

Supporting figure 1.

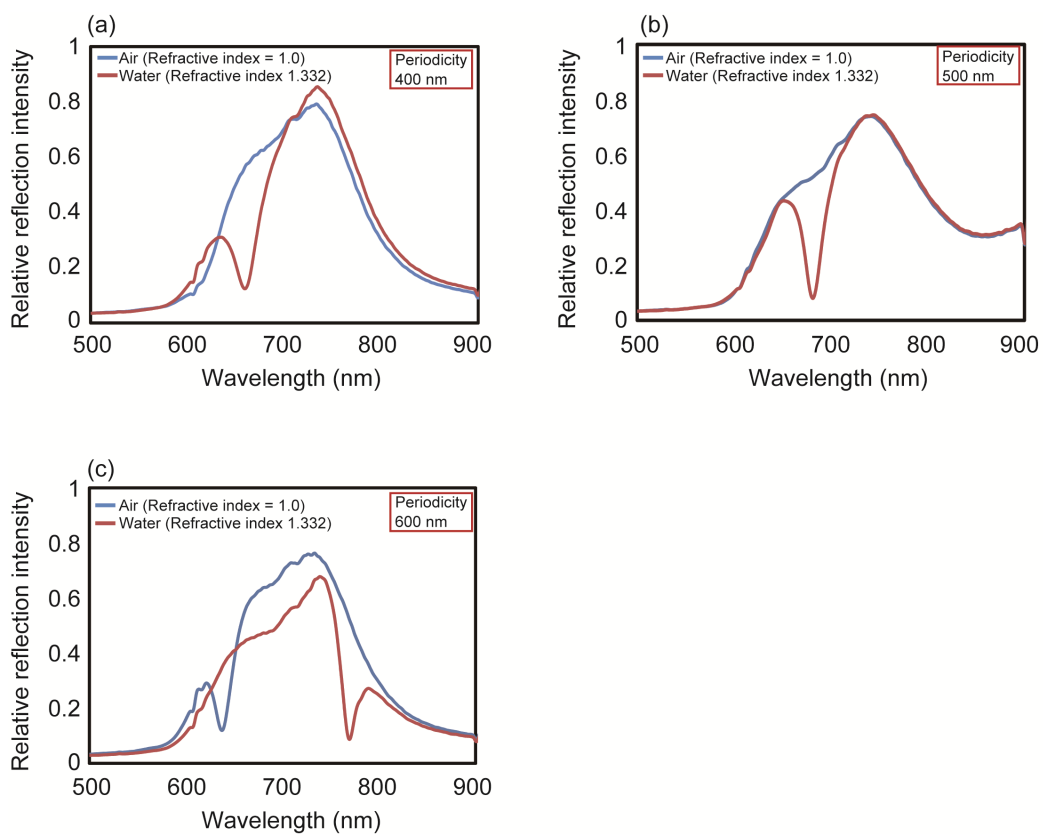


Figure S1. Reflection spectra when (a) the surface material on the gold nanohole array was air (blue) and water (red) with a periodicity of 400 nm, (b) the surface material was air (blue) and water (red) with a periodicity of 500 nm, (c) the surface material was air (blue) and water (red) with a periodicity of 600 nm.

Supporting information 2

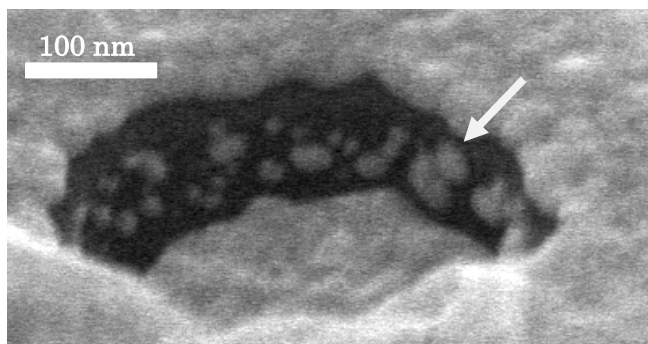


Figure S2. Figure S2. An SEM image of a gold nanohole obtained by tilting the device. Grains of gold at the side wall are observed.

