Electronic Supplementary Material (ESI) for Nanoscale.

Supporting Information

Silica nanowire assemblies as three-dimensional, optically transparent platforms for constructing highly active SERS substrates

*Yinghua Liu, Chao Deng, Deliang Yi, Xingdong Wang, Yi Tang and Yajun Wang**

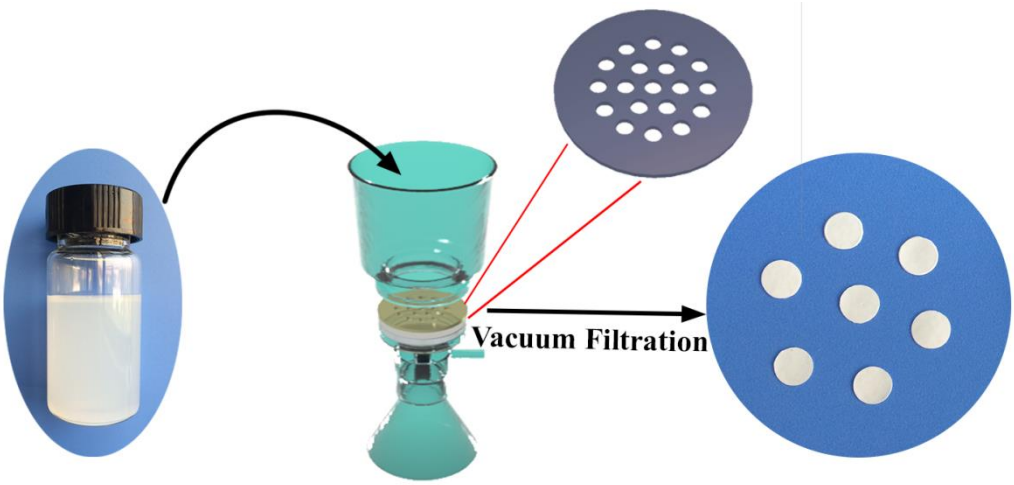

Fig. S1 The experimental setup used to assemble the free-standing SiO_2 NW membrane.

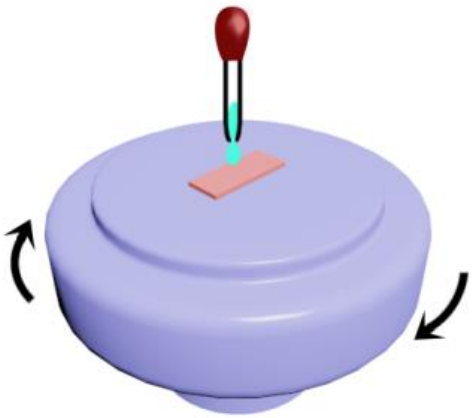

Fig. S2 The experimental setup used to assemble the Scotch tape-supported SiO_2 NW film.

