

Supporting Information

Au-BINOL Hybrid Nanocatalysts: Insights into the Structure-Based Enhancement of Catalytic and Photocatalytic Performance

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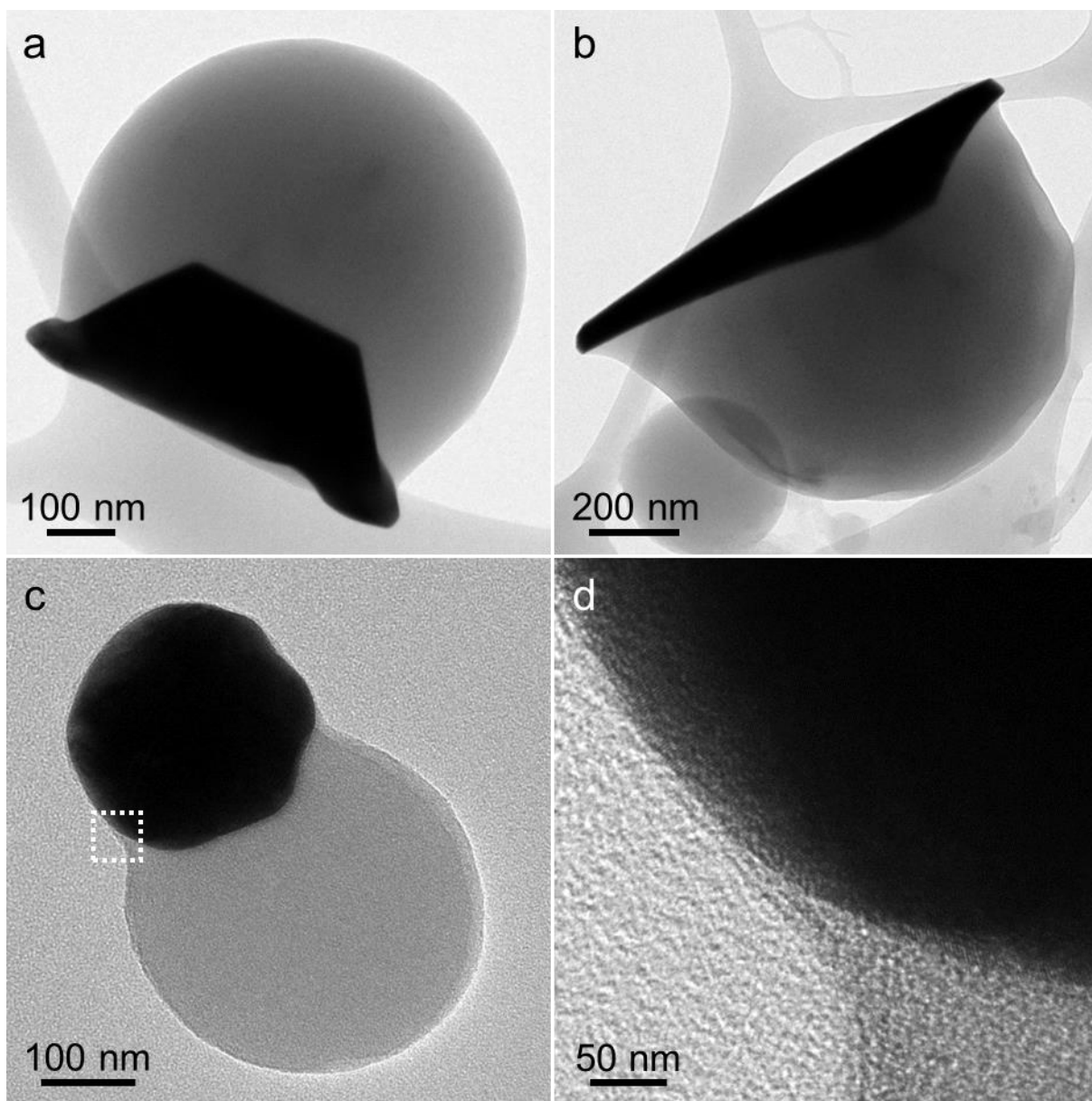


Figure S1. Bright-field TEM images of different types of eccentric Au-BINOL nanostructures.