Supporting information 3

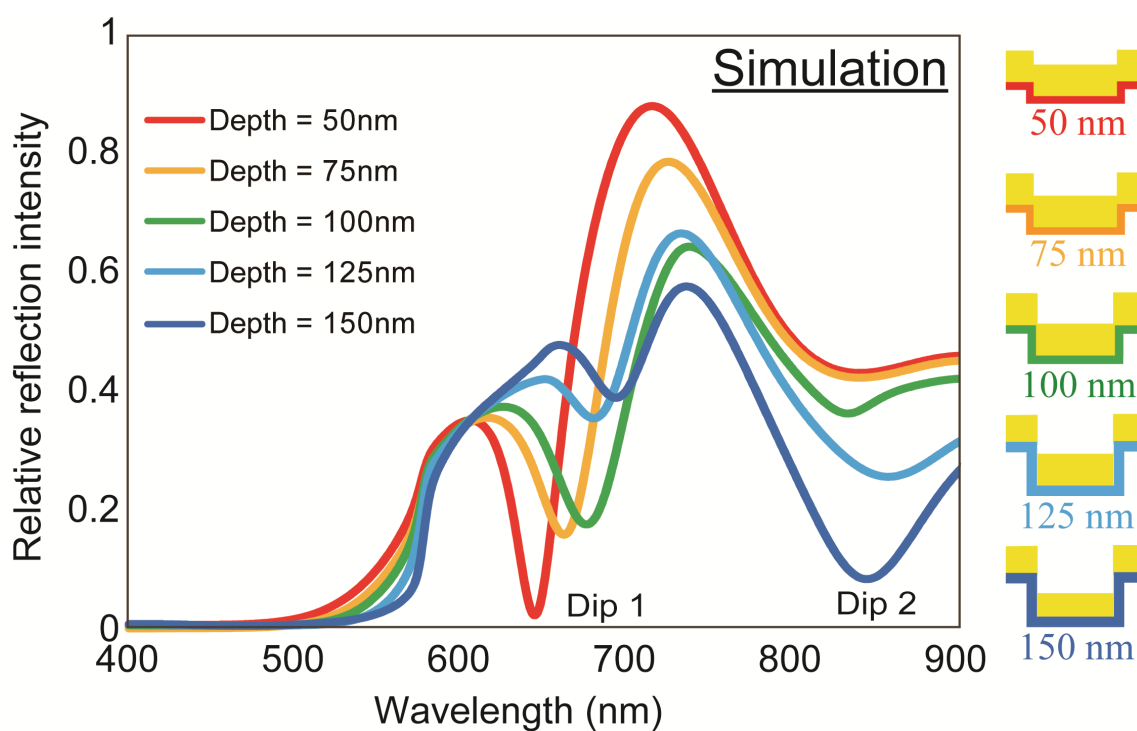


Figure S3. Calculated results of reflection spectra from the bottom filled gold nanohole arrays for polymer hole depths of 50, 75, 100, 125 and 150 nm. Gold thickness is all same.

