Supporting Information

Voltage-Gated Transport of Nanoparticles across Free-Standing All-Carbon-Nanotube-based Hollow-Fiber Membranes

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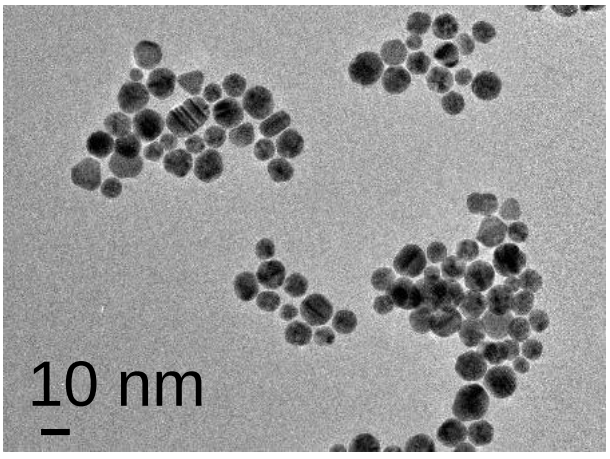

Figure S1. Transmission electron microscope image of 10 nm GNPs.

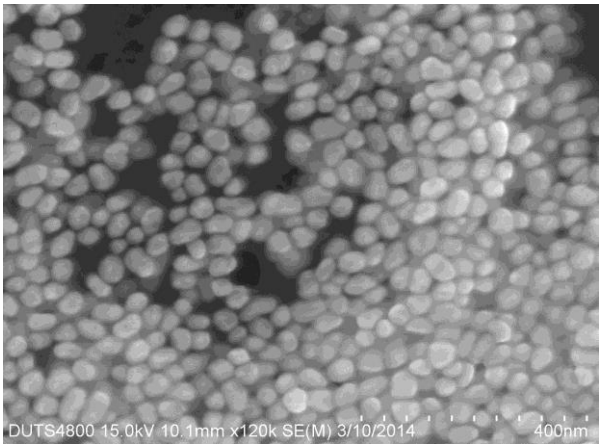

Figure S2. Scanning electron microscope image of 40 nm GNPs.

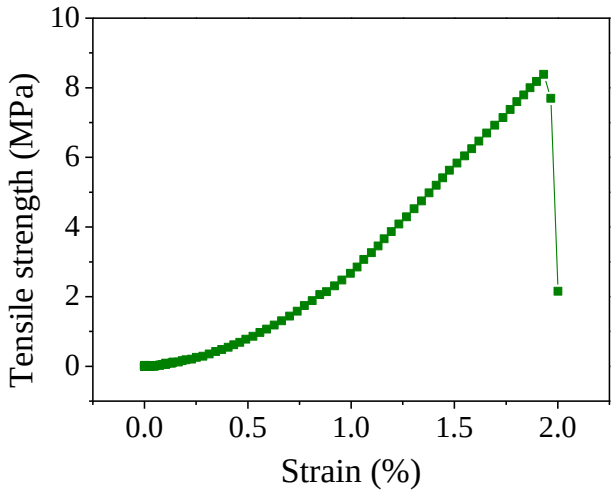

Figure S3. Typical stress-strain curve of prepared CNT hollow-fiber membrane.

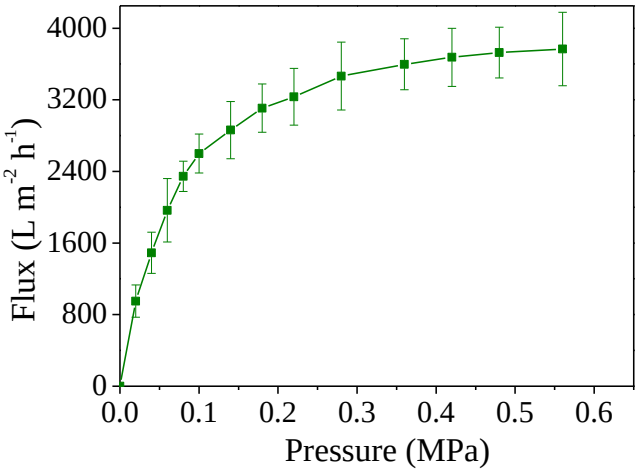

Figure S4. The transmembrane flux as a function of pressure.

Because of hydrophobicity of original CNT hollow-fiber membranes, water is not capable of wetting their pore channels at low pressure. Therefore, we firstly filter anhydrous ethanol at a pressure of 0.01 MPa to wet the pores. Subsequently, their pure water flux is measured. As shown in Figure S4, the permeation flux of CNT

hollow-fiber membranes does not reveal a sharp increase during the increasing process of pressure, which suggests the membrane structure is not destroyed by the water pressure even it is up to 0.52 MPa. So the maximum transmembrane pressure that the CNT membranes can withstand is higher than 0.5 MPa.

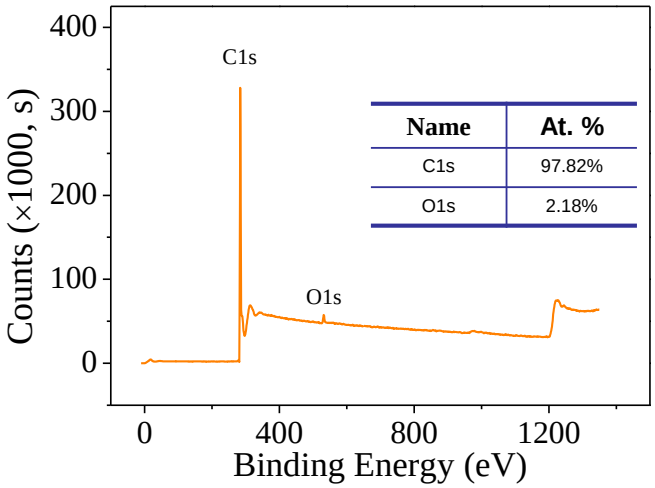

Figure S5. The X-ray photoelectron spectroscopy analysis of CNT hollow-fiber membranes after calcination in a mixture flow of Ar (40 sccm) and H_2 (10 sccm) at 1000 ^{o}C for 2 h.

