

Supplementary Materials

Surface-Enhanced Raman Scattering from Dye Molecules in Silicon Nanowire Structures Decorated by Gold Nanoparticles

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Porosity estimation

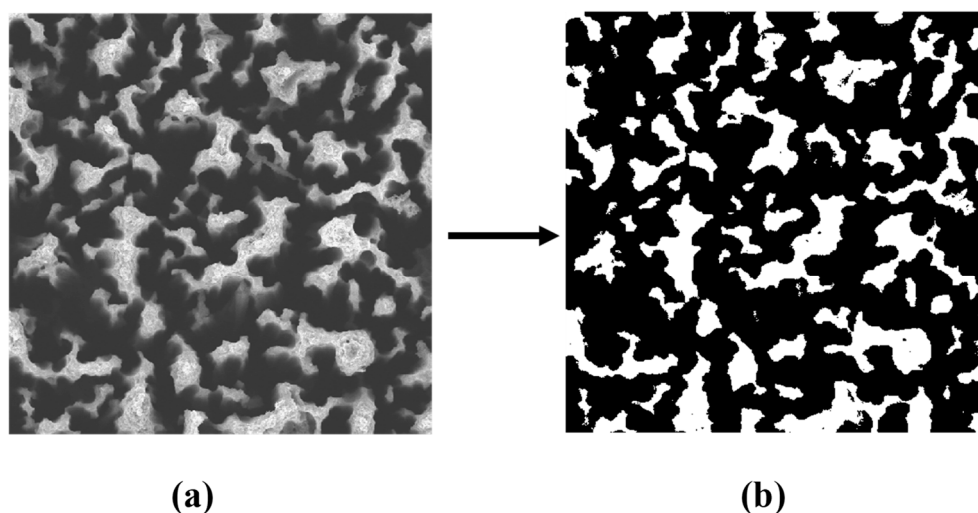


Figure S1. Illustration of the box-count method to estimate the porosity of SiNWs arrays: (a) SEM top-view image and (b) the same image in the “black-white” format. Porosity of SiNWs arrays is estimated by using the following equation:

$$P = 1 - \frac{N_w}{N_w + N_b} \quad (S1)$$

where N_w and N_b are numbers of black and white pixels, respectively.

EDX analysis

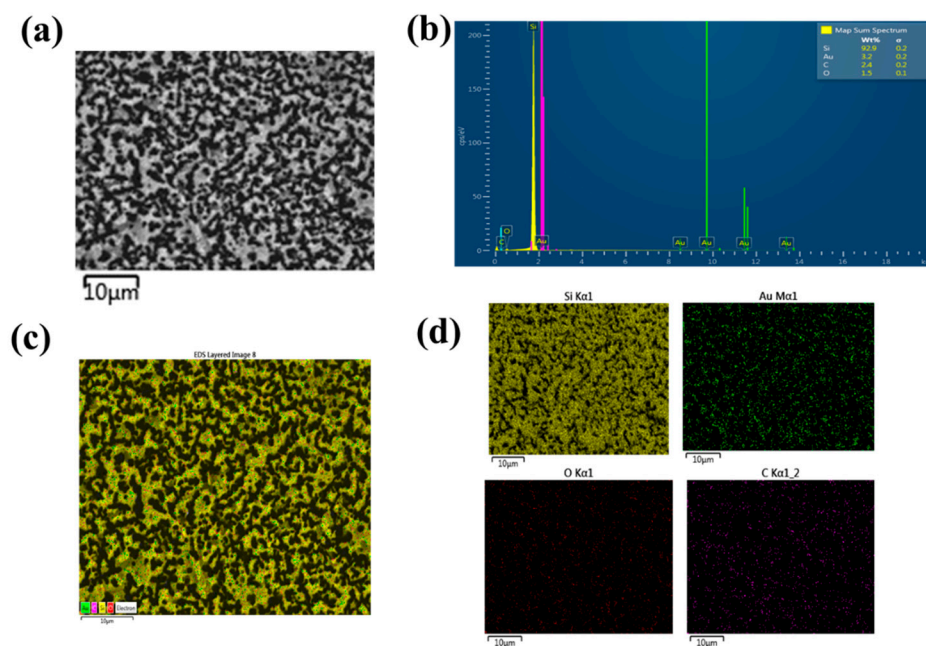


Figure S2. (a) SEM image of SiNWs:Au-NPs ($P = 55\%$), (b) EDX spectrum of this sample, (c) merged elemental image and (d) images for selected elements (Si, Au, O, C).