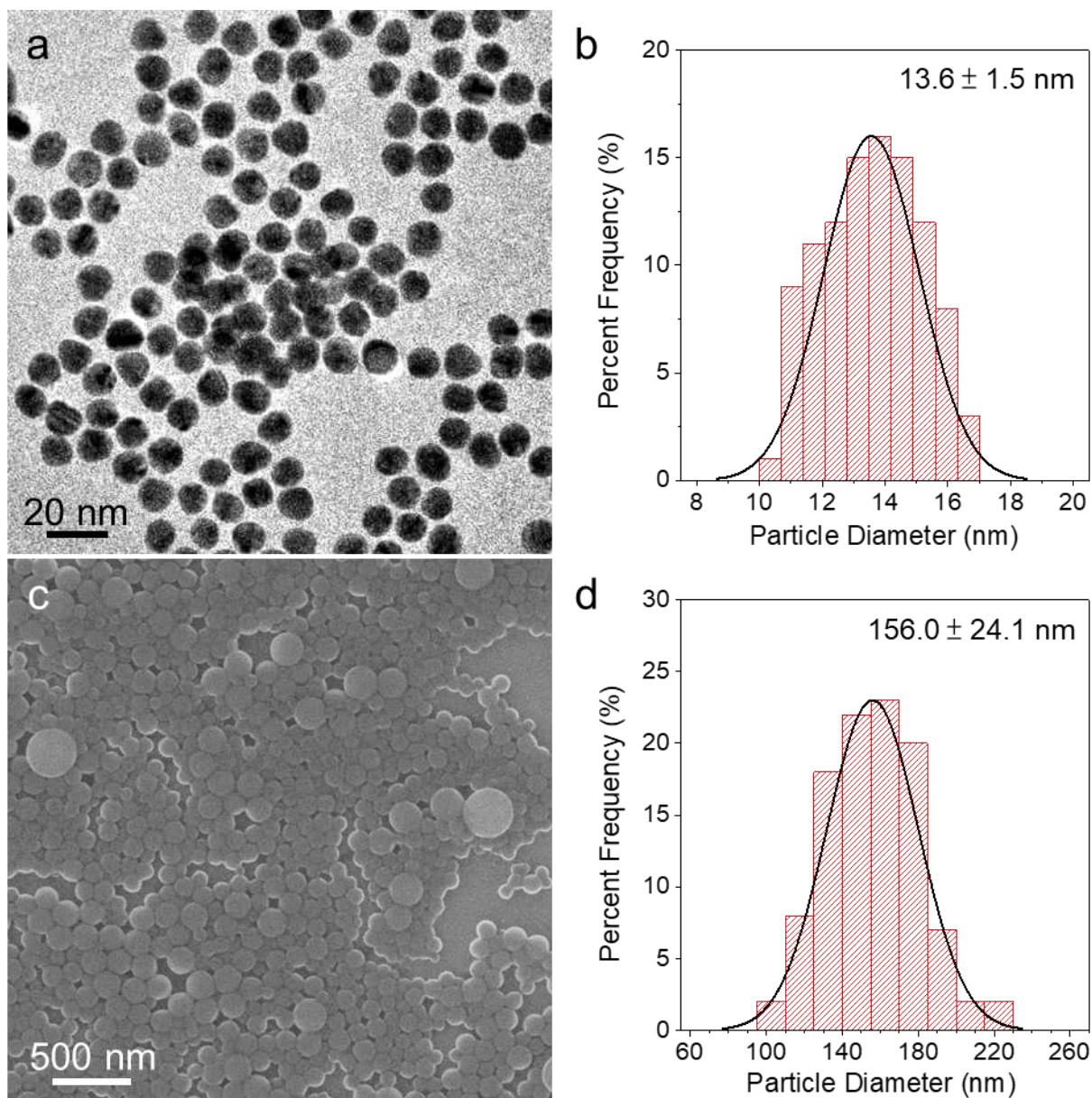


Figure S2. Monodispersed (a) pure Au nanoparticles, (c) pure BINOL nanospheres, and their corresponding size-distribution histograms.

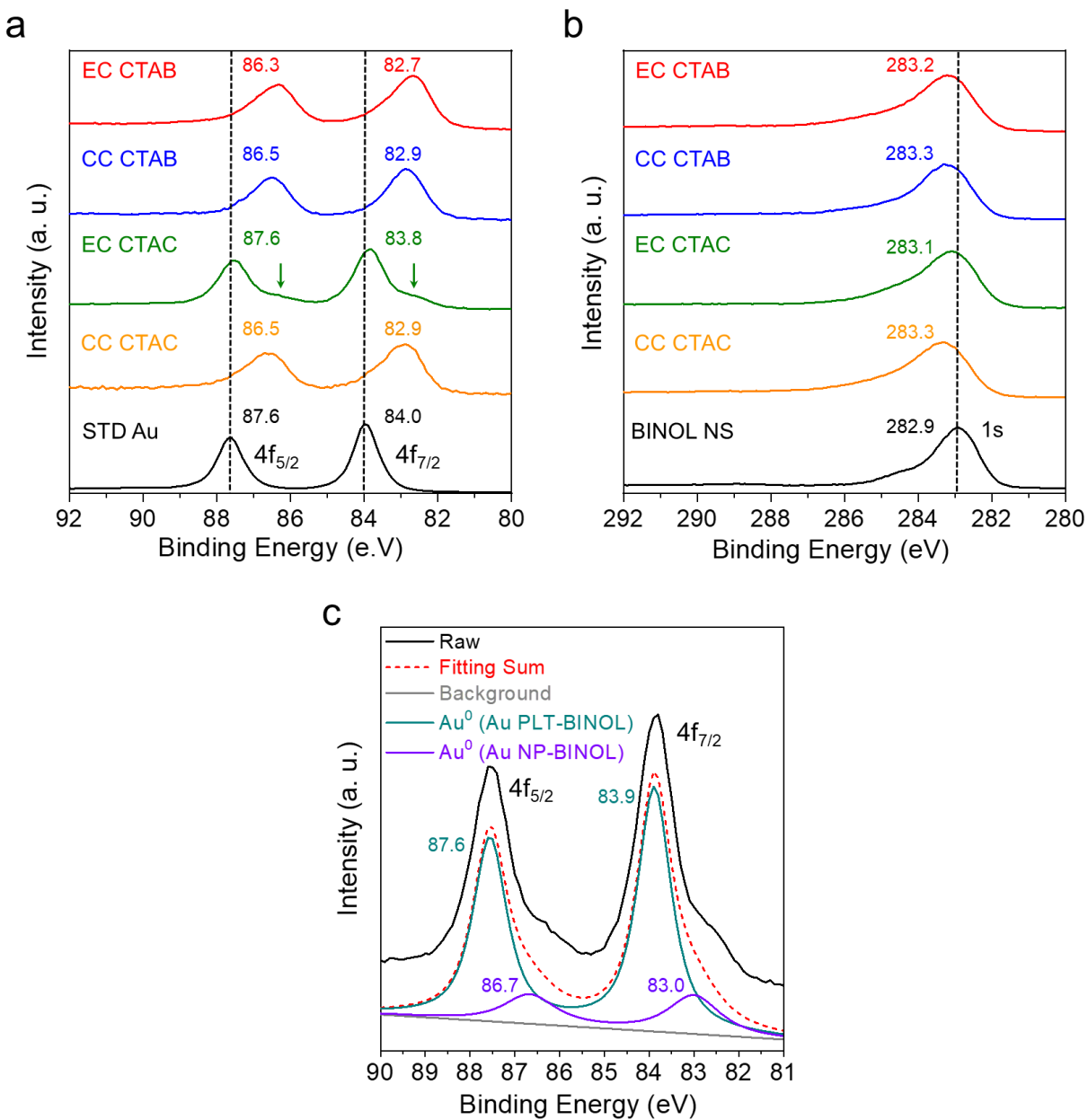


Figure S3. HRXPS (a) Au 4f, (b) C 1s spectra of Au-BINOL hybrid nanocomposites, Au nanoparticles, and pristine BINOL nanospheres. (c) The Au 4f spectrum of CTAC-eccentric Au-BINOL nanostructures with fitting peaks.