Supporting information 4

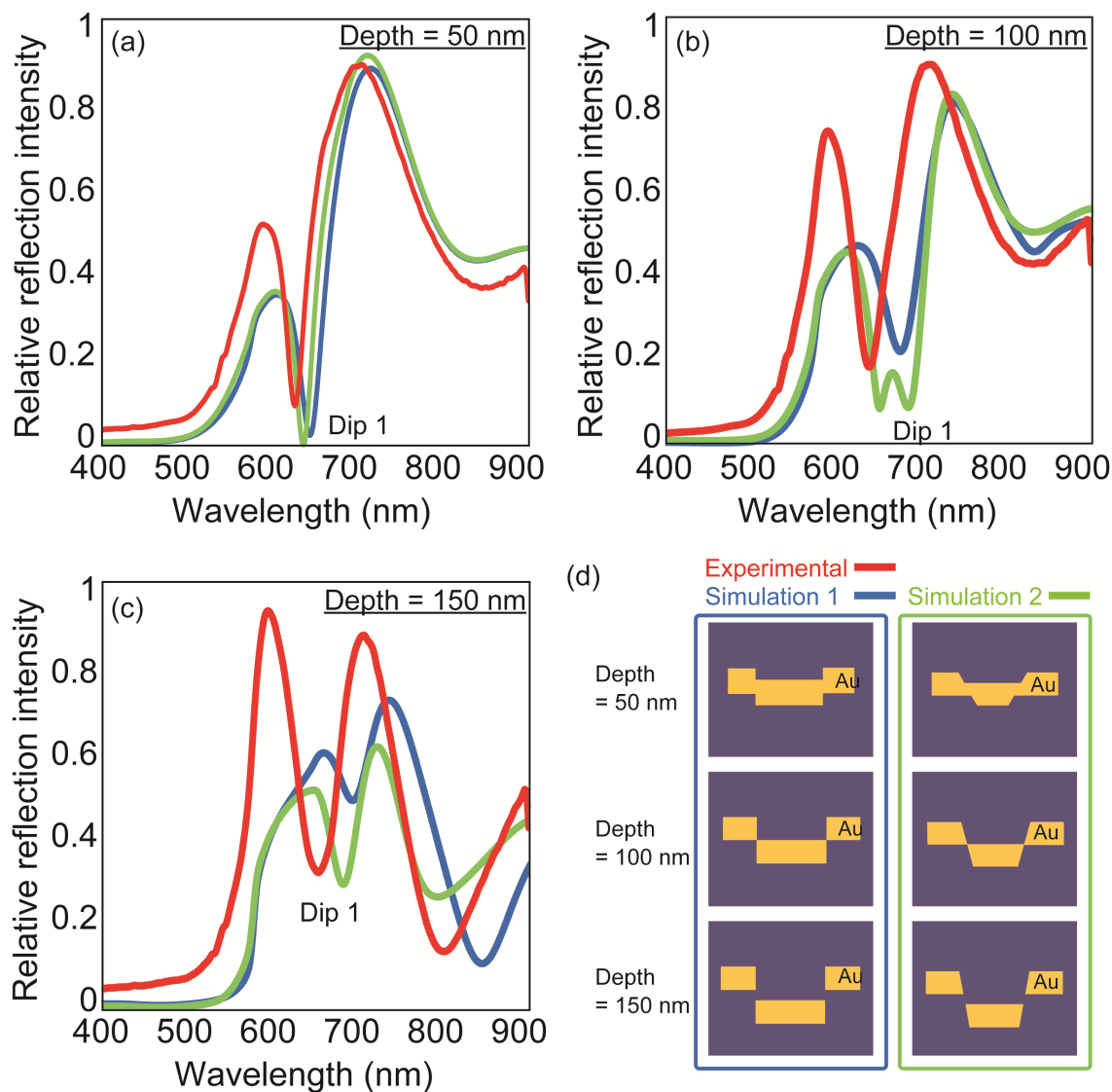


Figure S4. Experimental and calculated results of relative reflection spectra from the gold nanohole arrays for hole depths of (a) 50 nm, (b) 100 nm and (c) 150 nm, respectively. Gold film thickness of all the substrates are 100 nm. (d) Schematic illustration of simulation model structure. Simulation 1 is based on the structural models surrounded by blue line that have same top and bottom diameters of 300 nm. Simulation 2 is based on the structural models surrounded by light green line that have different top and bottom diameters of 300 nm and 250 nm, respectively.

