Lab on a Chip

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Supporting information

Fast and cost-effective fabrication of large-area plasmonic transparent biosensor array

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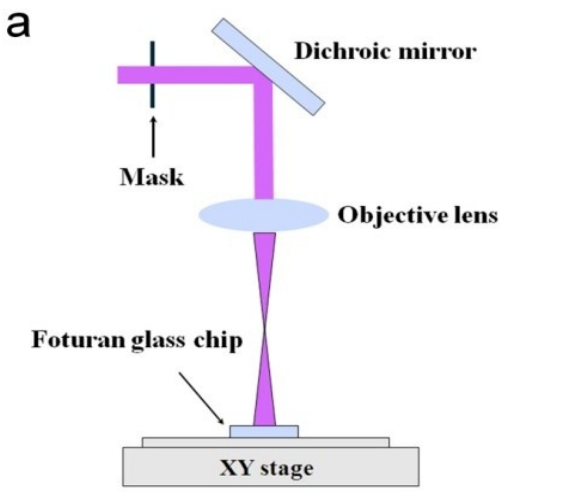
SECTIONS

1. Schematic of (a) mask projection excimer laser irradiation and (b) laser ablation in solution to realize transparent plasmonic devices.



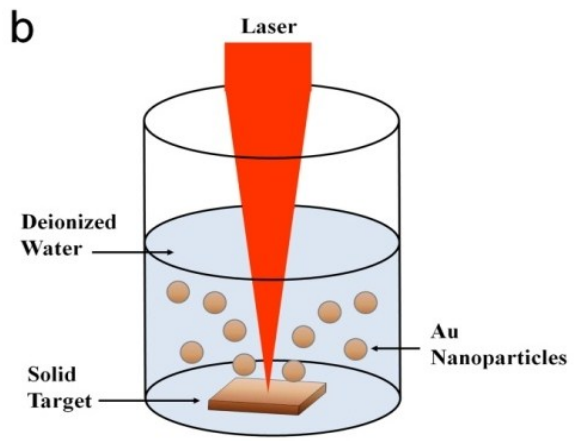


Figure 1S. (a) Schematic of hydrophobe microtip array production using mask projection excimer laser lithography and (b) Ultra-fast laser ablation of Gold bulk in deionized water to generate ligand-free Au NPs.

2. Variety of masks employed.

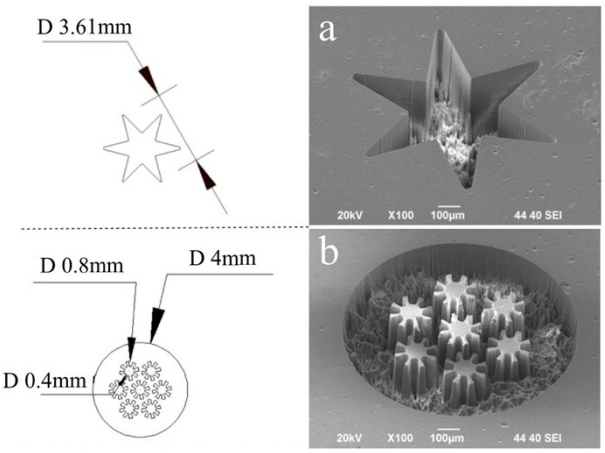


Figure 2S. SEM images of the fabricated structures in Foturan glass (on the right) and the corresponding masks applied (on the left) in the excimer laser-based projection technique. (a) and (b) obtained with 308 nm XeCl excimer laser. Note the 4-fold demagnification of the projection system.

3. Ligand-free gold nanoparticles absorption properties

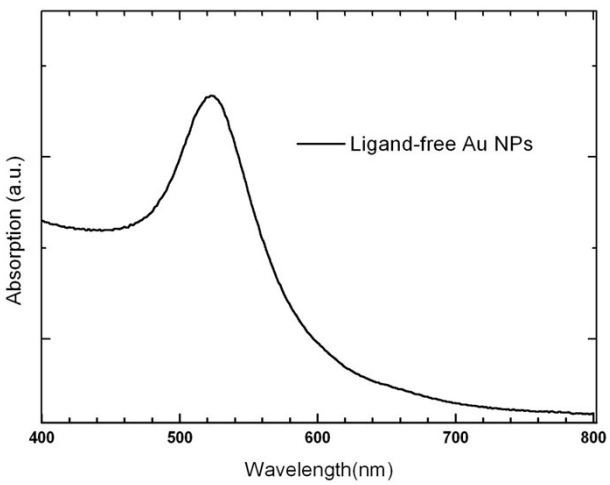


Figure 3S. Absorption properties of ligand-free Au nanoparticles prepared by ultra-fast laser ablation of gold target in deionized water.