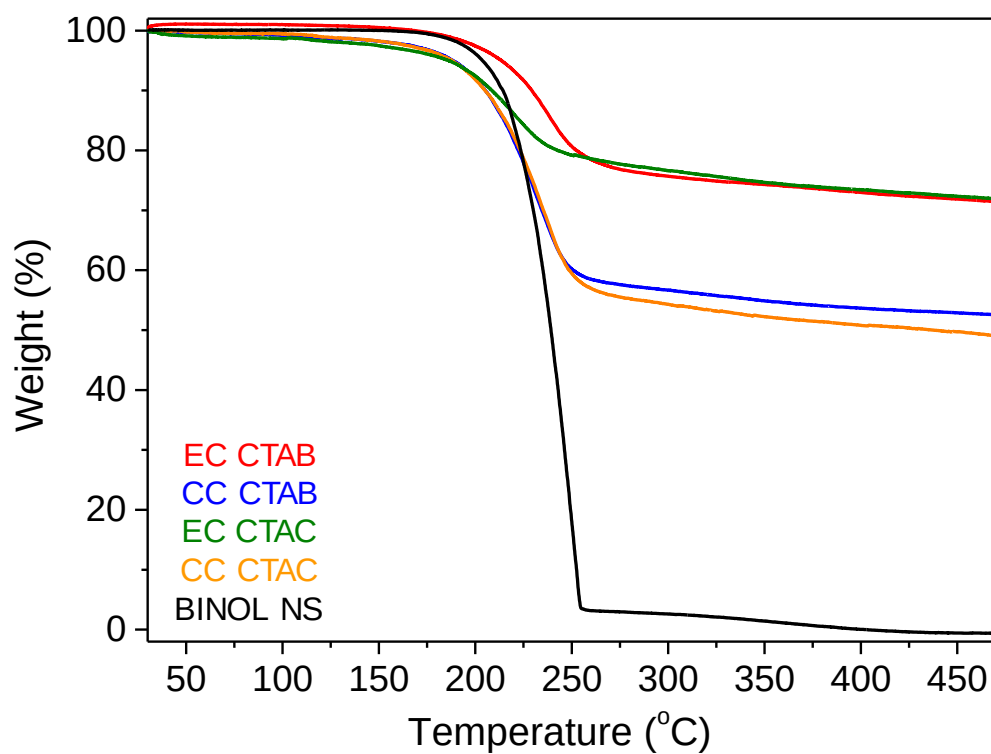


Figure S4. TGA plots of Au-BINOL samples and pristine BINOL nanospheres.

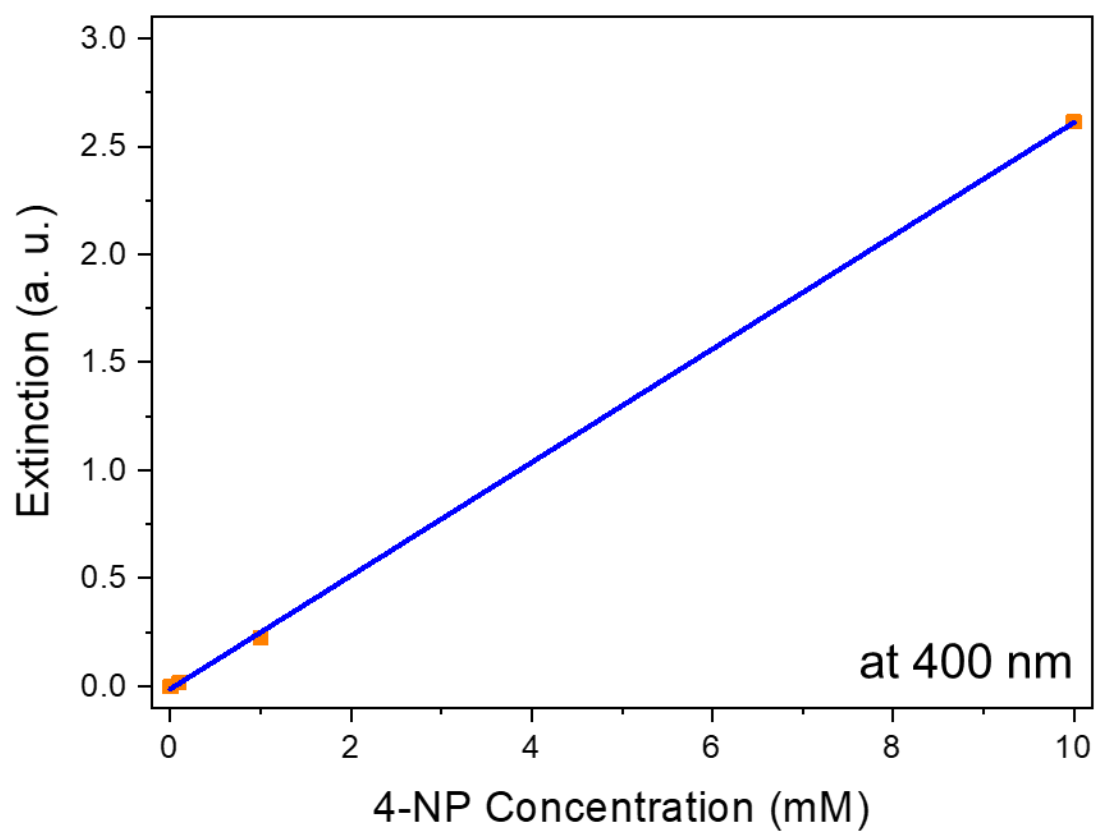


Figure S5. The calibration line of 4-NP plotted in the extinction at 400 nm versus concentration.

