Electronic Supplementary Information

Gold nanobipyramid-embedded silver–platinum hollow nanostructures for monitoring stepwise reduction and oxidation reactions

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Supplementary figures

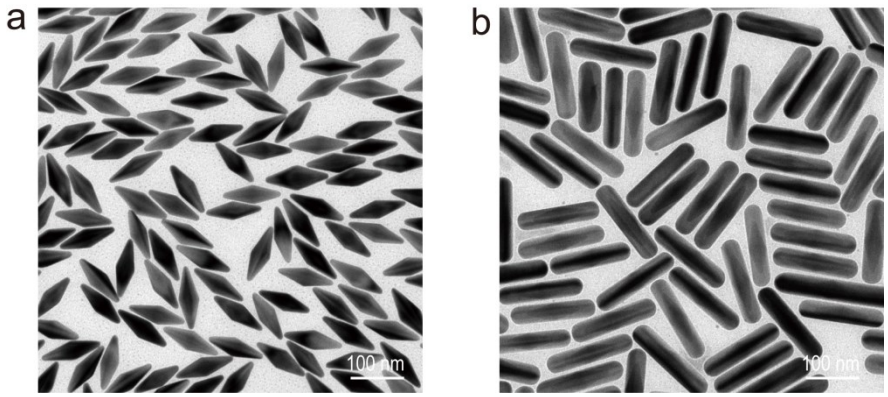

Fig. S1 (a) TEM image of Au NBPs with average waist width of 21 ± 1 nm and length of 69 ± 3 nm. (b) TEM image of the Au NBP@Ag nanorods with average diameter of 24 ± 1 nm and length of 105 ± 4 nm.

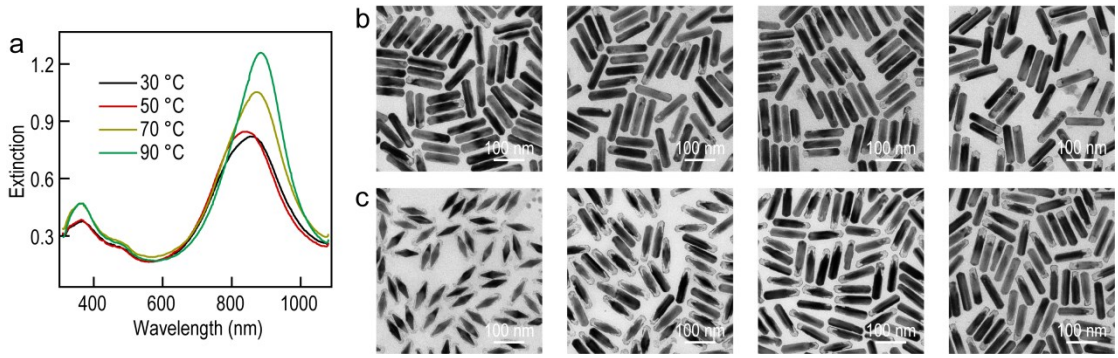

Fig. S2 (a) Extinction spectra of the (Au NBP@Ag)@AgPt nanostructures after etching with H_2O_2 at different temperatures. TEM images of the (Au NBP@Ag)@AgPt nanostructures (b) before and (c) after etching with H_2O_2 at different temperatures.

