

Supplementary Information

1. A absorption spectrum and a TEM image of GNRs

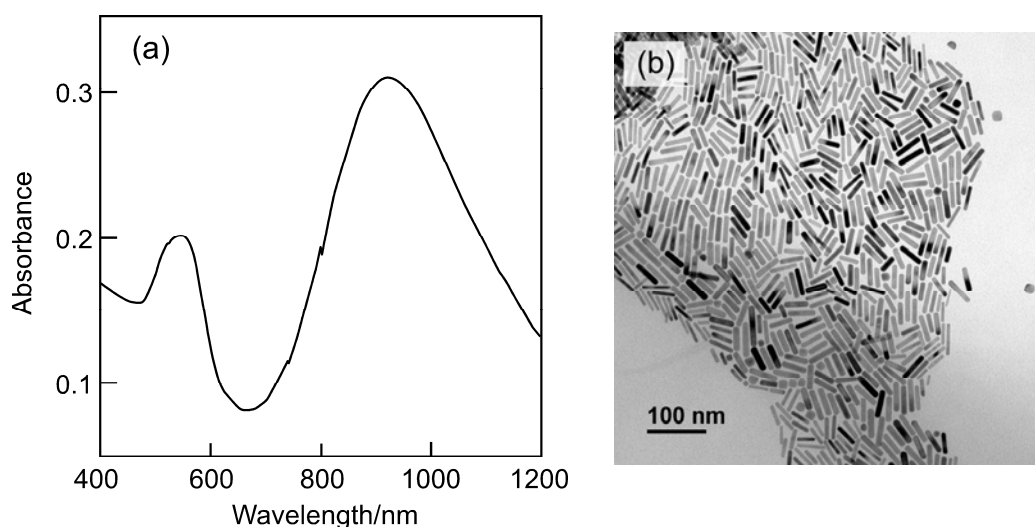


Fig. S1 An absorption spectrum (a) and a typical TEM image (b) of GNRs.

The transverse and longitudinal surface plasmon bands are found in 548 and 921 nm, respectively. The TEM image indicates the mean size is 11 ± 0.8 and 45 ± 3.8 nm in transverse and longitudinal directions, respectively.

2. Preparation of gold nanoparticles

A reaction solution contained 2 mM tetrabromoaurate (AuBr_4^-), 80 mM CTAB, 0.67 mM AgNO_3 , and 230 mM acetone. In the reaction solution (3 mL), an ascorbic acid solution (40 mM, 200 μL) was added to reduce the AuBr_4^- into AuBr_2^- . An aliquot of the reaction solution was put into a thin quartz cell (optical path length: 1 mm), and was irradiated for 30 min by monochromatic ultraviolet (UV) light from a Xenon lamp (Bunko Keiki, SM-25, 280 nm, 0.45 mW cm^{-2}).

Spherical gold nanoparticles were prepared in hexadecyltrimethylammonium chloride (CTAC) using the same procedures as those of the GNR preparation. The reaction solution contained 80 mM CTAC, 2 mM tetrachloroaurate (AuCl_4^-), 0.67 mM AgNO_3 , and 230 mM acetone. The UV irradiation (280 nm, 0.45 mW cm^{-2}) resulted in the formation of spherical gold nanoparticles.

3. Replacement of the surfactants (CTAB and CTAC)

A GNR solution containing CTAB was centrifuged at $6000 \times g$ for 10 min to precipitate GNRs. The supernatant was decanted and the precipitate was dispersed in a CTAC solution (80 mM). The centrifugation process was repeated two times, and then we obtained GNRs dispersed in a CTAC solution.

A spherical solution containing CTAC was treated in the same manner as that of the GNR solution, but when the precipitates were dispersed in solution, CTAB solutions (80 mM) were used. After centrifuging two times, we obtained spherical gold nanoparticles dispersed in a CTAB solution.

4. Bromide in a mass spectrum of seven-times centrifuged GNRs

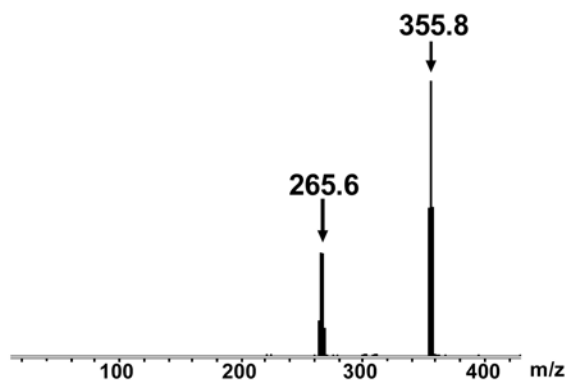


Fig. S2 Mass spectra of seven-times centrifuged GNRs.

The bromide peak ($m/z = 77.3$) could not be observed in the spectrum. After the seventh centrifugation, the bromide ions that were not interacting with metal ions were not retained in the GNR solutions.

5. Chemical forms of silver ions in the presence of bromide ions

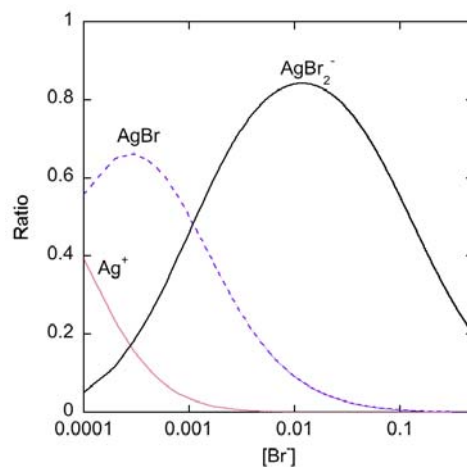


Fig. S3 Chemical forms of silver ions in the presence of bromide ions (calculation).

Total stability constants of AgBr ($\log\beta_1$), AgBr₂⁻ ($\log\beta_2$), and AgBr₃²⁻ ($\log\beta_3$) were 4.15, 7.11, and 8.23, respectively. Thus, the main species of silver ions in a 80 mM CTAB solution are AgBr₂⁻.