- Supplementary Information -

Underwater Superoleophobic Nanofibrous Cellulosic Membrane for Oil/Water Separation with High Separation Flux and High Chemical Stability

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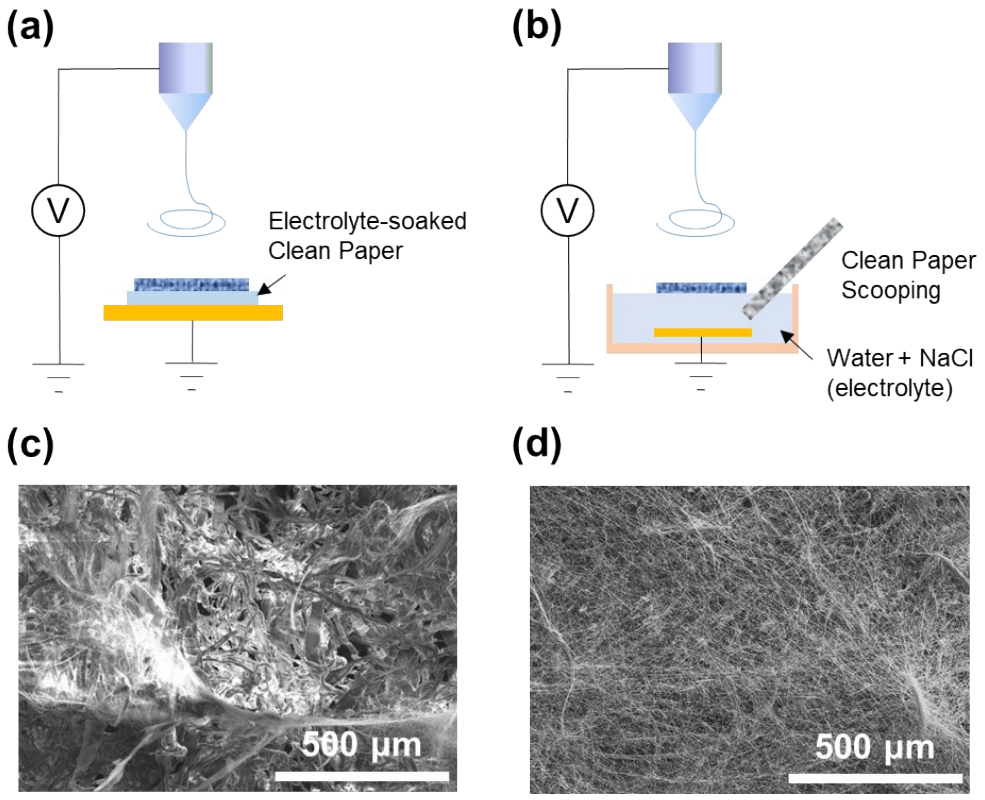

Fig. S1 Schematic of electrospinning cellulose acetate (CA) nanofibrous membrane using (a) electrolyte soaked clean paper as the collector and (b) electrolyte surface as the collector. (c) and (d) shows the respective SEM image of the resulting CA nanofibrous membrane from (a) and (b).

Fig. S1a, b introduces two different electrospinning methods for fabricating the NFC membrane: using an electrolyte-soaked clean paper as the collector and using electrolyte surface as the collector. As it is shown in Fig. S1 c, the resulting CA nanofibrous membrane is unevenly formed on the electrolyte-soaked clean paper as bare areas of the clean paper are exposed while clusters of CA nanofibers are formed in selective areas. Fig. S1 d shows the evenly formed CA nanofibrous membrane, scooped with the clean paper, which effectively covers the whole area.

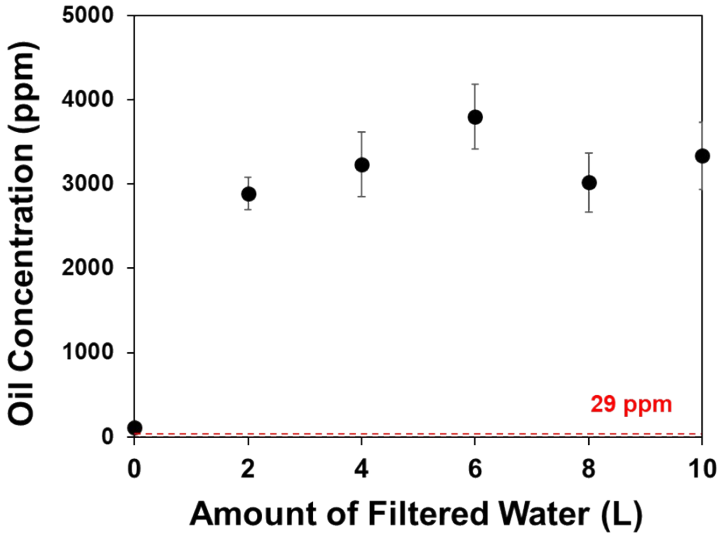

Fig. S2 Repetitive oil/water separations using only the clean paper. The red dotted line at 29 ppm indicates the maximum oil concentration regulated by the U.S. Environmental Protection Agency. The test had been carried out using mineral oil.

Fig. S2 shows the repetitive oil/water separations using only the clean paper. For the NFC membrane, the oil concentration in filtrate stayed below 29 ppm throughout the whole separation process up to 10 L. On the other hand, the oil concentration in the filtrate for the clean paper was around 100 ppm for the very first separation and it skyrocketed to around 3000-4000 ppm after it had processed over 2 L of oil/water mixture. This can be held accountable to the low oil intrusion pressure of the clean paper: 1.2kPa. Without the CA nanofibrous membrane, the clean paper seemed to had been penetrated by oil during the first cycle of oil/water separation (2 L of oil/water mixture). It is suspected that the poor oil intrusion pressure of the clean paper is low enough for the kinetic energy of the oil content (being poured down into the separation device by gravity) to break through. Once the clean paper is penetrated by oil, that specific region becomes a constant source of oil leakage, which explains the constantly high oil concentration in the filtrate after the first cycle of oil/water separation.