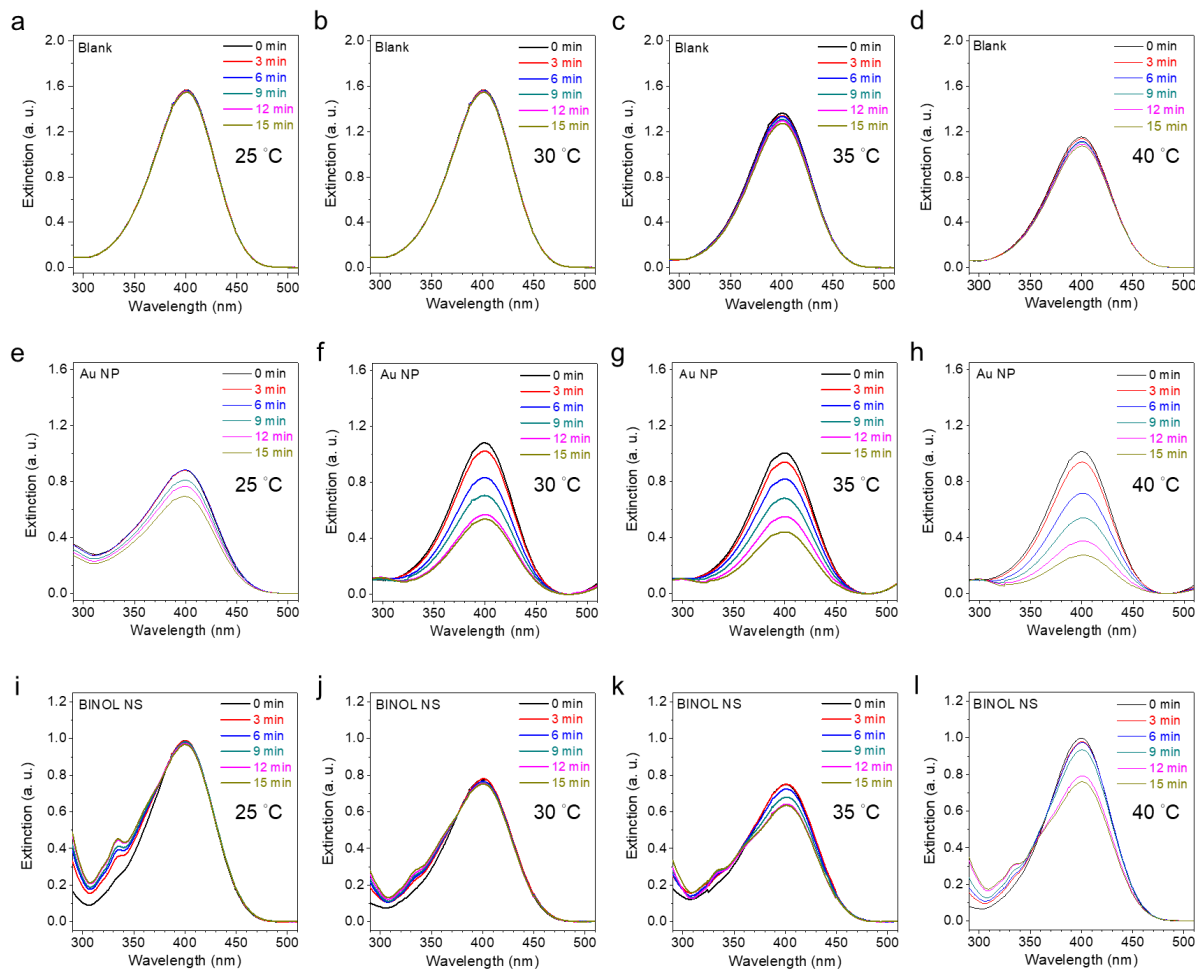


Figure S6. Time-dependent UV-Vis extinction spectra of 4-NP reduction with (a-d) no catalyst, (e-h) Au nanoparticles, and (i-l) BINOL nanospheres in dark at 25 °C, 30 °C, 35 °C, and 40 °C.

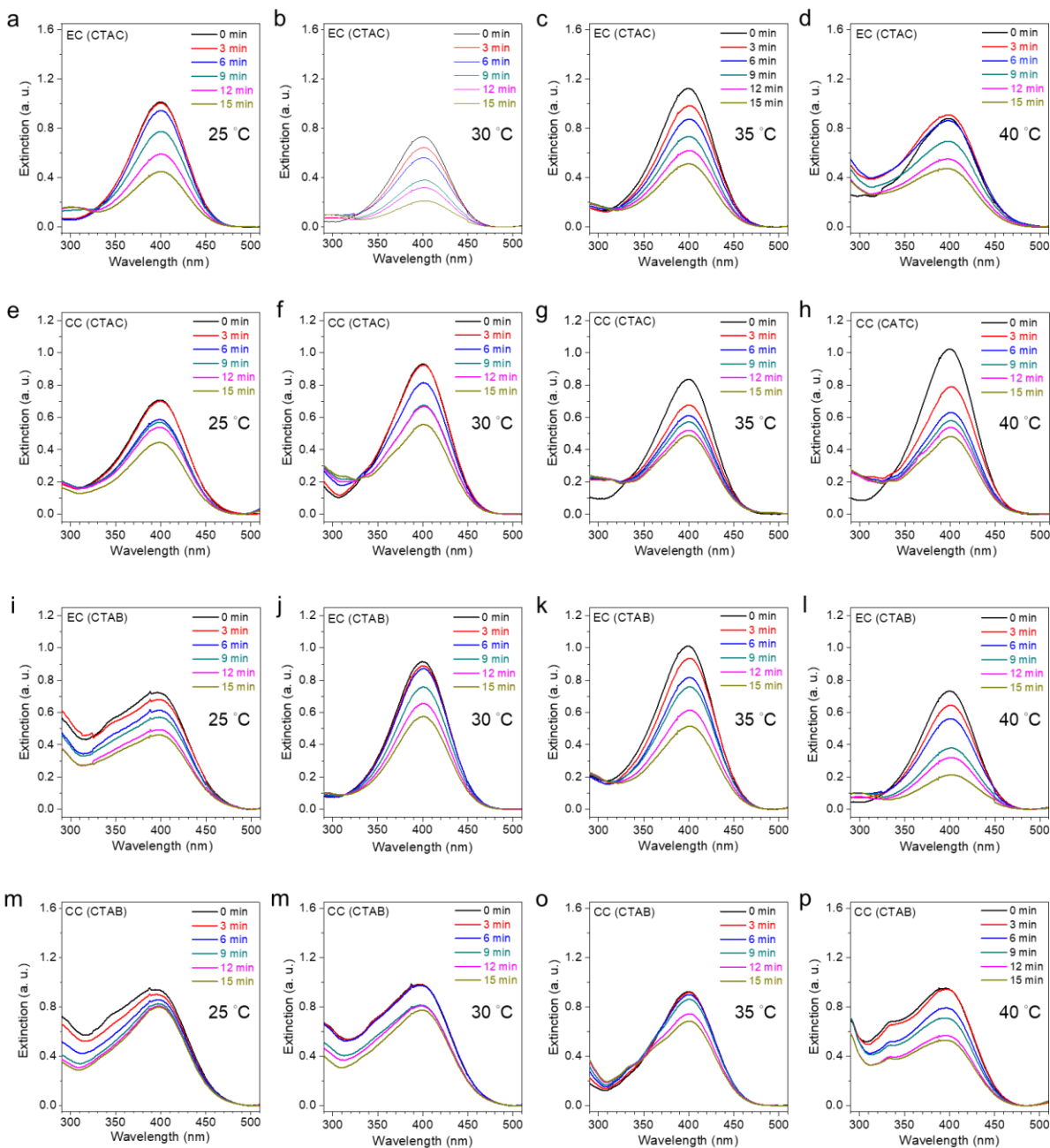


Figure S7. Time-dependent UV-Vis extinction spectra of 4-NP reduction with (a-d) eccentric Au-BINOL catalysts (CTAC), (e-h) concentric Au-BINOL catalysts (CTAC), (i-l) eccentric Au-BINOL catalysts (CTAB), (m-p) concentric Au-BINOL catalysts (CTAB) in dark at room temperature (25 °C), 30 °C, 35 °C, and 40 °C.