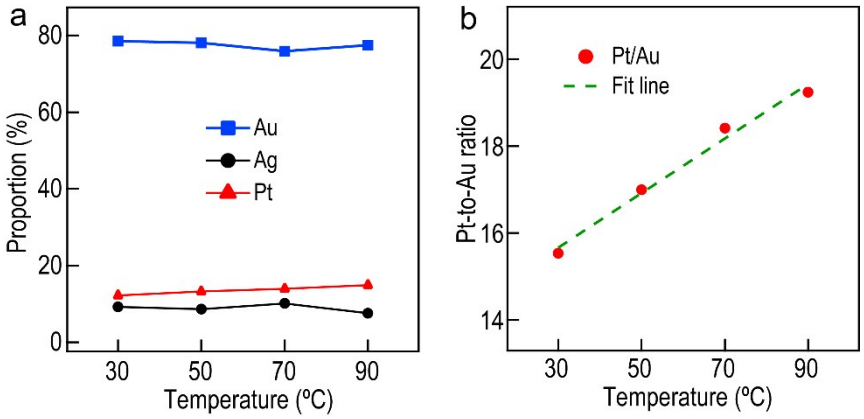

Fig. S3 ICP-AES measurements. (a) The proportion of Au, Ag and Pt elements in the Au NBP@AgPt hollow nanostructures that varied with the temperatures. (b) Dependence of the Pt-to-Au atomic ratio of the Au NBP@AgPt hollow nanostructures on temperature.

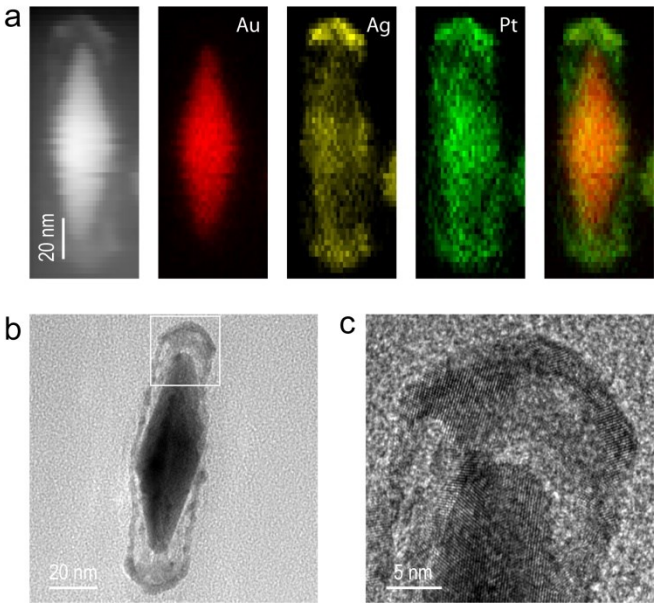

Fig. S4 (a) HAADF-STEM and elemental mapping images of a single Au NBP@AgPt nanoframe. The elemental mapping images have the same size scale as the HAADF-STEM image. (b) TEM image of a single Au NBP@AgPt nanoframe. (c) HRTEM image recorded in the region indicated with the white box in (b).

