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Supporting Information

Concurrent filtration and inactivation of bacteria using poly (vinylalcohol-*co*-ethylene) nanofibrous membrane facilely modified by chitosan and graphene oxide

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Membranes characterization

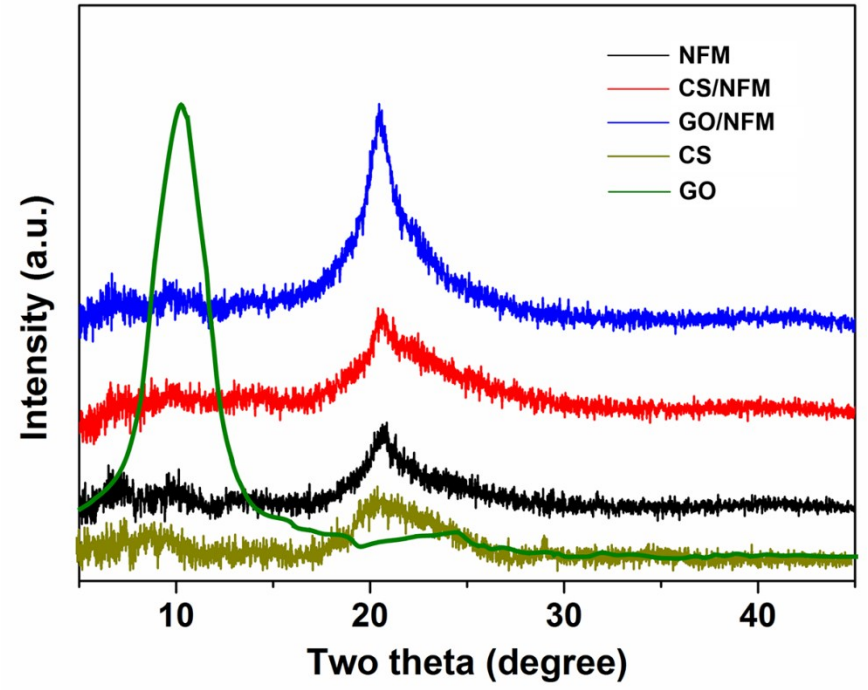

Fig. S1 XRD diagrams of NFM, CS/NFM, GO/NFM, CS and GO

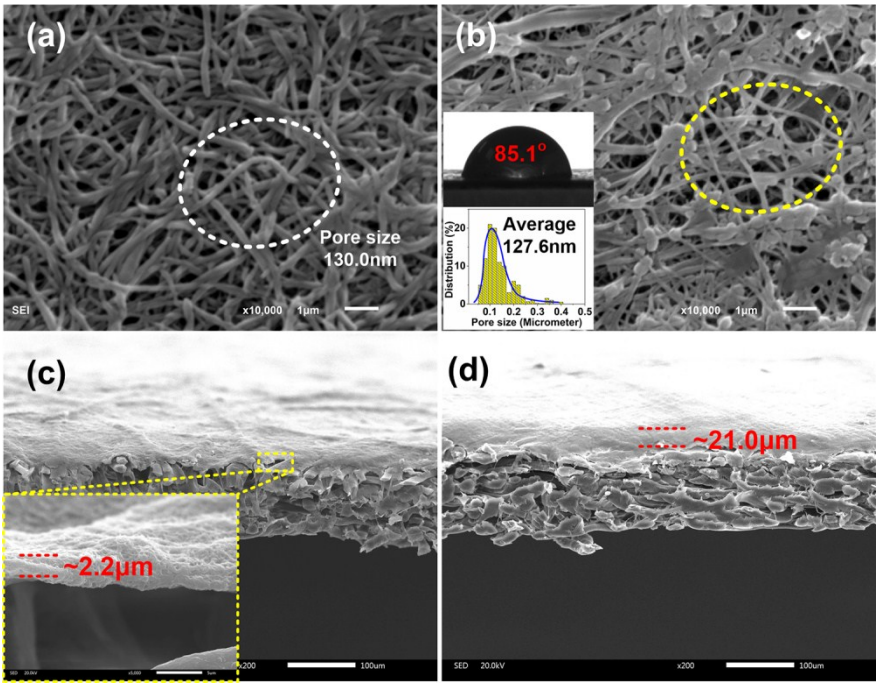

Fig. S2 (a) (b) Surface morphology and (c) (d) cross section view of NFM (left) and PVDF membrane (right)

