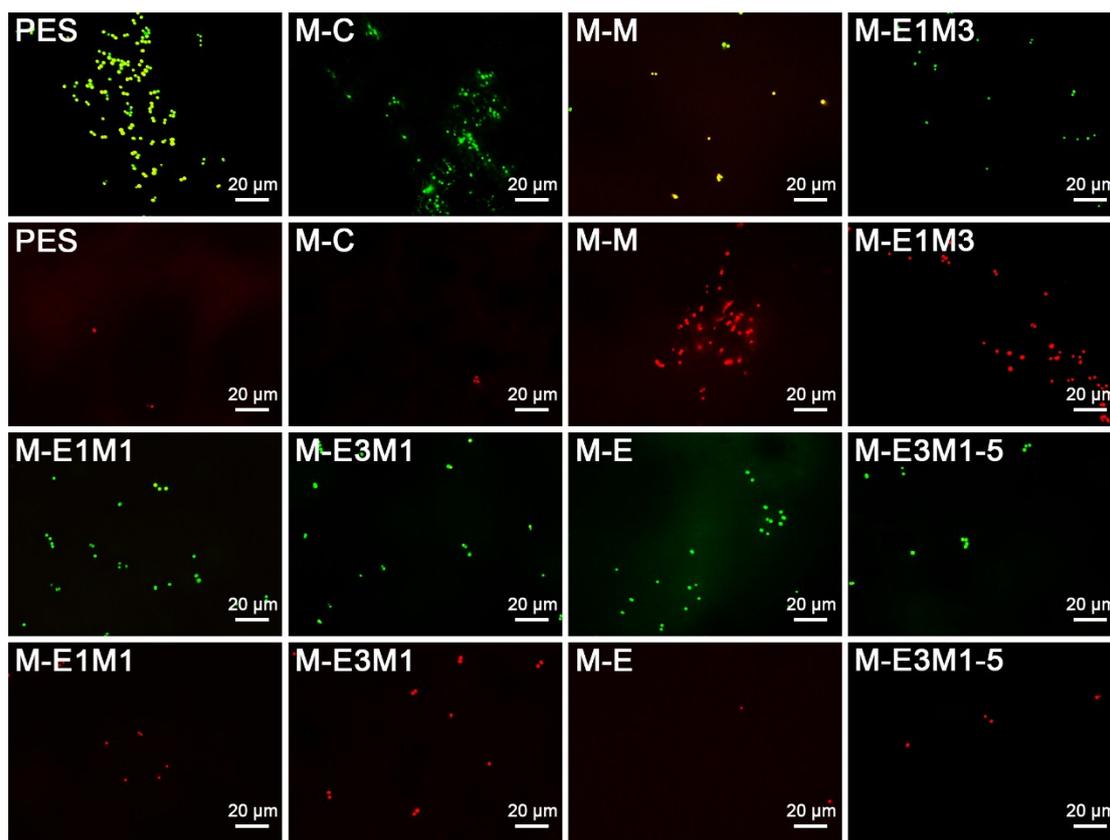


Fig. S6. Fluorescence microscopy images for the adhered *S. aureus* (green staining shows live bacteria, while red staining shows dead bacteria).

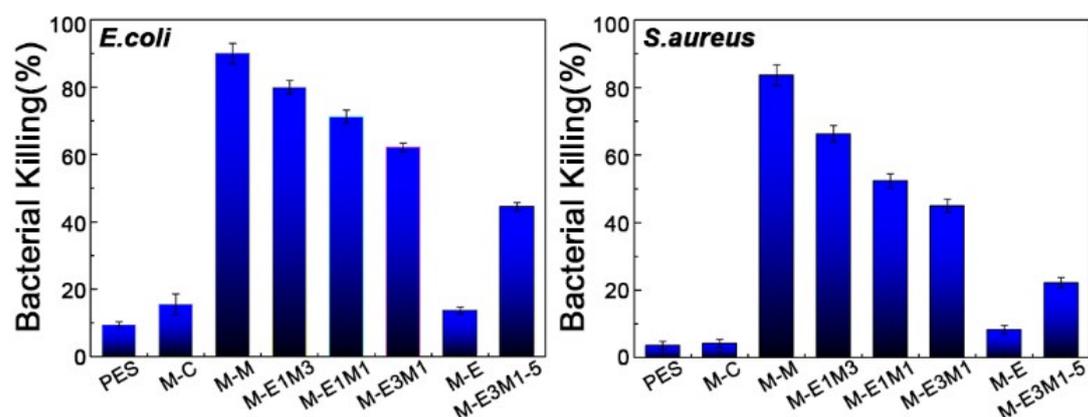


Fig. S7. Bacterial killing percentages for the membranes. Values are expressed by mean \pm SD, n=6.

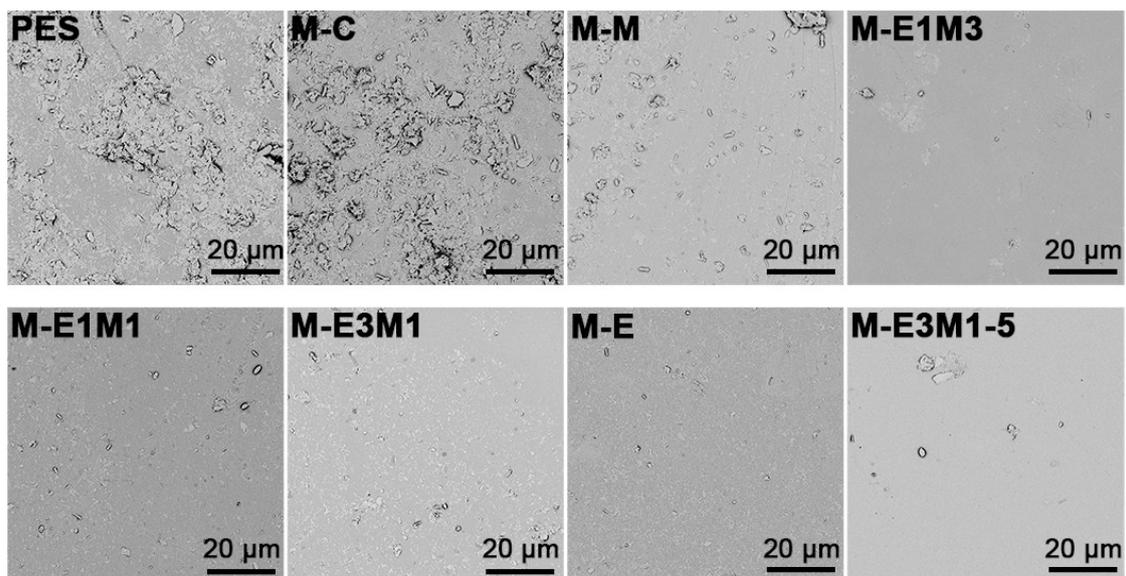


Fig. S8. Unmarked SEM images of the microbes adhered on the membranes. Scale bar: 20 μm .