Supporting Information

SERS spectral evolution of azo-reactions mediated by plasmonic Au@Ag core-shell nanorods

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Stability experiments of Au @ Ag core-shell nanorods

The stability experiment of Au @ Ag core-shell nanorods stored at 4 ^{o}C for 1 year were measured by UV-Vis-NIR absorption and SERS spectrum after adsorbing PATP. Raman spectrum measurement method is the same as the text.

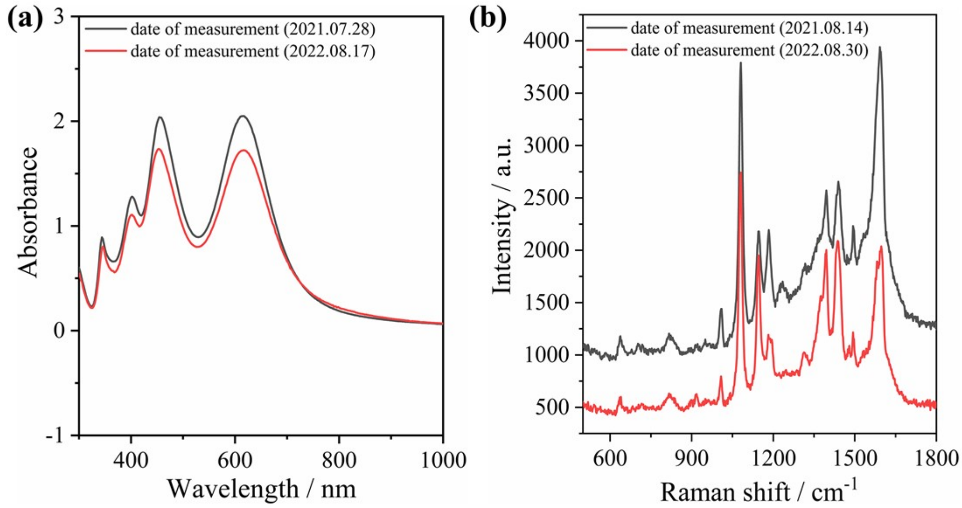

Fig. S1 The (a) UV-Vis-NIR absorbance spectra and (b) SERS spectra of PATP under 633 nm excitation light of the Au@Ag core-shell nanorods after 1 year of storage.

The conversion of PATP catalyzed by Au nanorods and Au@Ag core-shell nanorods with different aspect ratios.

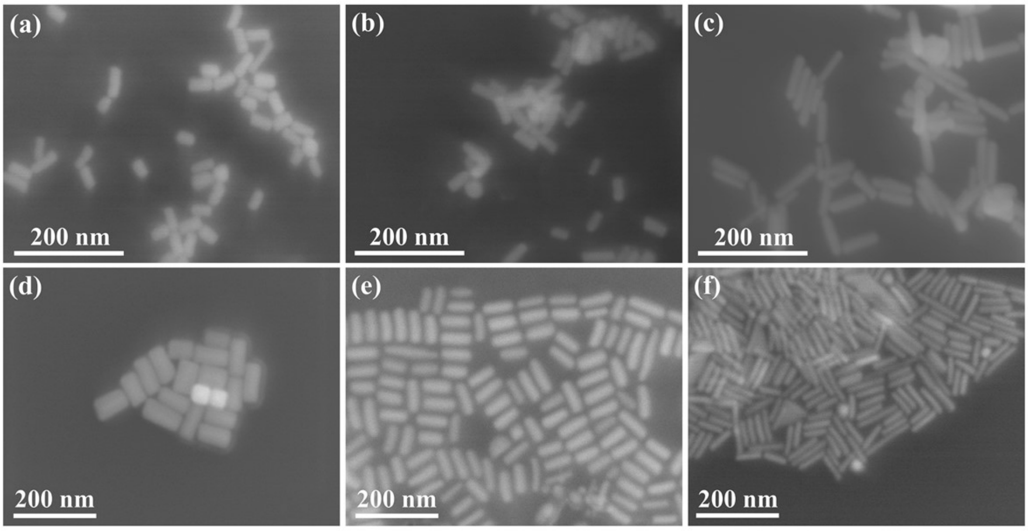

Fig. S2 Au nanorods with different aspect ratios (a) 2.2, (b) 2.8, and (c) 4.2. Au@Ag core-shell nanorods with different aspect ratios (d) 1.8, (e) 2.7, and (f) 3.9.

Table S1 plasmon peaks of Au nanorods and Au@Ag core-shell nanorods with different aspect ratios.

