Supplementary information

Controlled growth and optical response of semi-hollow plasmonic nanocavity and ultrathin sulfide nanosheets on Au/Ag platelets

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1. Directly growth of CdS on Au/Ag nanoplates

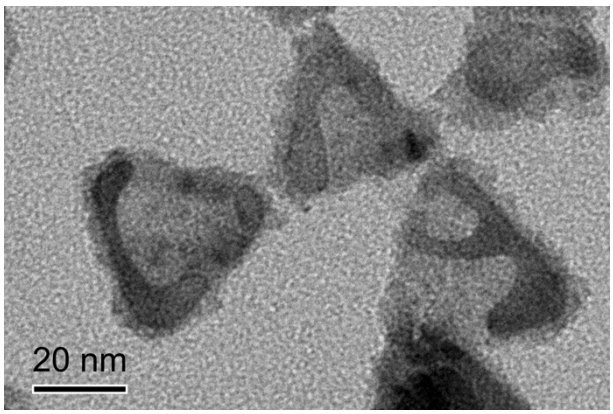

Fig. S1 TEM image of destroyed nanostructures after CdS nanoparticles were deposited on the Au/Ag nanoplates instead of (Au/Ag)-Ag nanocavities.

For comparison, the synthesized Ag/Ag nanoplates were used as templates to directly grow CdS without Au ions etching. Other reaction conditions of growing CdS remained unchanged. Figure S1 shows TEM image of destroyed (Ag/Ag)-CdS nanoplates. Unexpectedly, the generating CdS nanoparticles directly were grown on Au/Ag nanoplates, but destroy Ag atoms on the triangular faces by Cd ions.

2. Optical response of Ag_2S nanoparticles

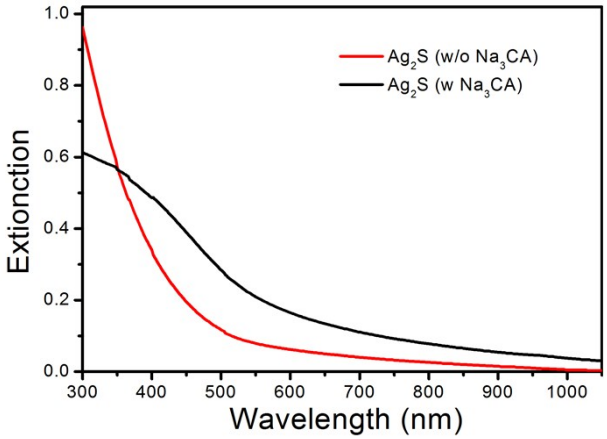

Fig. S2 The extinction spectra of Ag_2S nanoparticles prepared with and without adding Na_3CA.

The Ag_2S nanoparticles are prepared by mixing $AgNO_3$ (20 mM, 2 mL), TAA (10 mM, 0.5 mL), and Na_3CA (100 mM, 1 mL), while the mixture was heated for 4 h in a 60 °C oven. For comparison, we have added pure water (1 mL) to replace Na_3CA and remained other reaction conditions. The extinction spectra of Ag_2S nanoparticles are obtained for discussion. The results indicate that the presence of Na_3CA in the reaction mixtures leads to a broad band in the ultraviolet region. Here, Na_3CA is used as complexing agent to absorb on nanoparticles and prevents their agglomeration. Besides, Na_3CA can reduce the Ag^+ ions in the solution to Ag particles for further sulfuration.[1,2]

3. Stacks of Au/Ag nanoplates on Cu grids

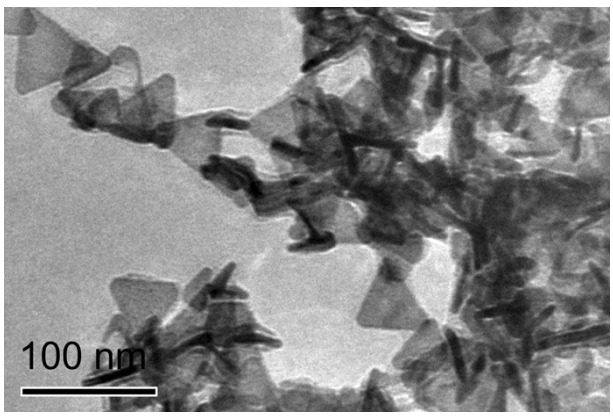

Fig. S3 TEM image of Au/Ag nanoplates assembling upright on Cu grids, which

allows for measurement of their thickness.

4. Optical response of (Au/Ag)-Bi_2S_3/Ag_2S hybrid nanocavities

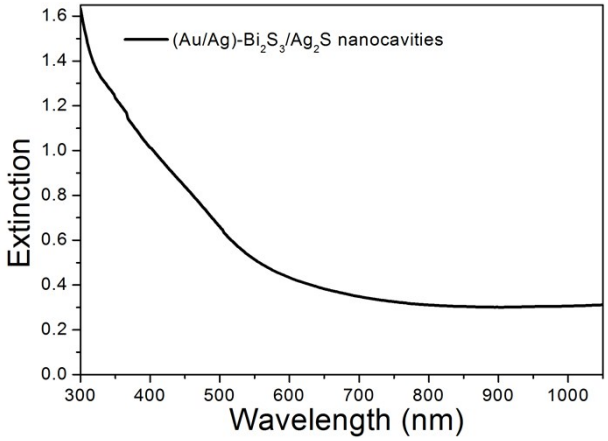

Fig. S4 The extinction spectrum of (Au/Ag)-Bi_2S_3/Ag_2S hybrid nanocavities.

References

1 S. I. Sadovnikov, Y. V. Kuznetsova and A. A. Rempel, Nano-Structures & Nano-Objects, 2016, **7**, 81-91.

2 M. Wang, P. Ju, W. Li, Y. Zhao and X. Han, Dalton Transactions, 2017, **46**, 483-490.