Supporting information 5

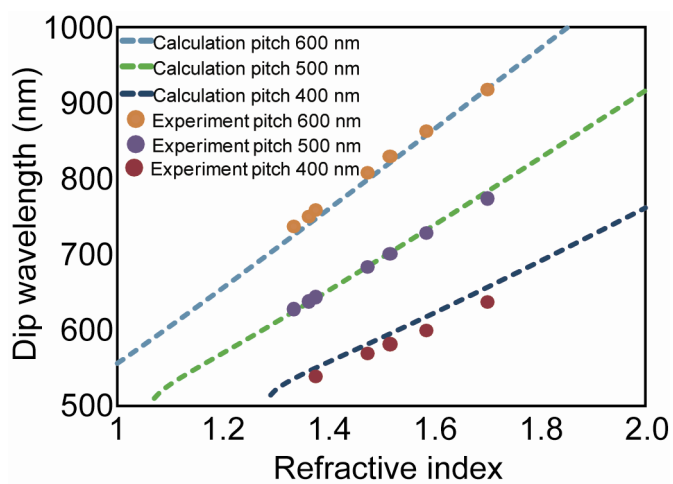


Figure S5. Experimental and calculated relationships between refractive index change and dip wavelength derived from surface plasmon polariton. Hole periodicity was varied from 400, 500 and 600 nm. The polymer hole depth was 50 nm and deposited gold thickness was 100 nm.

Supporting information 6

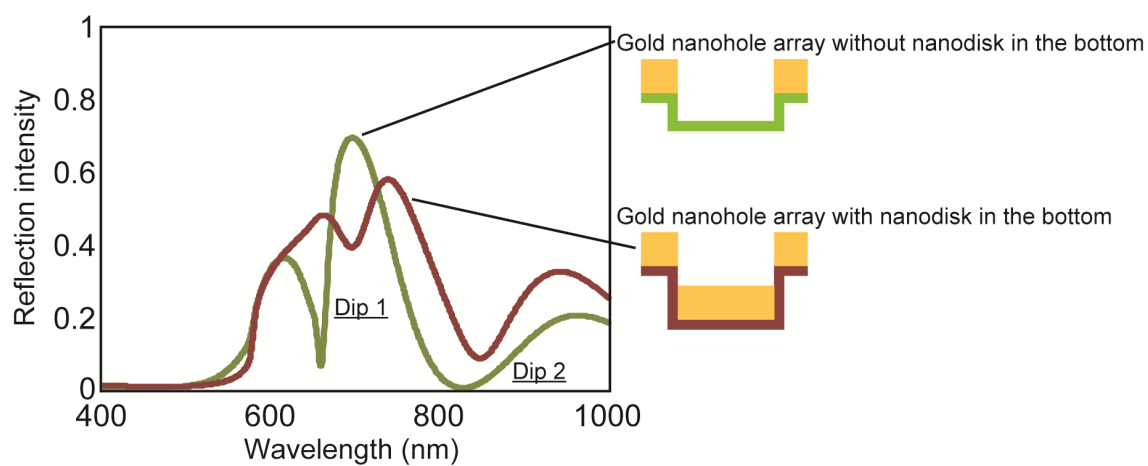


Figure S6. Calculated reflection spectra from gold nanohole array with or without a nanodisk in the bottom. The nanohole depth was 150 nm and the deposited gold thickness was 100 nm.