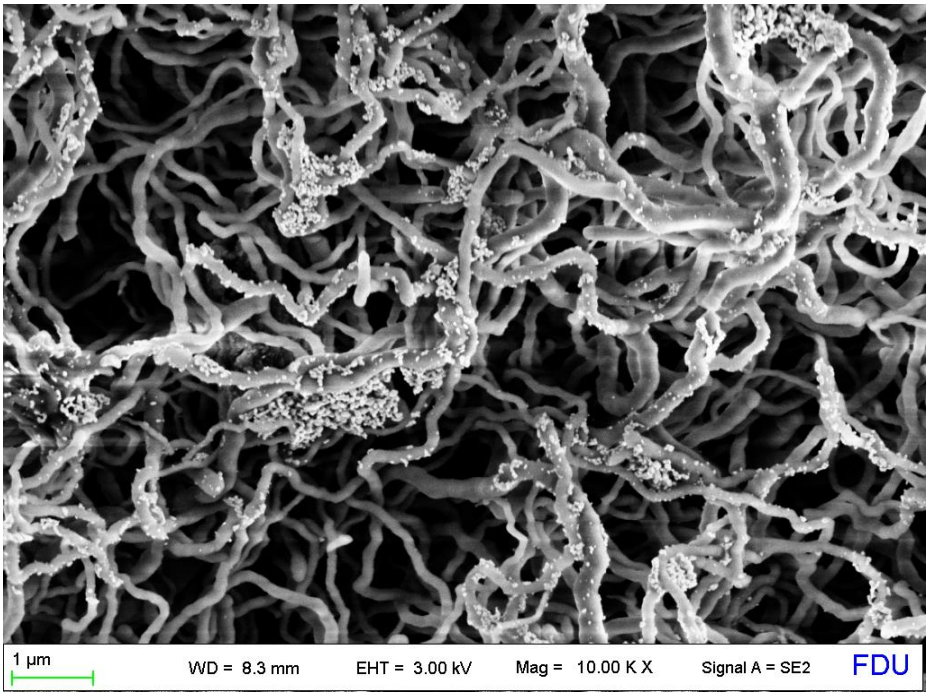

Fig. S3 SEM image of the AgNPs-deposited SiO_2 NW membrane without annealing treatment to remove the C_{18} alkyl groups from the as-prepared SiO_2 NWs.

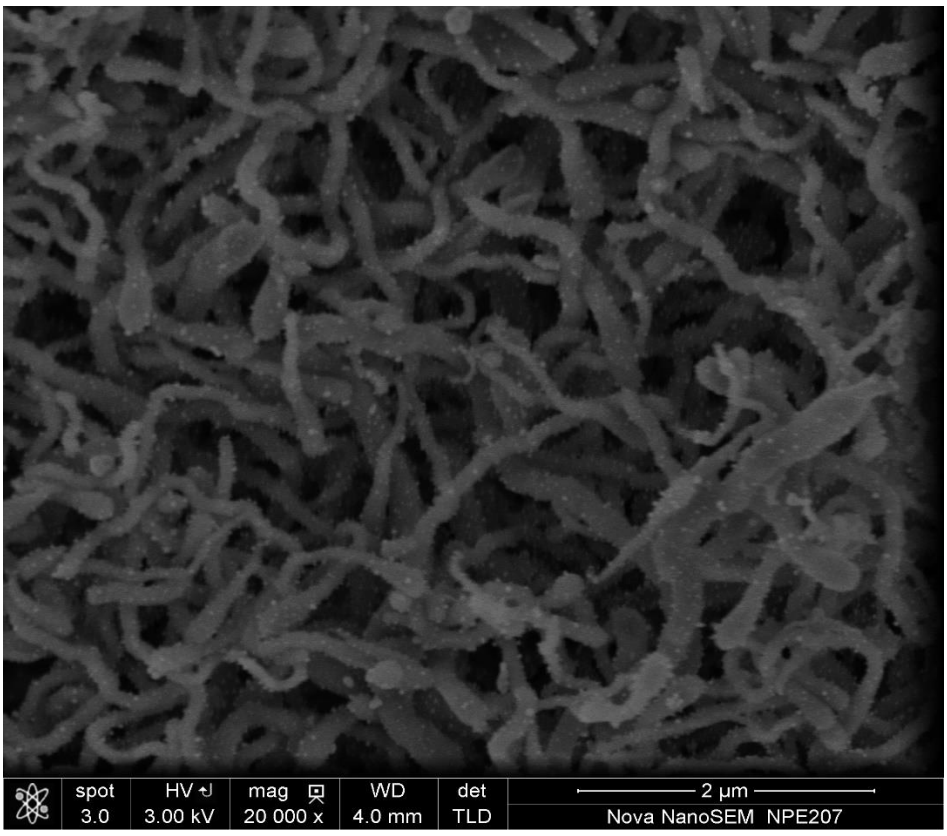

Fig. S4 SEM image of the AgNPs-deposited SiO_2 NW membrane prepared with a $AgNO_3$ concentration of 0.5 mg mL^{-1}.