Stability of CS and GO in nanofibrous membrane

The UV-vis absorption spectra of GO suspension with various concentration and the corresponding fitting curve are plotted in Fig. S3. The absorbance intensity of GO released in pure water and the content of GO introduced in GO/NFM sample (28.3 cm^2 area, 6 cm in diameter) were measured as 0.001 a. u. and 20mg, respectively. By using the following fitting function $Y = -0.00308 \cdot \left(1\text{-}e^{1.56597X}\right)$ (where Y is the concentration of pigment nanoparticle content, X is the UV absorbance intensity at wavelength of 228nm), the concentration of GO released to pure water and release rate of GO is estimated as 4.8 μg/L and 0.43 %, respectively. It should be noted that the accuracy of spectrum intensity in UV-vis measurement (model: UV-2550, Shimadzu, China) is 0.001 (a. u.). thus it can be concluded that the concentration of released GO is no higher than 4.8 μg/L and release rate of GO is no higher than 0.43% in present leaching test.

To date, there is no standard formulated about the maximal concentration limit of GO in drinking water. But we can reference the information of another common antibacterial material Ag: the limit is 100 μg/L in the U.S. Environmental Protection Agency regulation and the World Health Organization Guideline [1]. Obviously, 4.8 μg/L is much lower than 100μg/L. Additionally, it has been reported that the GO is less harmful to human being especially in low content [2]. Therefore, even some GO releases from our membrane, the content is low enough that it cannot impact the quality of treated water by our membrane.

Chitosan is one natural polymer which cannot be dissolved in water. The released chitosan to pure water should be in form of particles and can be investigated by UV-vis measurement. The UV-vis absorbance intensity of filtrate through CS/NFM in the leaching test is zero in the wavelength range of 200 nm to 800 same to pure water indicating the excellent combination of chitosan with nanofibrous membrane.

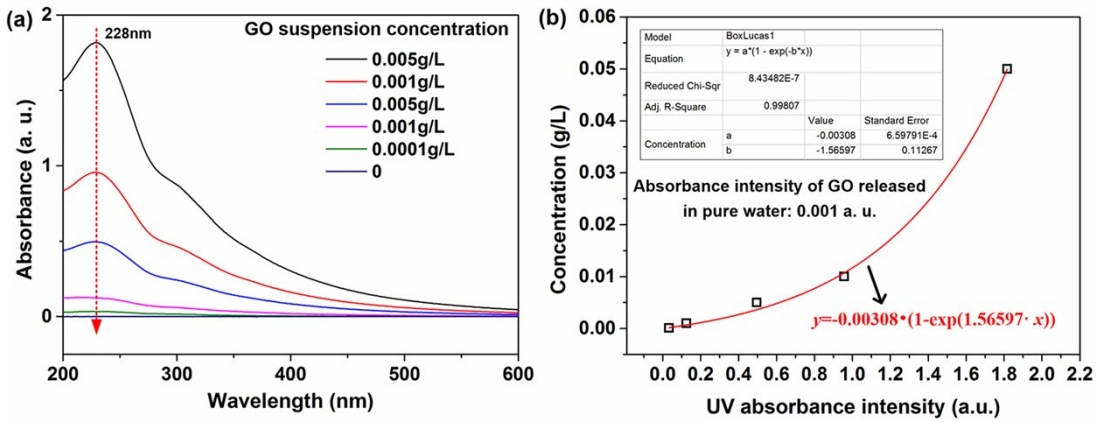

Fig. S3 (a) UV-vis absorption spectra of GO suspension with various concentration, (b) relationship between concentration of GO suspension and UV-vis absorbance intensity at wavelength of 228nm

