Supporting Material for

Ultrabroad Spectral Response and Excellent SERS Performance of PbS-assisted Au/PbS/Au Nanostars

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Figure S1. SEM image of Au nanobipyramids.

Figure S2. SEM images of Au BPs@PbS nanoparticles prepared by adding different amounts of Pb(Ac)$_2$, (a) 5 μL, (b) 20 μL, (c) 50 μL. The concentration of Pb(Ac)$_2$ is 0.01 M.
Figure S3. SEM images of Au/PbS/Au nanostars prepared with adding different amount of HAuCl₄. The amount of HAuCl₄ is (a) 5 μL (5 mM), (b) 20 μL (5 mM), (c) 100 μL (5 mM), (d) 50 μL (15 mM), (e) 200 μL (15 mM), (f) 500 μL (15 mM).
Figure S4. SEM images of Au/PbS/Au nanostars without/with the addition of HCl. (a) Au/PbS/Au nanostars with 50 μL HAuCl₄ without HCl. (b) Au/PbS/Au nanostars with 200 μL HAuCl₄ without HCl. (c) Add HCl to the sample in figure S4(a). (d) Add HCl to the sample in figure S4(b).

Figure S5. Size of photocatalytic activity of different nanoparticles in 4-NP:NaBH₄. (a) Extinction spectra of 4-NP:NaBH₄ with Au/PbS/Au nanostars (Au(180)) recorded at the reaction time of 0, 10, 20, and 30 mins. (b) Peak extinction intensity at 664 nm of 4-NP molecules as a function of reaction time t. (c) Catalytic degradation curves of 4-NP over different catalysts. (d) Reaction rate K for different samples.
Figure S6. Normalized extinction spectra of Au/PbS/Au nanostars (short) (Au(50)) (a) and Au/PbS/Au nanostars (long) (Au(200)) (b) with 0 day and 5 days.