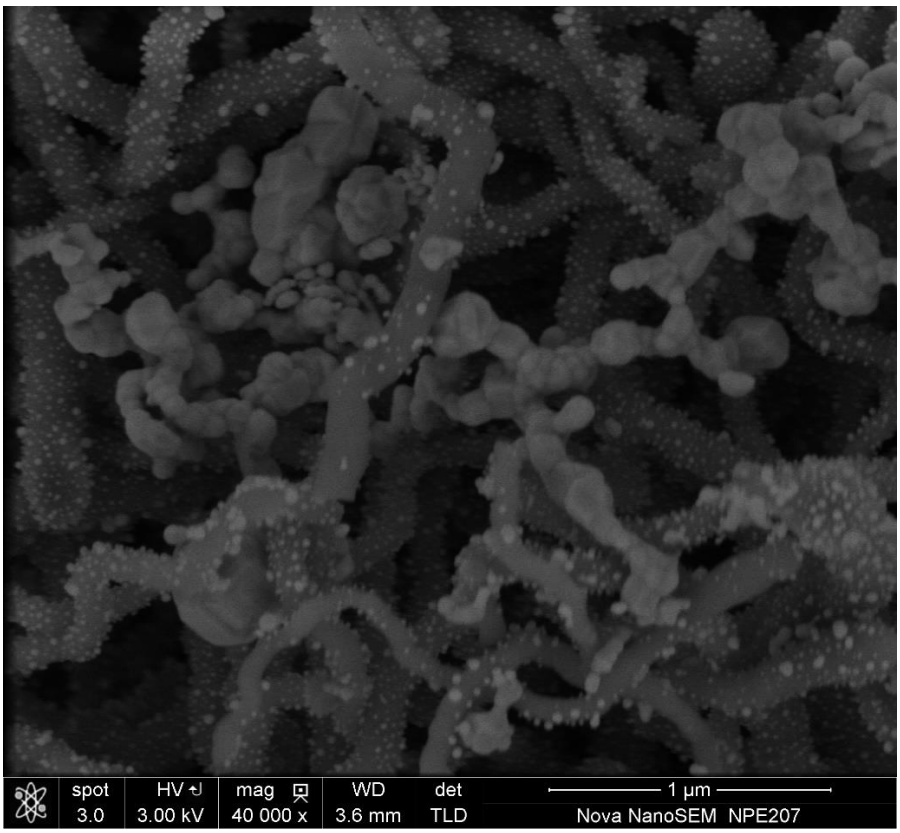

Fig. S5 SEM image of the AgNPs-deposited SiO_2 NW membrane prepared with a $AgNO_3$ concentration of 1.5 mg mL^{-1}.

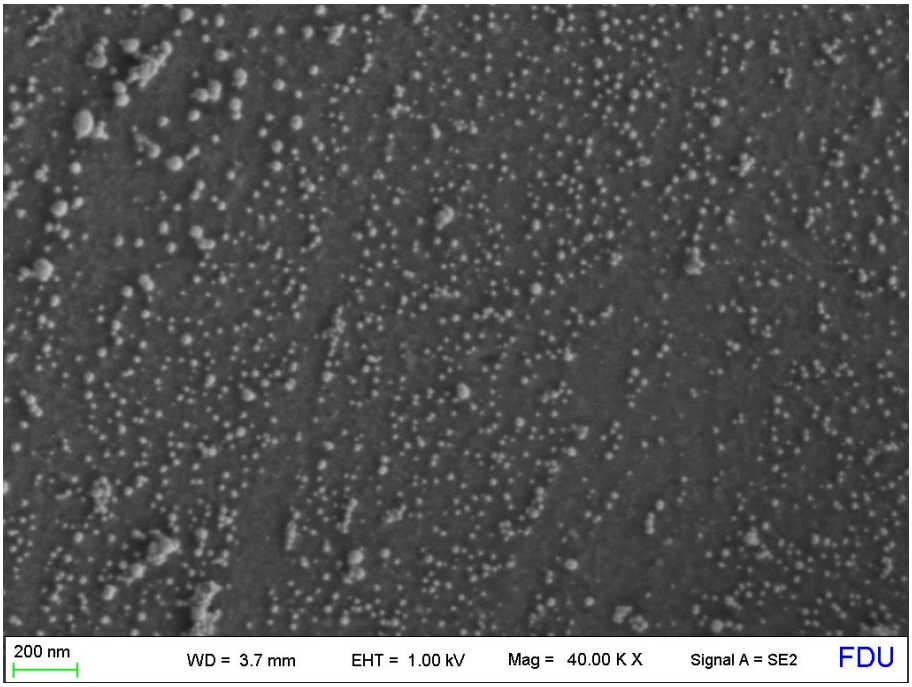

Fig. S6 SEM image of the AgNPs-deposited glass slide, which was pretreated with 0.01 M NaOH for 2 h.