Filtration and inactivation behavior of membranes against bacteria

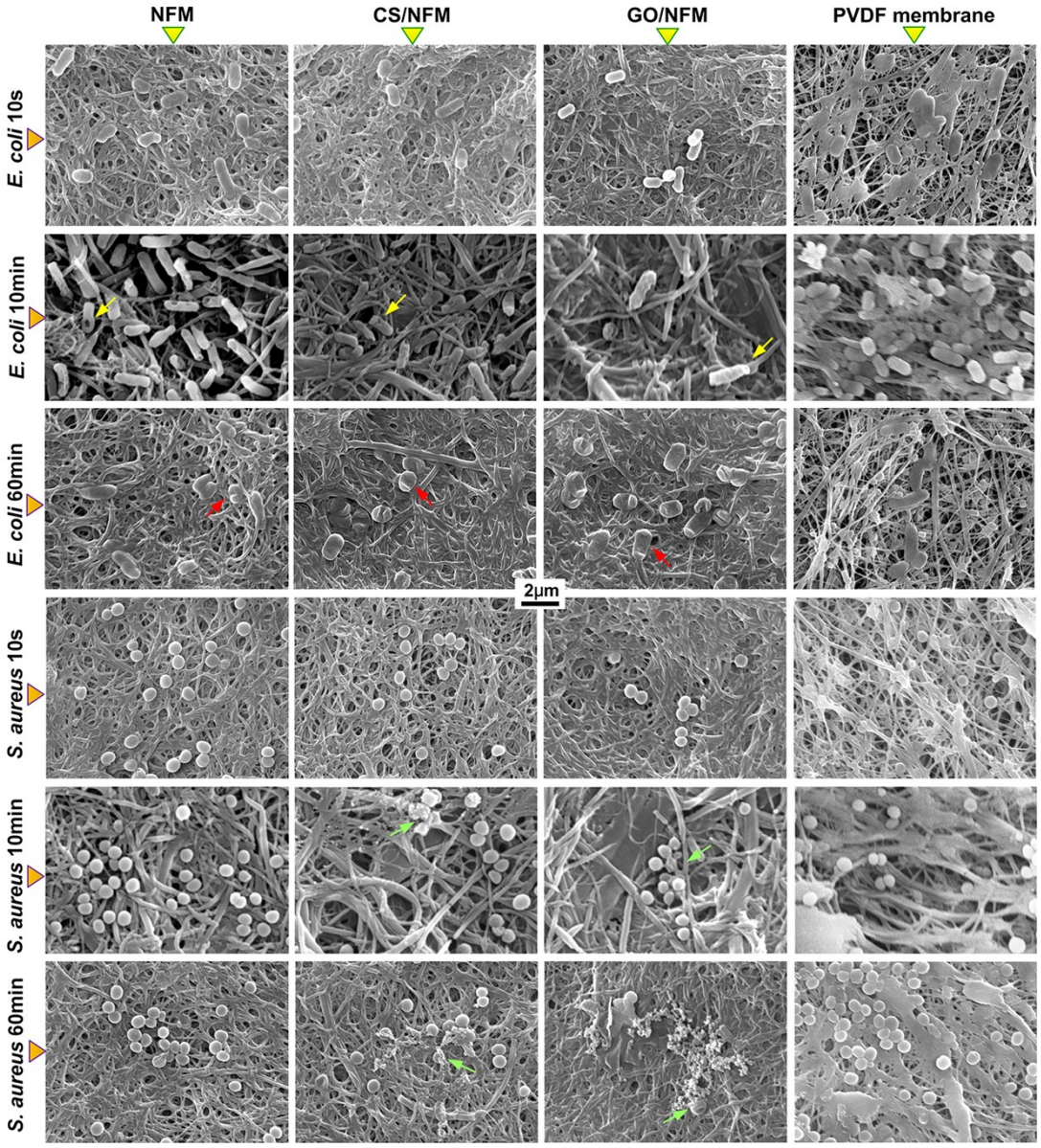

Fig. S4 SEM of membranes' surface after the filtration of bacterial suspension with contacting time for 10s, 10min and 60min, respectively.