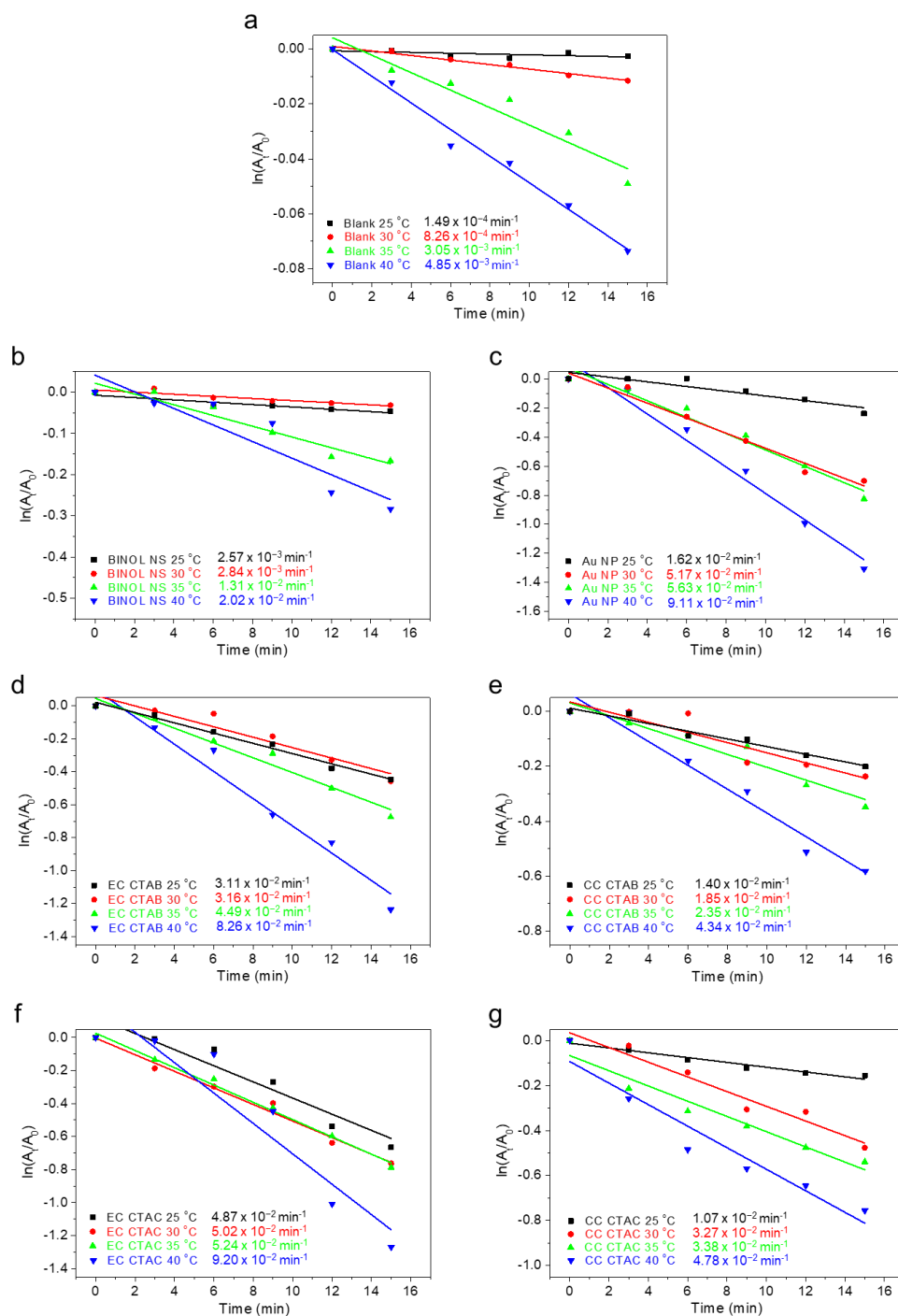


Figure S8. Plots of $\ln(A_t/A_0)$ vs time of 4-NP reduction catalyzed with (a) no catalysts, (b) BINOL nanospheres, (c) Au nanoparticles, (d) CTAB-eccentric, (e) CTAB-concentric, (f) CTAC-eccentric,

and (g) CTAC-concentric Au-BINOL hybrid nanocomposites at constant temperatures of 25, 30 °C, 35 °C, and 40 °C.