	AuNR	AuNR	AuNR	Au@AgNR	Au@AgNR	Au@AgNR
aspect ratio	2.2	2.8	4.2	1.8	2.7	3.9
Plasmon peak	600 nm	650 nm	852 nm	615 nm	660 nm	822 nm

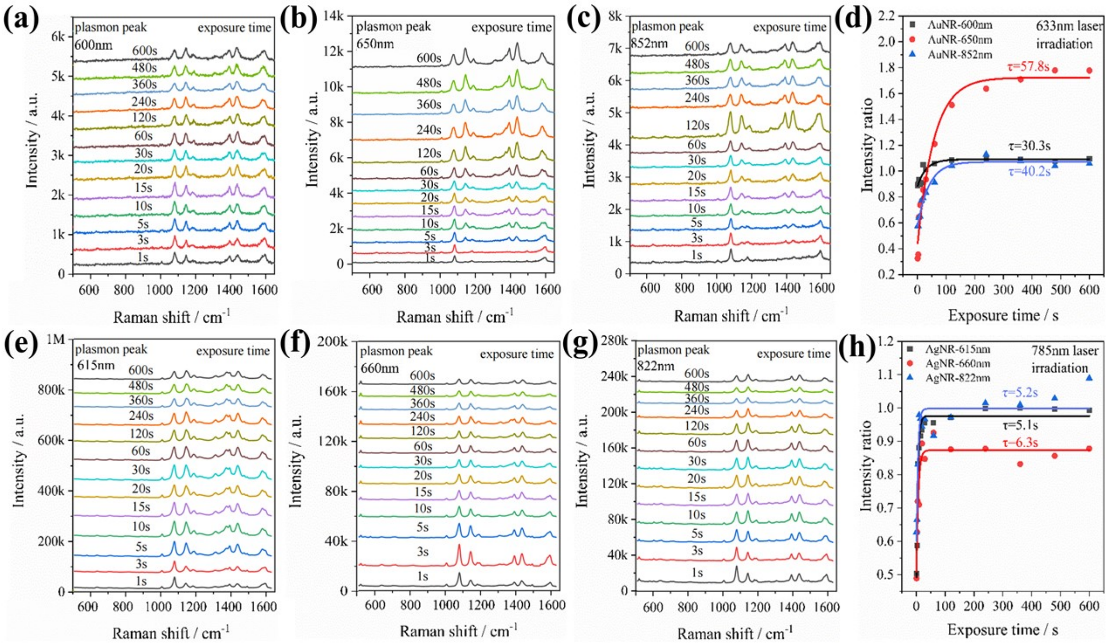

Fig. S3 (a)-(c) Time-dependent SERS spectra of PATP adsorbed on Au nanorods and irradiated with 633 nm monochromatic light. (e)-(g) Time-dependent SERS spectra of PATP adsorbed on Au@Ag core-shell nanorods and irradiated with 785 nm monochromatic light. The variations of peak intensities at 1080 cm^{-1} and 1440 cm^{-1} with increasing irradiation time for (d) Au nanorods, (h) Au@Ag core-shell nanorods.

The effect of laser power on Au@Ag core-shell nanorod plasma-driven photocatalysis.

We investigated the plasmon-driven photocatalysis of PATP with Au@Ag core-shell nanorods under different laser power excitation conditions with 633 nm excitation light. The sample was irradiated for 3 s at each power condition and 5 points were randomly selected for measurement, and the Raman intensities were averaged.

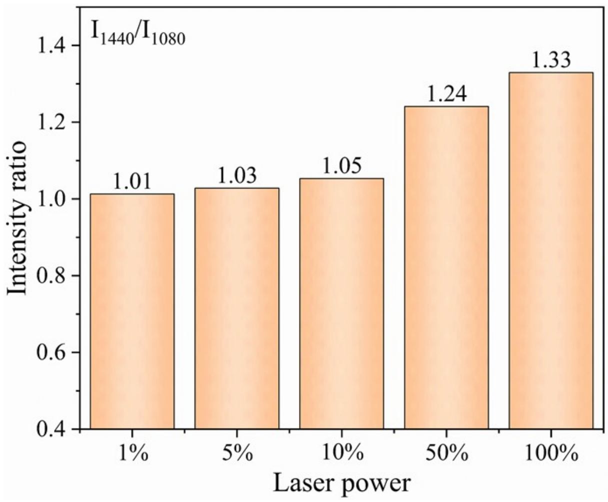

Fig. S4 The conversion rates of PATP under the different power of 633 nm excitation light.

Calculation of the reaction rate constant

The reaction rate constant k_1 can be determined by eqn (1).

$$k_1 = ln(c_0/c_t) \qquad (1)$$

c_0 and c_t are the concentrations of the reactants at the start and at time t, respectively. The relationship between SERS intensity and probe concentration can be determined by equation (2).

$$I_{SERS} = k \times c \qquad (2)$$

Here, c is the concentration of the probe and k is the constant of the substance. Therefore, the expression to obtain k_1 is shown in eqn (3).

$$k_1 = \ln[(I_{1440}/I_{1080})_0/(I_{1440}/I_{1080})_t] \qquad (3)$$