Supporting information 7

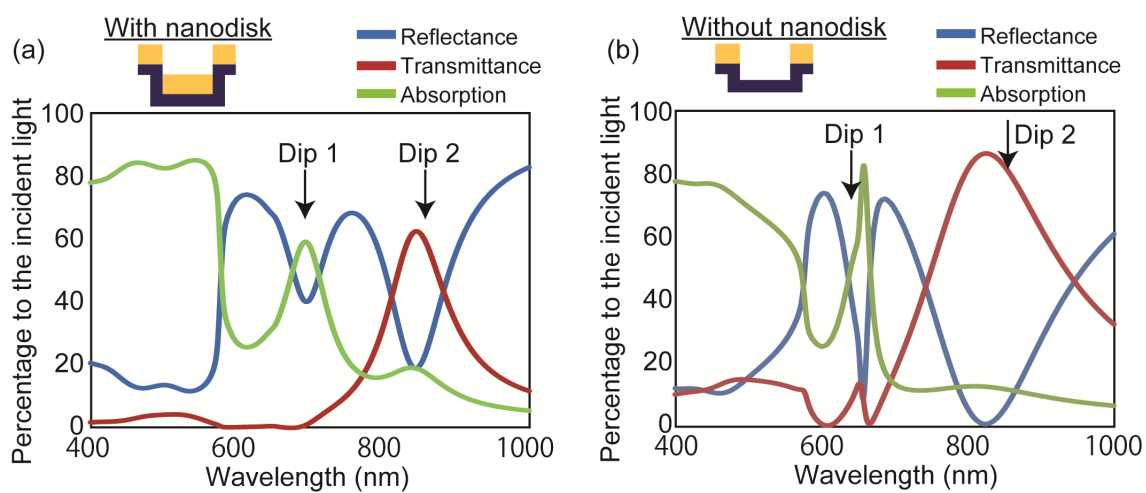


Figure S7. Calculated reflectance, transmittance and absorption spectra from gold nanohole array (a) with or (b) without a nanodisk in the bottom. The nanohole depth was 150 nm and the gold thickness was 100 nm.