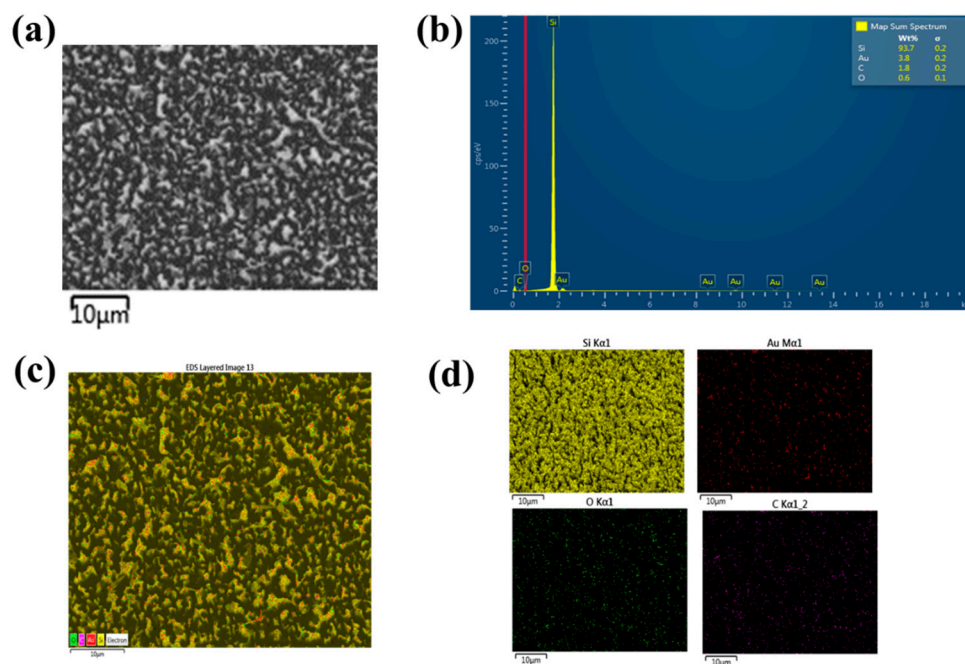


Figure S3. (a) SEM image of SiNWs:Au-NPs ($P = 72\%$), (b) EDX spectrum of this sample, (c) merged elemental image and (d) images for selected elements (Si, Au, O, C).

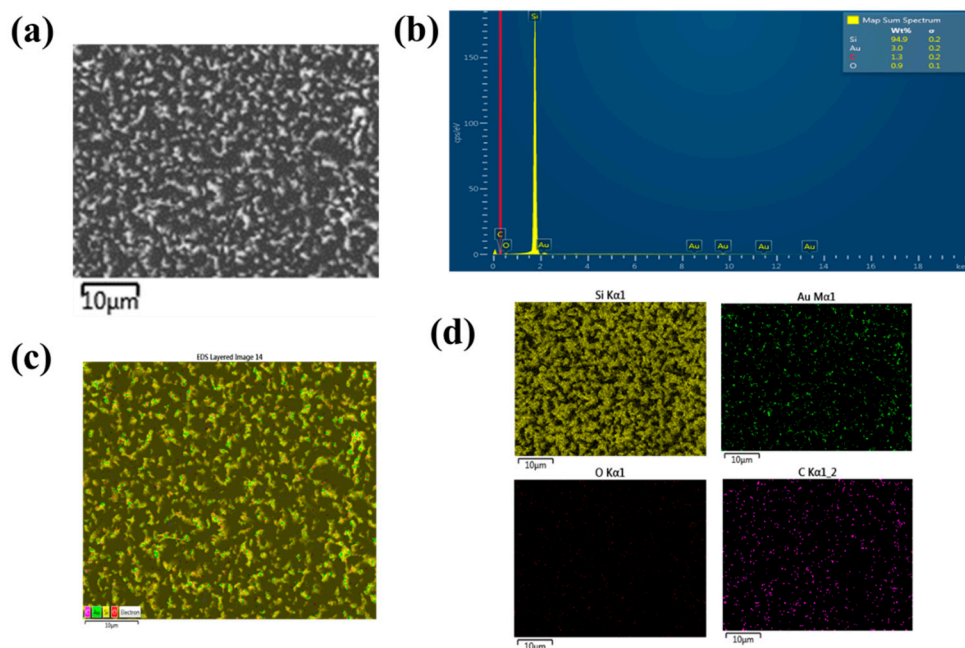


Figure S4. (a) SEM image of SiNWs:Au-NPs ($P = 83\%$), (b) EDX spectrum of this sample, (c) merged elemental image and (d) images for selected elements (Si, Au, O, C).