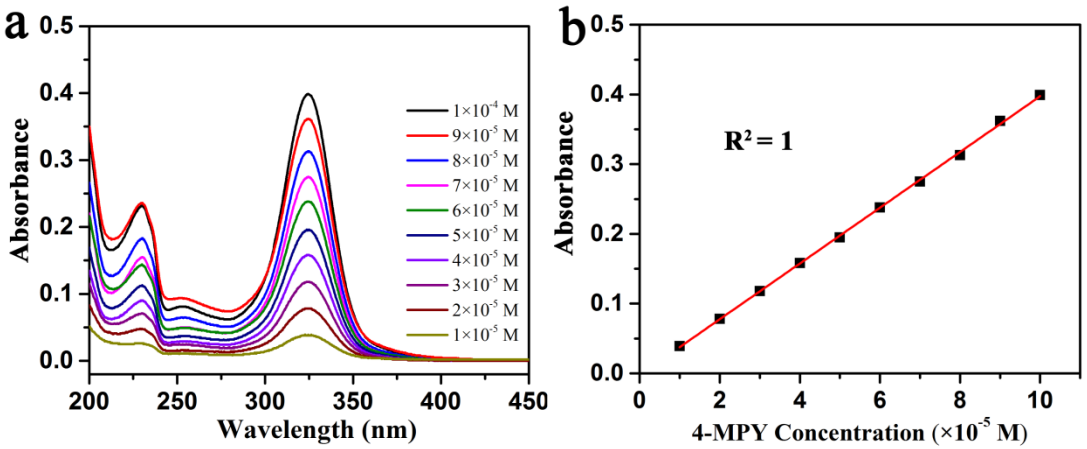

Fig. S7 (a) UV-Visible spectra of 4-MPY solution at different concentrations. (b) Calibration curve used for the measurement of 4-MPY absorption on the SERS membrane using the peak at 325 nm.

