Supplementary information for

Plasmonic-heating-induced Nanofabrication on Glass Substrates

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S1. Particle image and histogram.

Figure S1. (a) TEM image of spherical reshaped–gold nanoparticles.

Figure S1. (b) Size distribution of gold nanoparticles used for the experiments.
Figure S1. (c) SEM image of gold nanotriangles.
S2. Nanohole fabrication on a silica glass

**Figure S2** (a) SEM images after illumination of 100-nm-diameter Au NPs supported on a silica glass and submerged in 40% TBAOH with a 488 nm laser light (5 min at 3.3 mW µm⁻²). Scale bars: 100 nm.

**Figure S2** (b) SEM images after illumination of 100-nm-diameter Au NPs supported on a silica glass and submerged in 40% TBAOH with a 488 nm laser light (10 min at 3.3 mW µm⁻²). Scale bars: 100 nm.
S3. Scattering spectral changes of single Au nanotriangles supported on a glass substrate.

Figure S3 (a) Laser peak power density: 1.7 mW µm⁻². No shifts were observed.

Figure S3 (b) Laser peak power density: 3.3 mW µm⁻². Gradual red shifts were observed.
Figure S4 (a) SEM images after illumination of 100-nm-diameter Au NPs supported on a borosilicate glass and submerged in 40% TBAOH with a 488 nm laser light (60 s at 3.3 mW µm⁻²). Scale bars: 100 nm.

Figure S4 (b) SEM images after illumination of 100-nm-diameter Au NPs supported on a borosilicate glass and submerged in 40% TBAOH with a 488 nm laser light (5 min at 3.3 mW µm⁻²). Scale bars: 100 nm.

Figure S4 (c) SEM images after illumination of 100-nm-diameter Au NPs supported on a borosilicate glass and submerged in 40% TBAOH with a 488 nm laser light (20 min at 3.3 mW µm⁻²). Scale bars: 100 nm.
S5. Particle temperature estimation.

Figure S5-1. Computational geometry of core-shell structure on substrate.

The numerical calculations were performed by COMSOL Multiphysics 5.2a (http://www.comsol.com).

**Computational parameters:**
- **Heat source:**
  To estimate the local temperature field the AuNP was introduced as heat source $Q$ [W m$^{-3}$]:

$$Q = \frac{C_{abs} \cdot I_p}{V}$$

with $C_{abs}$ [m$^2$]: absorption cross section of AuNP at the excitation wavelength, $I_p$ [W m$^{-2}$]: peak power density of the excitation laser and $V$ [m$^3$]: the particle Volume.

The spatial laser profile was assumed as a Gaussian function with FWHM of 0.6 μm. The laser peak power density $I_p$ [mW μm$^{-2}$] is given by:

$$I_p = T \frac{P (2.3546)^2}{2\pi (FWHM)^2}$$

where $P$ is the laser power density (laser power divided by the beam area) and $T$ is the factor for intensity loss due to the dichroic mirror and the substrate interfaces. In our experiments we used values for $P$ ranging from 0.5 – 3 mW and a $T$ of 0.67.
• Absorption cross section (obtained by COMSOL):
  Polarization of incident light: linear polarized light (plane wave)
  particle diameter: 100 nm
  surrounding medium: water (n = 1.33)
  substrate: glass (n = 1.52)
  excitation wavelength: 488 nm
  Absorption cross section: $C_{abs}(488 \text{ nm}) = 1.886 \times 10^{-14} \text{ m}^2$ (water/glass)

• Thermal conductivities:
  $k_{water}: 0.60 \text{ W m}^{-1} \text{ K}^{-1}$
  $k_{glass}: 1.0 \text{ W m}^{-1} \text{ K}^{-1}$
  $k_{Au}: 314 \text{ W m}^{-1} \text{ K}^{-1}$

Figure S5-2. Calculated particle temperature as a function of applied laser peak power density for a water-immersed 100 nm Au sphere supported on a borosilicate glass substrate.
S6 Numerical simulation of optical spectra for a core-shell structure supported on a substrate.

The numerical calculations were performed using COMSOL Multiphysics 5.2a (http://www.comsol.com). The geometry for computing the absorption and scattering cross section spectra of the core-shell structures with various shell thicknesses supported on a glass substrate is given in Figure S6-1.

![Computational geometry of the core-shell structure supported on a glass substrate.](image)

Figure S6-1. Computational geometry of the core-shell structure supported on a glass substrate.

The computational parameters are given below.

- Polarization of incident light: linearly polarized light (plane wave)
- Particle diameter: 100 nm
- Refractive index of the medium: water (n = 1.33)
- Refractive index of the substrate: glass (n = 1.52)
- Refractive index of the shell: n = 1.52 with various thicknesses
Figure S6-2. Simulated scattering cross section ($C_{\text{sc}}$) spectra of 100-nm-diameter Au NP with various shell thicknesses on a glass substrate.
S7. Numerical simulation of optical spectra for a 100 nm-diameter Au sphere supported on a glass substrate.

Figure S7 Simulated absorption cross section ($C_{\text{abs}}$) and scattering ($C_{\text{sca}}$) spectra of a 100 nm-diameter Au sphere supported on a glass substrate and submerge in aqueous solution using COMSOL Multiphysics.