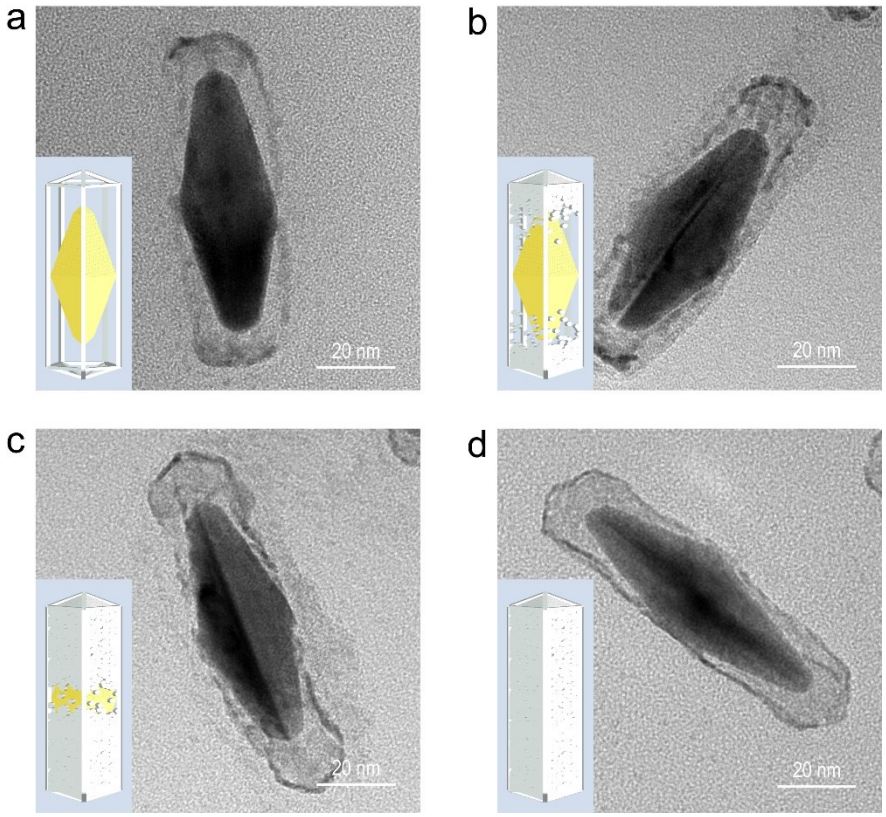

Fig. S5 (a–d) HRTEM images of a single Au NBP@AgPt hollow nanostructure obtained at 30 °C, 50 °C, 70 °C and 90 °C, respectively.

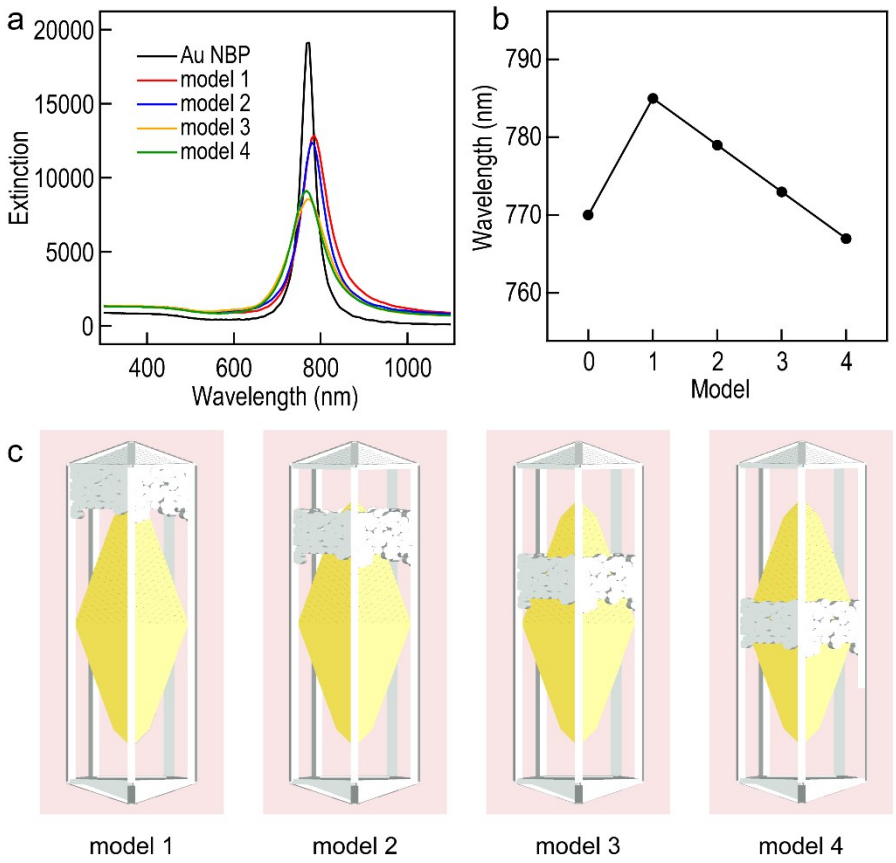

Fig. S6 (a) Simulated extinction spectra of the Au NBP and the modes. (b) Variation of the longitudinal dipolar plasmon wavelength as a function of the model. The point of model 0 represents the Au NBP. (c) Schematic models utilized in the simulations.