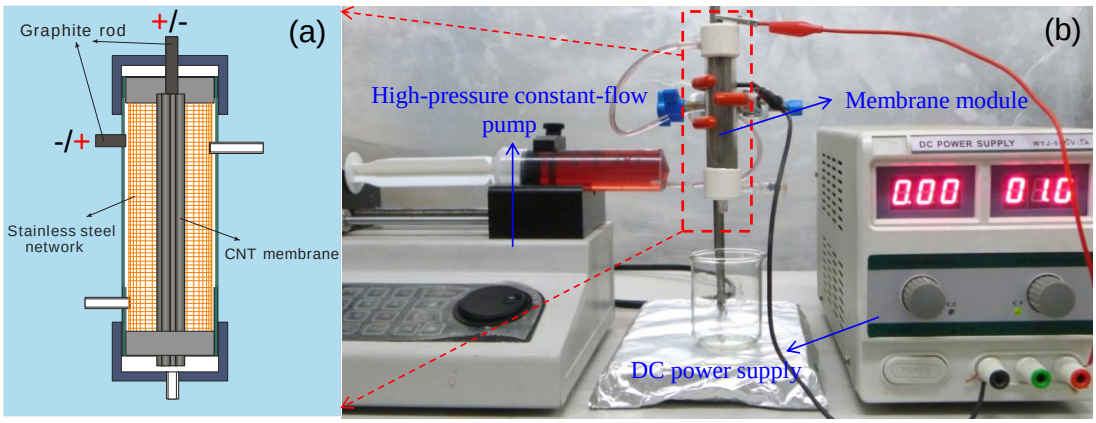

Figure S6. (a) Schematic illustration of the membrane module. (b) The experimental setup used in this work.

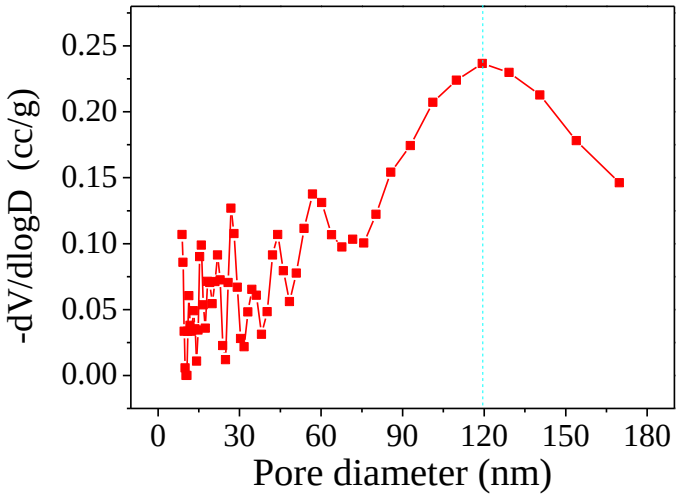

Figure S7. The pore size distribution of CNT hollow-fiber membranes. This characterization is preformed using a mercury porometer (Quantachrome PoreMaster-60GT).

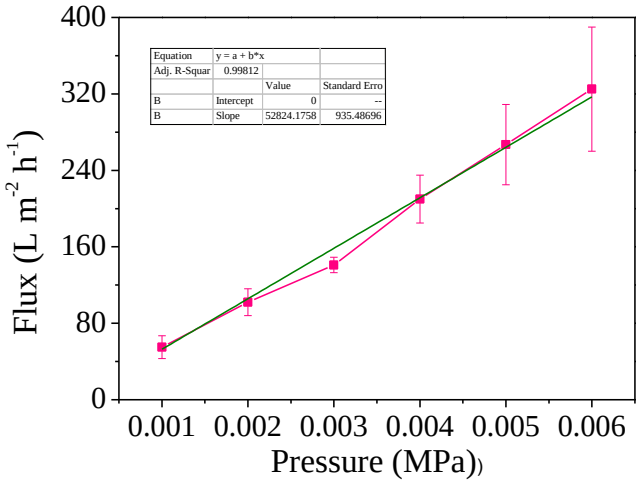

Figure S8. The flux of CNT hollow-fiber membranes as a function of pressure.

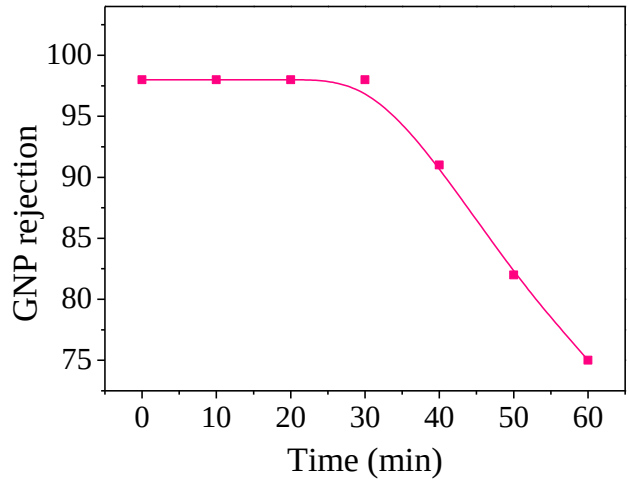

Figure S9. The GNP (40 nm) rejection as a function of operation time in absence of electricity.