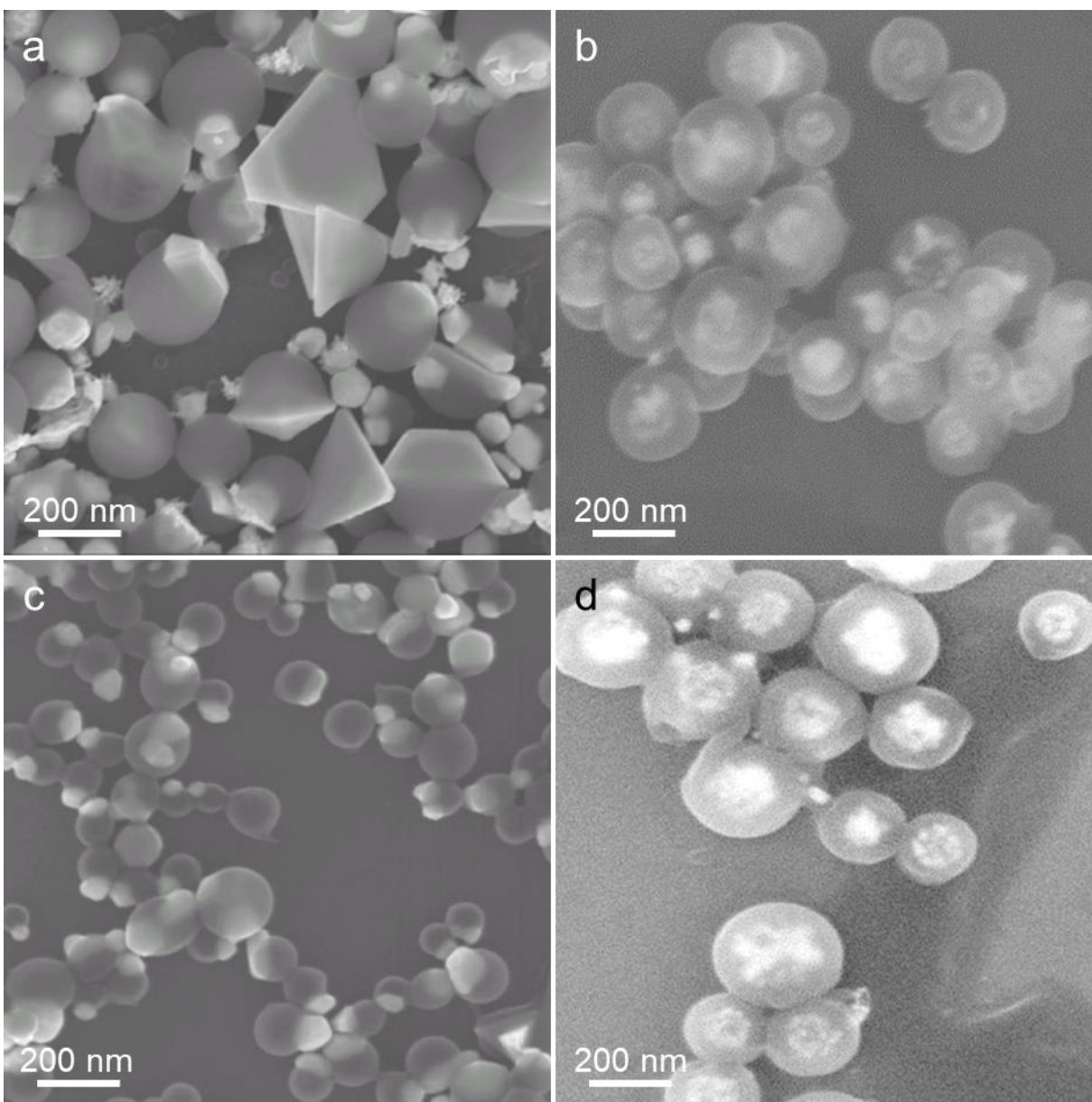


Figure S9. SEM images of (a) CTAC-eccentric, (b) CTAC-concentric, (c) CTAB-eccentric, and (d) CATB-concentric Au-BINOL hybrid nanocomposites after experiencing 4-NP reduction reaction at 35 °C.

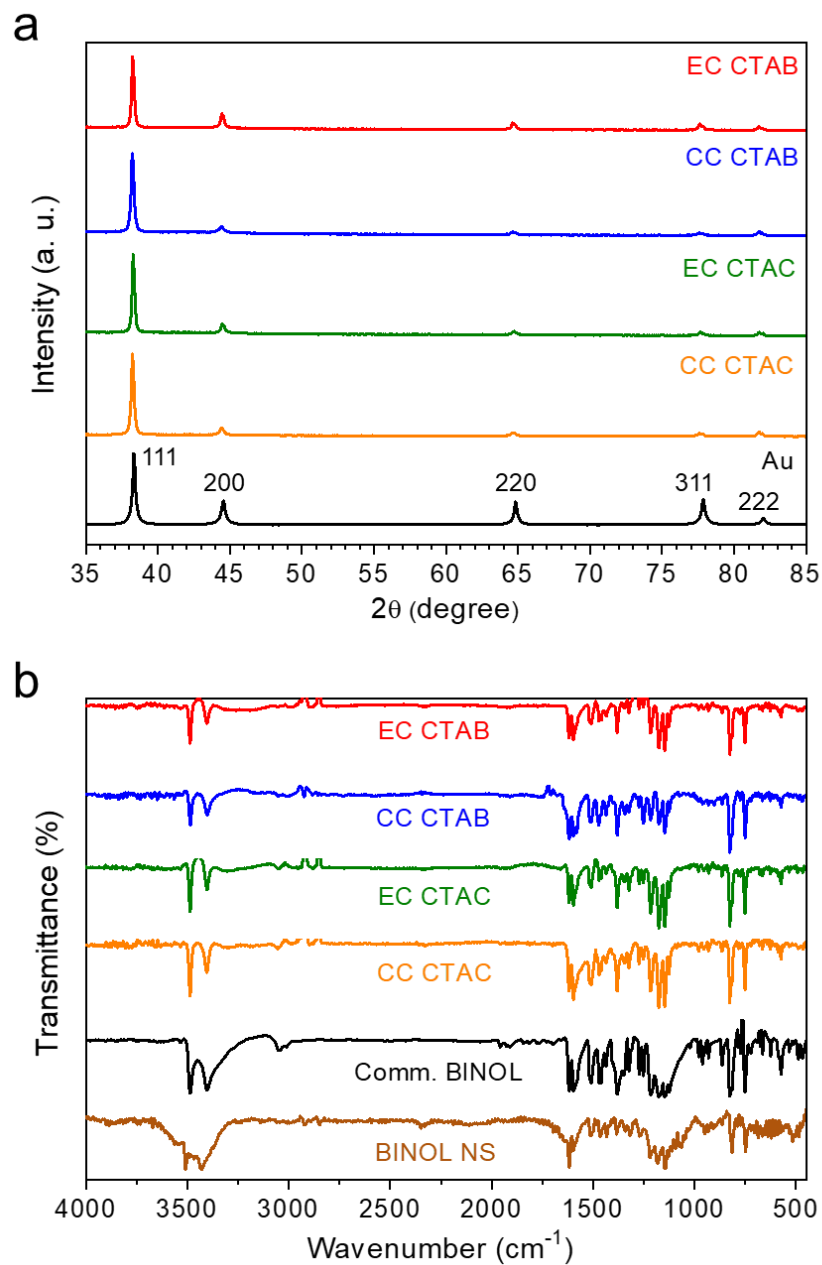


Figure S10. (a) XRD patterns and (b) FT-IR spectra for the samples of Au nanoparticles, BINOL nanospheres, and Au-BINOL hybrid nanocomposites collected after experiencing 4-NP reduction reaction. Fresh commercial BINOL powder in (b) is used as a reference.