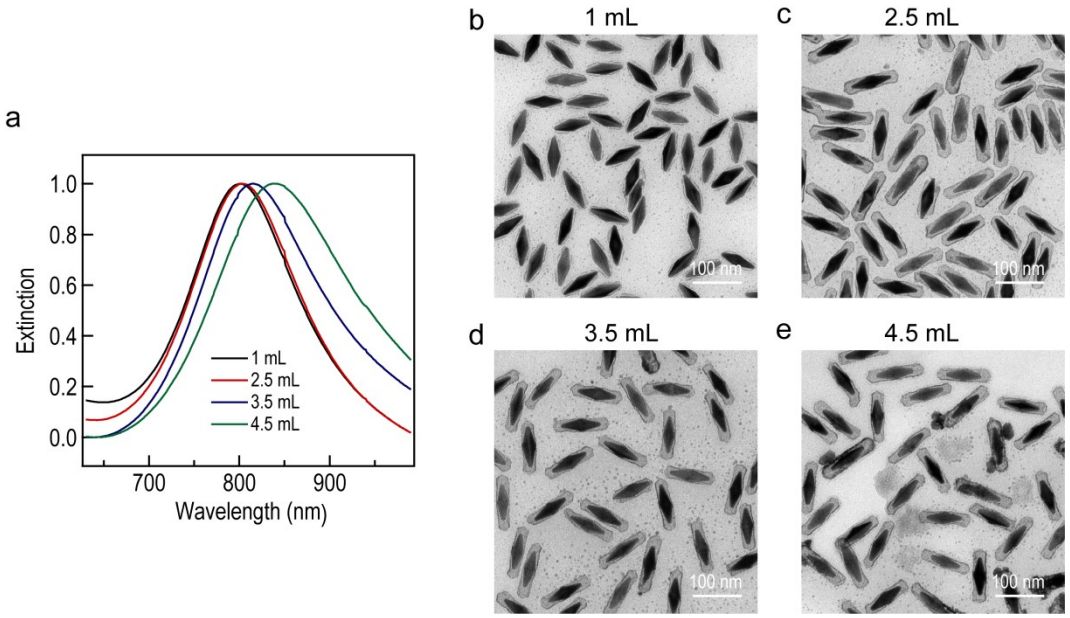

Fig. S7 (a) Extinction spectra and (b–e) TEM images of Au NBP@AgPt nanostructures with varied amount of H_2PtCl_6 in CTAC condition.

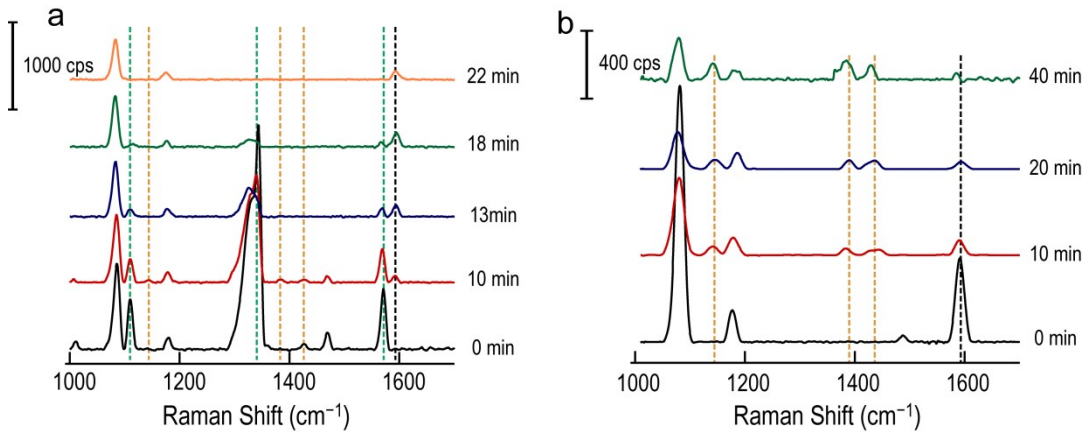

Fig. S8 Time-dependent SERS spectra collected during (a) the reduction of 4-NTP by $NaBH_4$ and (b) the oxidation of 4-ATP by H_2O_2 under excitation at 785 nm. The reaction catalyzed by the Au NBP@AgPt nanoframes produced at 30 °C in CTAB condition.