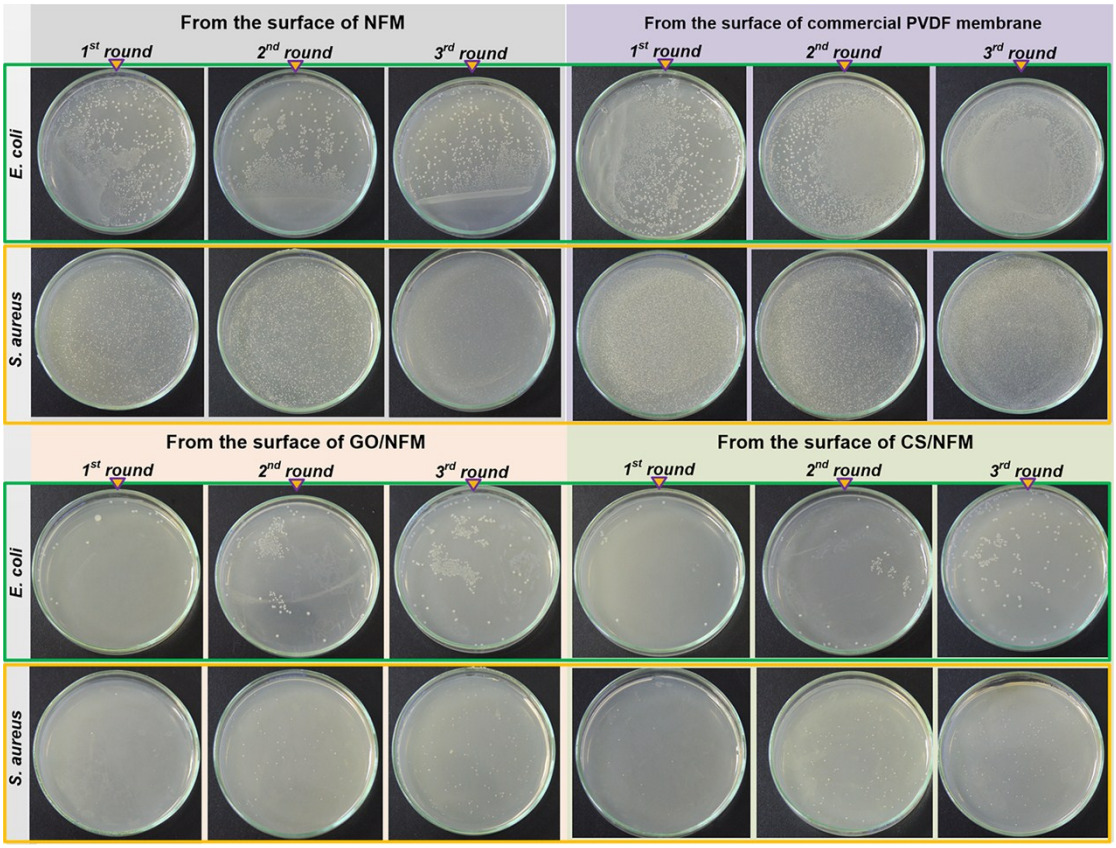

Fig. S5 The viable bacteria cells on the agar plates from the surface of membranes in repetitive tests

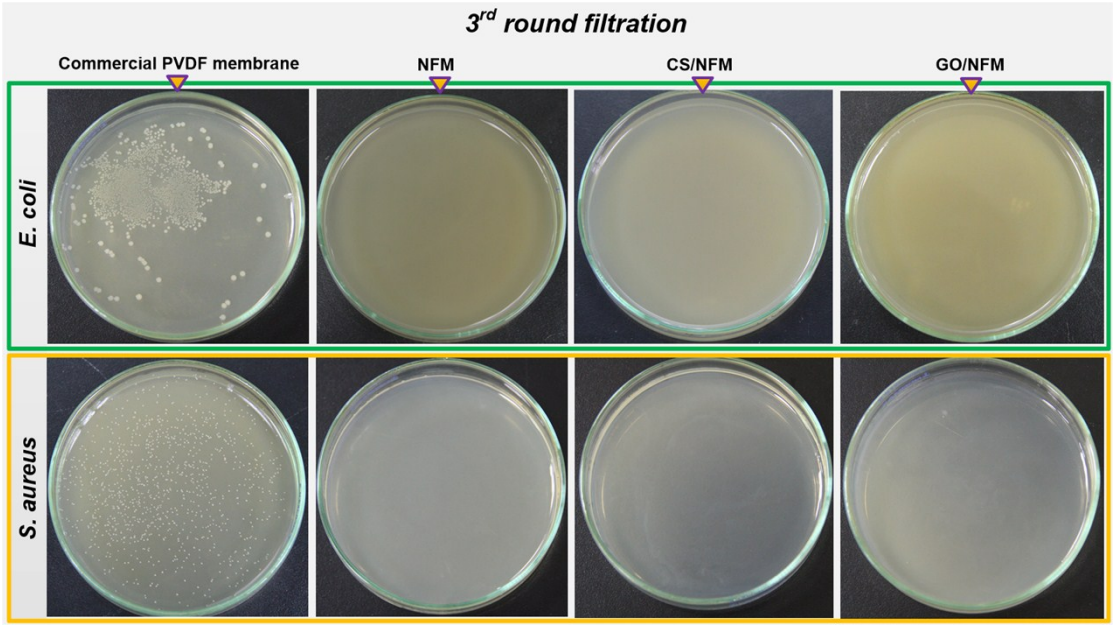

Fig.S6 The viable bacteria cells on the agar plates from the filtrate in repetitive tests

Reference

[1] Journal of Membrane Science, **2014**,471, 274-284

[2] Nature Nanotechnology, **2013**, 8, 594-601