4. Raman spectra of metallic NPs.

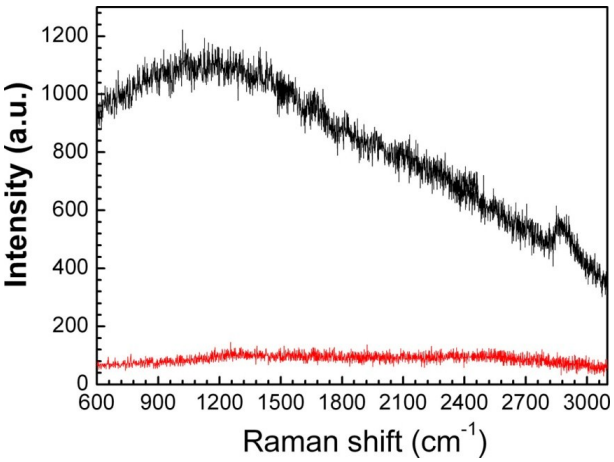


Figure 4S. Raman spectra of metallic NPs, produced by pulsed laser ablation of gold target in deionized water (red line), and produced by chemical method with citrate-capped surface (black line). (Laser power: 55 μW and integration time: 30 sec for both the measurements).

5. Optical image of species deposited onto the microstructured glass surface

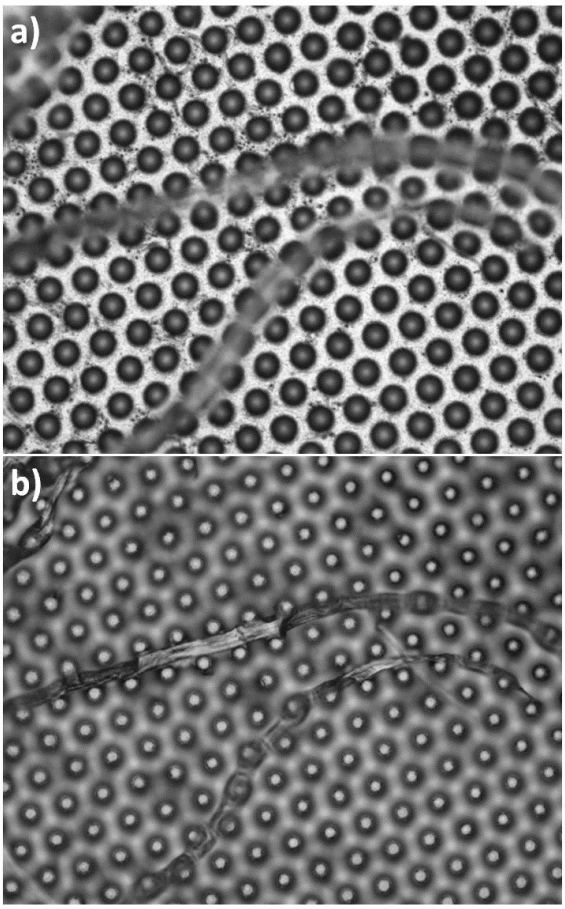


Figure 5S. Optical microscope image in transmission mode of cellulose fiber deposited on Au NPs coated microstructured glass at different focal plan (a) bottom of substrate and (b) on the top of microtip**.**

6. SERS enhancement calculation.

SERS enhancement factor can be calculated by using the following equation:

$$G = \left(\frac{I_{SERS}}{I_{Raman}} \right) * \left(\frac{A_{Raman} * t_{Raman} * P_{Raman}}{A_{SERS} * t_{SERS} * P_{SERS}} \right)$$

Here I_{SERS} and I_{Raman} are the intensities of the peak at 590 cm^{-1} in the SERS spectra, respectively and A, t, and P are the active area for molecules to attach under laser spot, time of acquisition and laser power. The subscript indicates the measurement type, i.e. SERS for the Au NPs on microtip-based substrate and Raman for the reference Au substrate. *I, t, P*, and *A* for Raman measurements are 1200, 50 sec., 55 μW and 0.785 μm^2. On the other hand, these values for SERS are 12000, 0.1 sec, 55 μW, and 1.57×10^{-2} μm^2, respectively. Considering these values, SERS enhancement is estimated to be 2.5×10^5 with respect to the flat gold surface.

7. SERS analysis of the area between the microtips

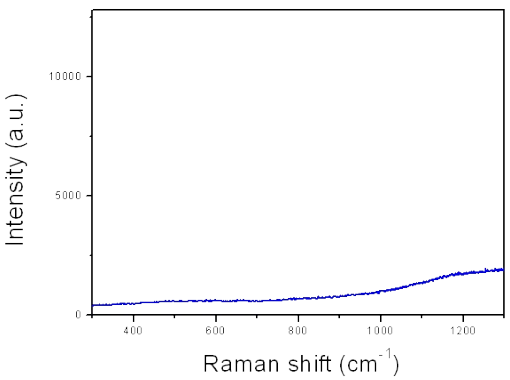


Figure 6S. Raman spectrum taken between the nearby flat area of the microtips coated with ligand-free Au NPs. The detection is evaluated using 1 nM cresyl violet (CV) molecules. The spectra are averaged over several measurements (λ_{ex}= 633 nm, laser power ~ 55 μW, integration time: 50 s).