Supporting information 8

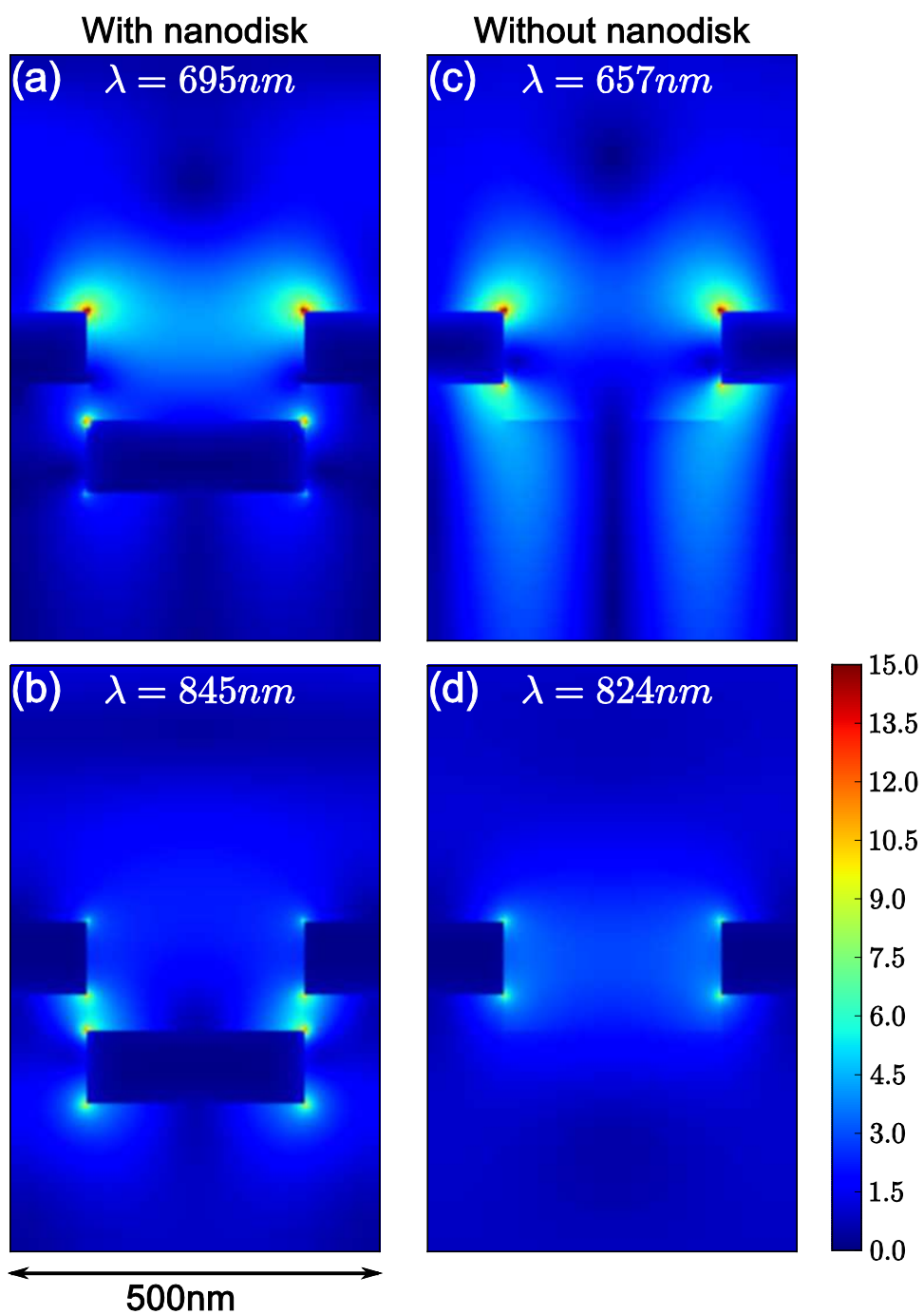


Figure S8. Time-averaged electric field distribution of the gold nanohole array (a) (b) with and (c) (d) without a nanodisk in the bottom. The nanohole depth was 150 nm and the gold thickness was 100 nm. The wavelength λ of the incident light was adjusted to (a) (c) the first dip or (b) (d) the second dip.

Supporting information 9

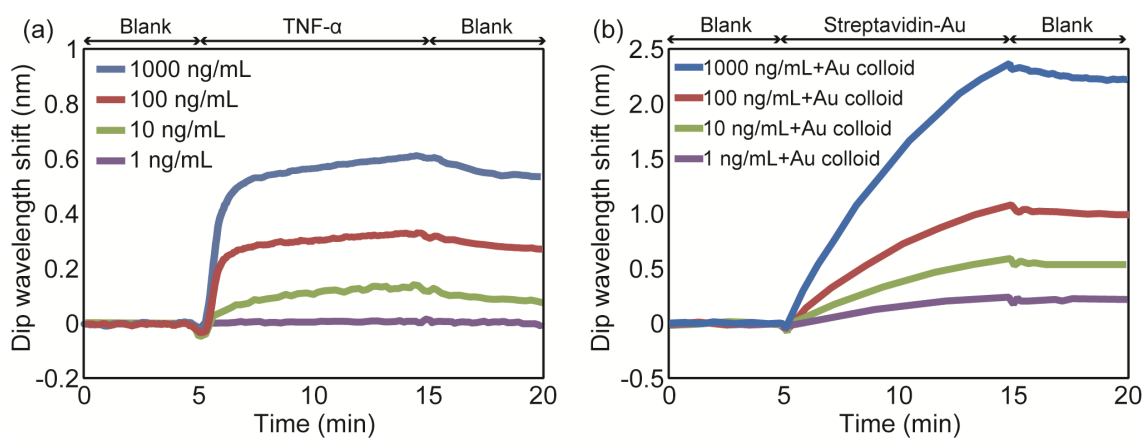


Figure S9. Real-time measurements of (a) TNF- α with an antigen antibody interaction and (b) streptavidin-gold in a microfluidic device. All flow rates were 5 μ L/min.

Supporting information 10

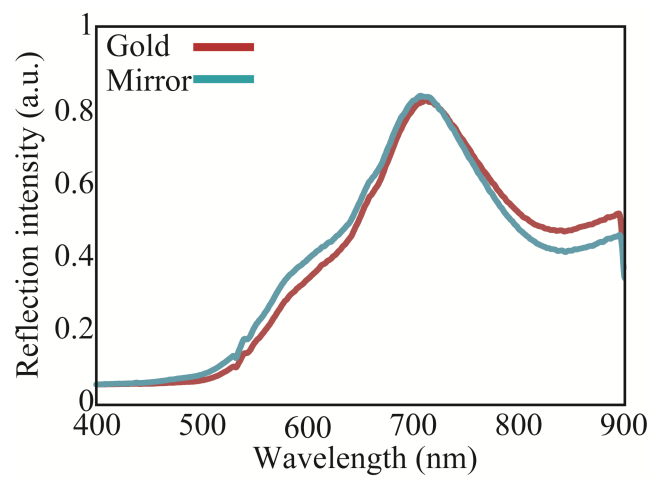


Figure S10. Reference reflection spectra from flat gold film (red) and mirror (teal blue).