Table S1. Summarized results of the elemental content of SiNWs:Au-NPs with different porosity.

| Samples | Elements | Wt(%) | At (%) |
|------------|----------|-------|--------|
| $P = 55\%$ | Si | 92.9 | 91.5 |
| | Au | 3.2 | 0.4 |
| | C | 2.4 | 5.5 |
| | O | 1.5 | 2.6 |
| $P = 72\%$ | Si | 93.7 | 94.0 |
| | Au | 3.8 | 0.5 |
| | C | 1.8 | 4.2 |
| | O | 0.7 | 1.3 |
| $P = 83\%$ | Si | 94.9 | 95.1 |
| | Au | 3.0 | 0.4 |
| | C | 1.2 | 2.8 |
| | O | 0.9 | 1.6 |

EF estimation

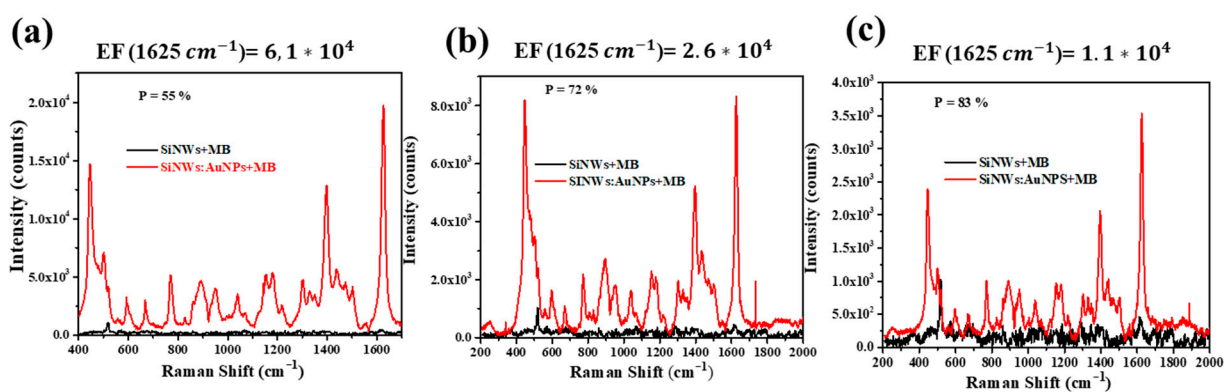


Figure S5. SERS spectra for SiNWs and SiNWs: Au-NPs with deposited MB ($1\ \mu\text{M}$) for the samples with different porosity: (a) $P = 55\%$, (b) $P = 72\%$, and (c) $P = 83\%$. The spectra are shown after subtraction of the photoluminescent background.

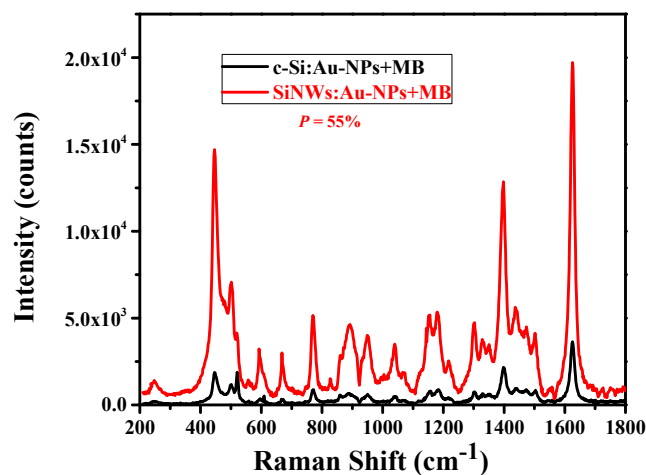


Figure S6. SERS spectra of MB ($1\ \mu\text{M}$) deposited on c-Si: Au-NPs (black line) and SiNWs: Au-NPs with $P = 55\%$ (red line). The spectra are shown after subtraction of the photoluminescent background.

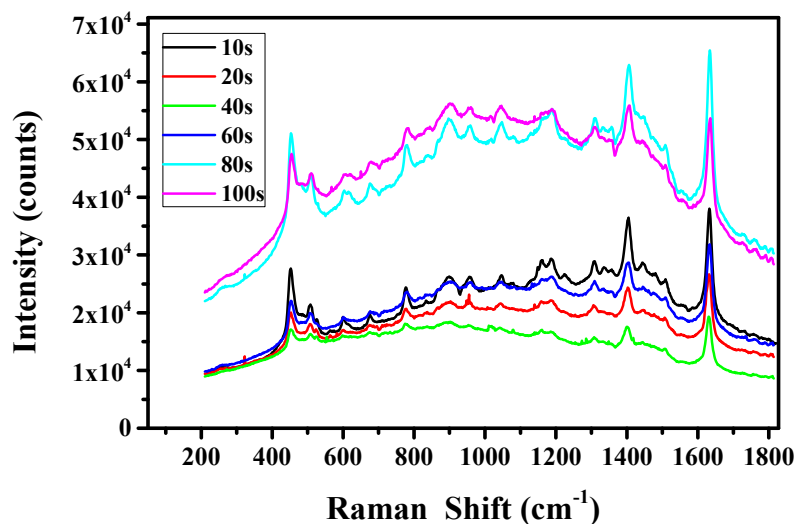


Figure S7. Spectra of the Raman scattering and photoluminescence of MB ($1\ \mu\text{M}$) for samples of SiNWs: Au-NPs with $P = 55\%$ and different time of Au-NP deposition varied from 10 to 100 s.