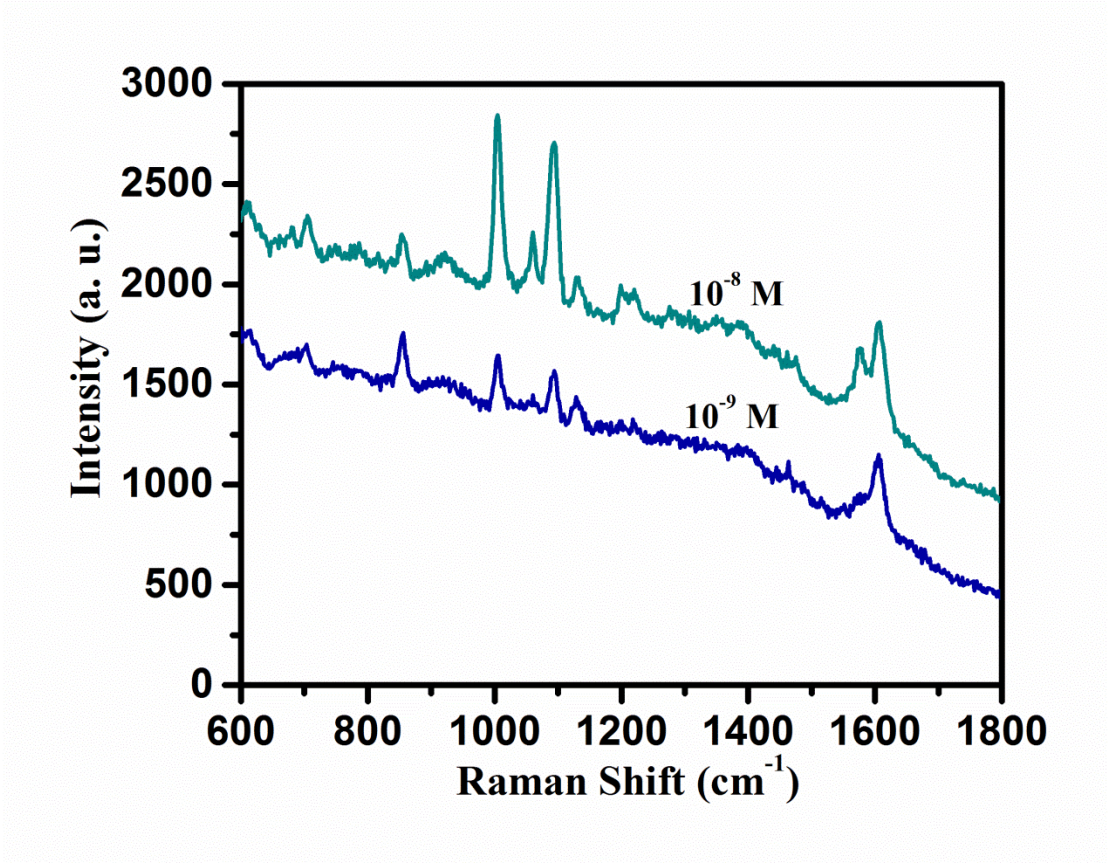

Fig. S8 SERS spectra of 4-MPY solution 10^{-8} and 10^{-9} M on a AgNPs-deposited SERS membrane.

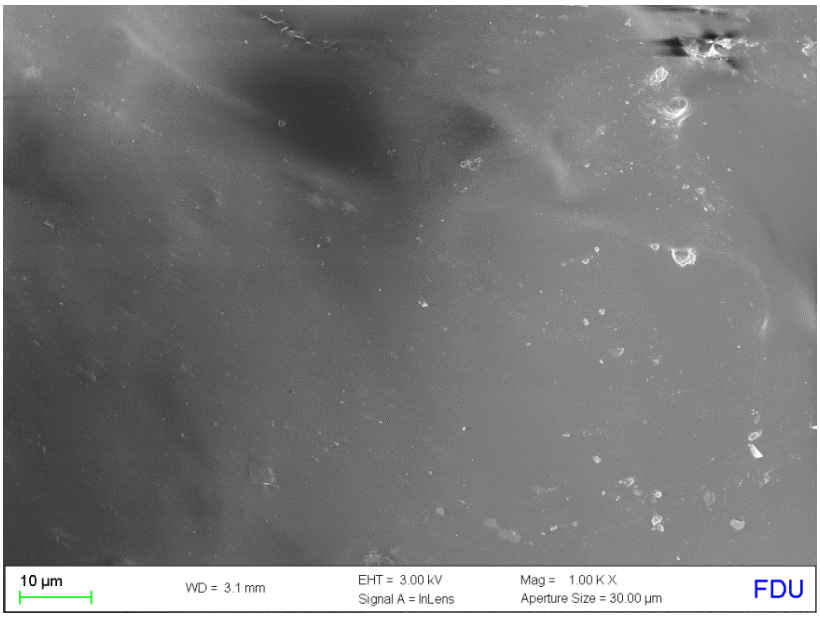

Fig. S9 SEM image of the sticky side of the Scotch tape.

Calculation of the enhancement factor (EF) for detecting 4-MPY:

The EF was calculated using the equation

$$EF = \frac{I_{SERS}/N_{SERS}}{I_{bulk}/N_{bulk}}$$

where I_{SERS} and I_{bulk} represent the intensity of the same band of 4-MPY (here, 1606 cm^{-1}) of SERS spectrum and normal Raman spectrum, and N_{SERS} and N_{bulk} represent the corresponding number of molecules in the focused incident laser spot.

The number of 4-MPY molecules adsorbed in the laser spot focused membrane substrate was *ca.* 3.56×10^{7}, determined through measuring UV-Vis spectral decrease of solution after soaking the membrane in 4-MPY solution (1.0×10^{-5} M) for one hour. To estimate the molecule number illuminated in the normal Raman characterization, 4-MPY solid was directly tested according to method previously reported.[1] The depth of field penetration of the laser into the 4-MPY solid was about 2.55 µm.[1] The density of 4-MPY solid was 1.2 g cm^{-3}. Hence, the number of 4-MPY molecules in the laser spot (diameter, 1.56 µm) was approximate 3.31×10^{13} in the normal Raman characterization. The obtained I_{SERS} and I_{bulk} were 11492 unites and 37 unites, respectively. Therafter, the EF was calculated to be 2.9×10^{8}.

Reference

1 R. A. Álvarez-Puebla, *J. Phys. Chem. Lett.*, **2012**, *3*, 857.