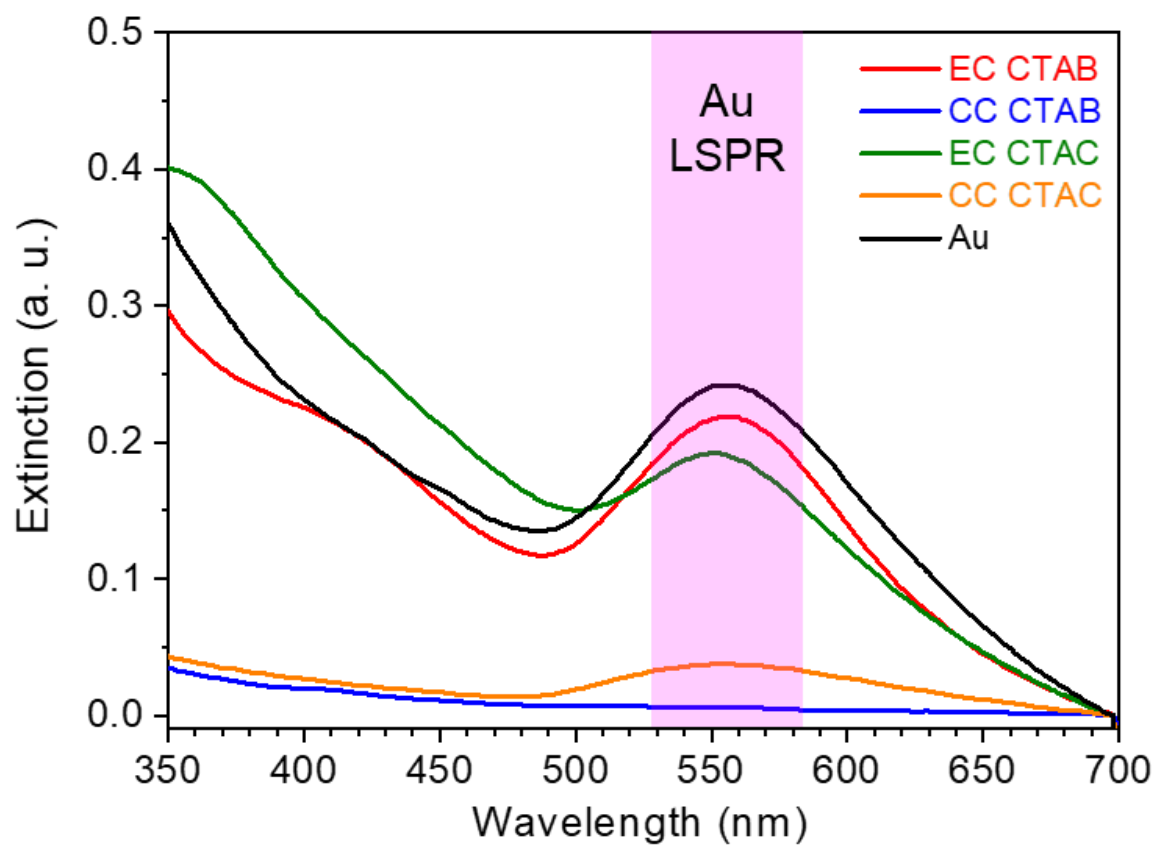


Figure S11. UV-Vis spectra of Au-BINOL hybrid nanocomposites and Au nanoparticles.

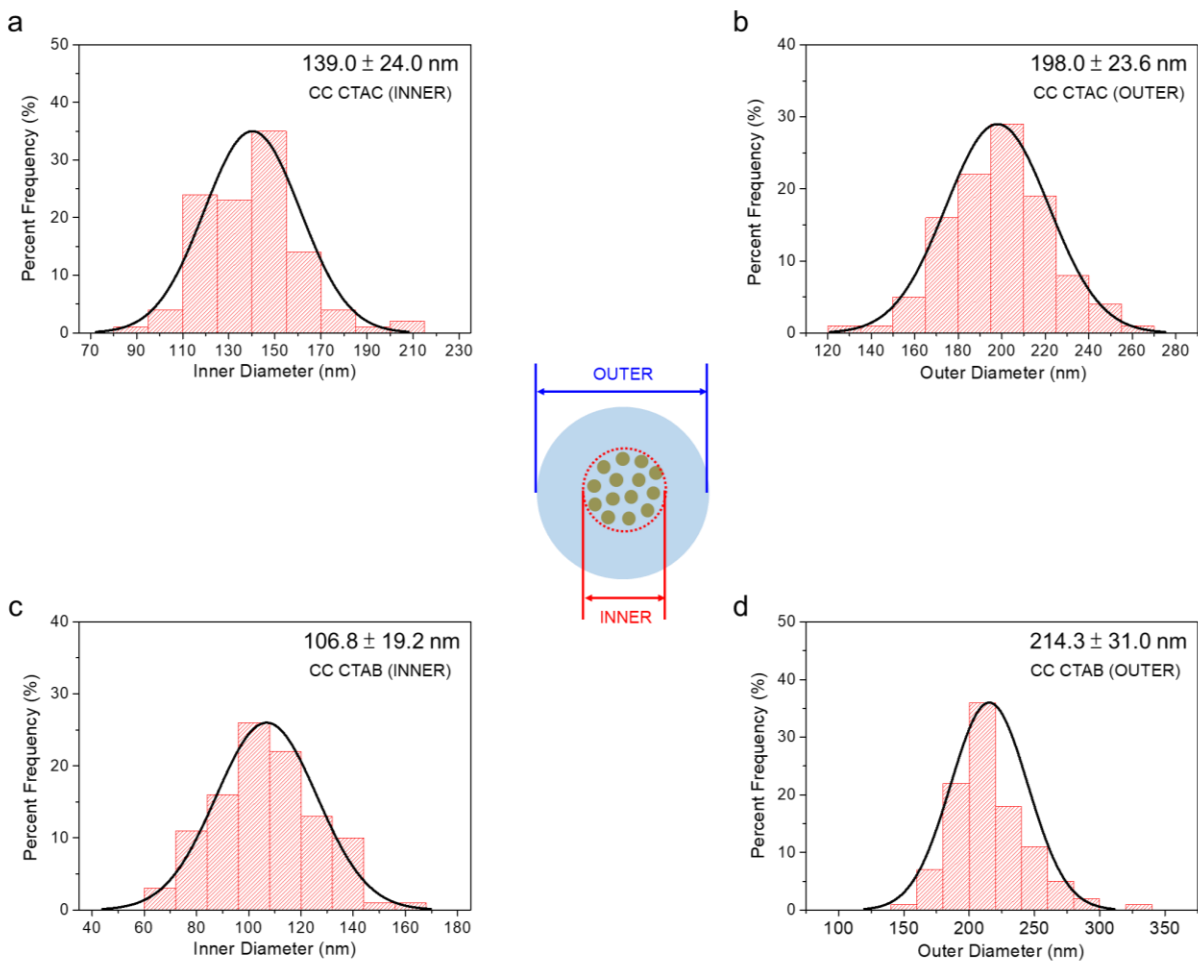


Figure S12. Histograms of outer diameters and inner distribution lengths of Au cluster groups in the concentric Au-BINOL hybrid nanostructures made with (a, b) CTAC and (c, d) CTAB.

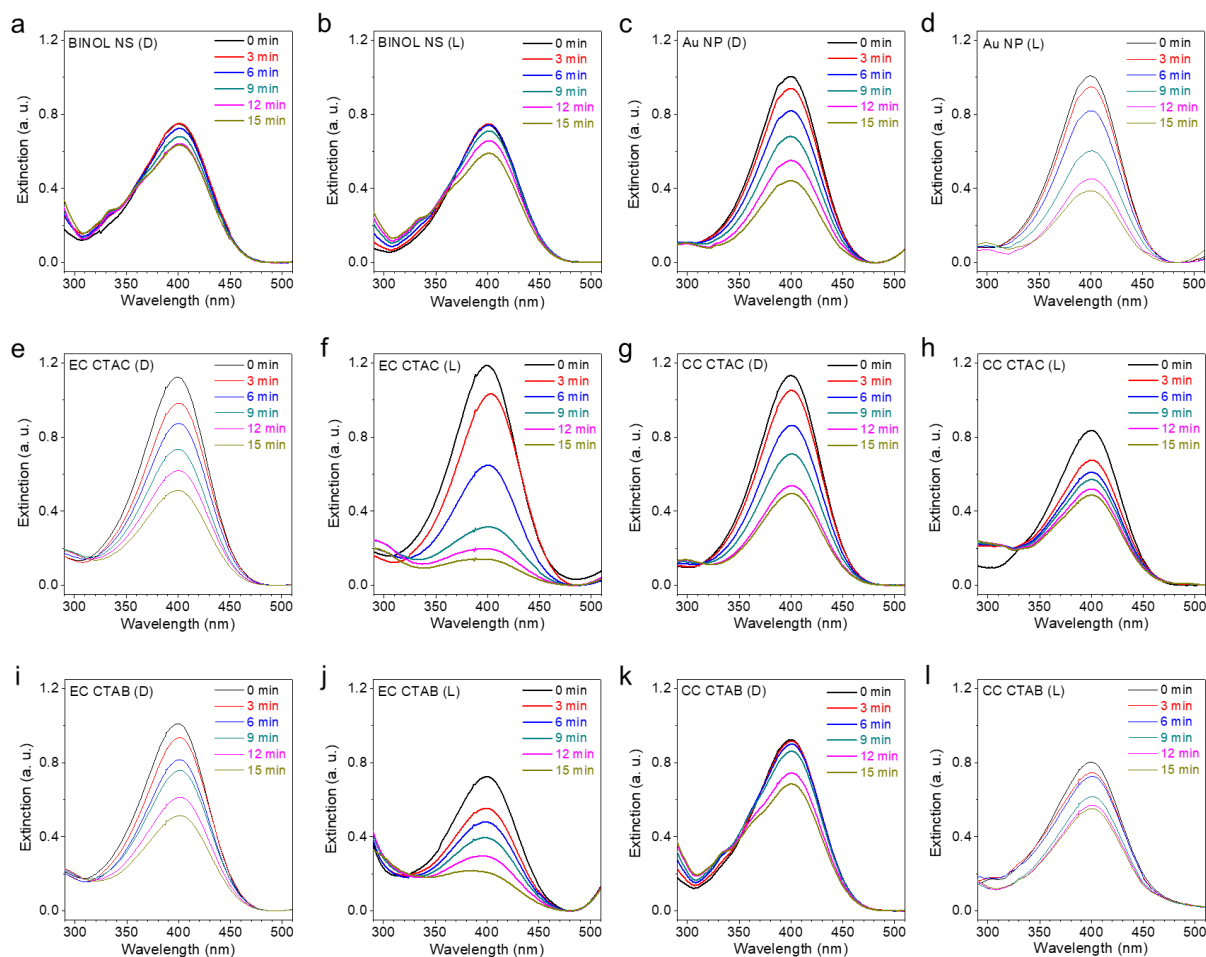


Figure S13. Time-dependent UV-Vis spectra of the 4-NP reduction with (a, b) pure BINOL nanospheres, (c, d) pure Au nanoparticles, (e, f) CTAC-eccentric, (g, h) CTAC-concentric, (i, j) CTAB-eccentric, and (k, l) CTAB-concentric Au-BINOL nanocomposites at 35 °C in dark (D) illumination of visible light (L).

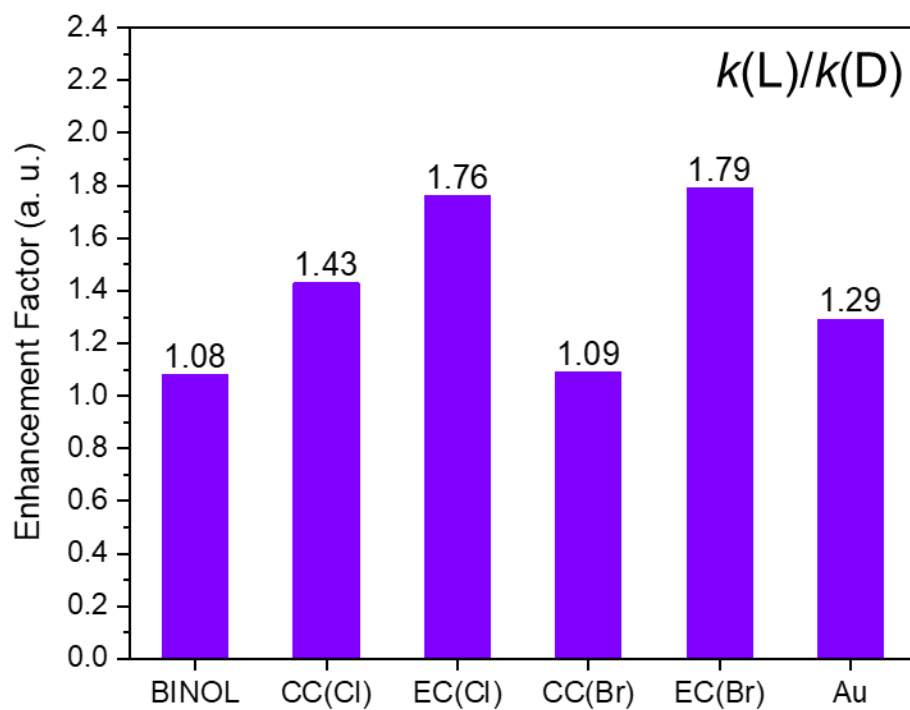


Figure S14. The column chart of enhancement factors $k(L)/k(D)$ for the samples of BINOL nanospheres, Au nanoparticles, and Au-BINOL hybrid nanostructures.