

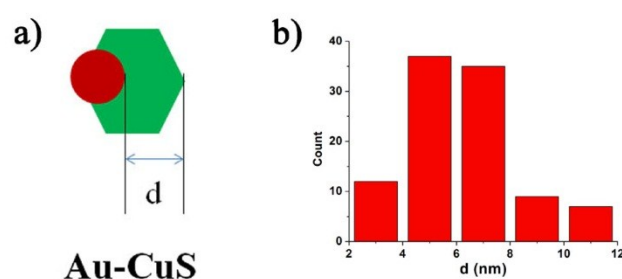
## Synthesis of plasmonic Au-CuS hybrid nanocrystals for photothermal transduction and chemical transformations

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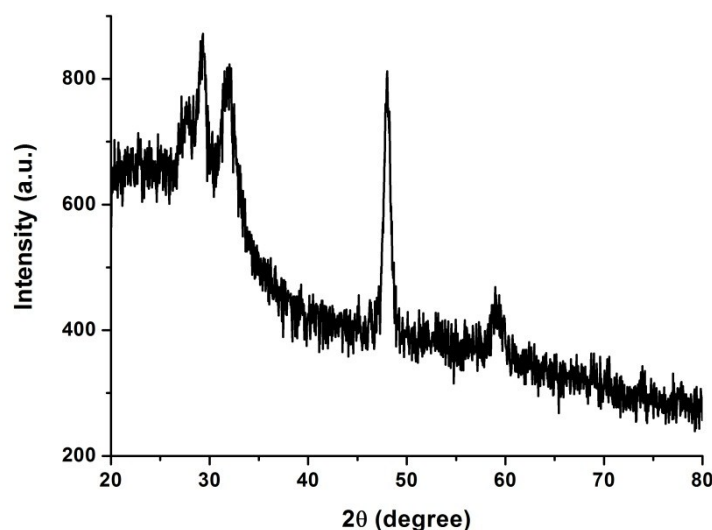
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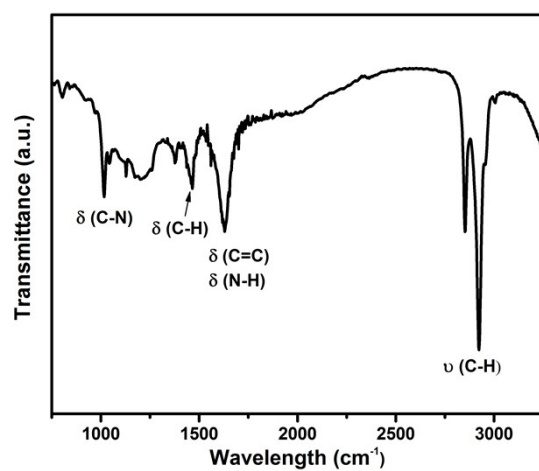
### Supporting information:



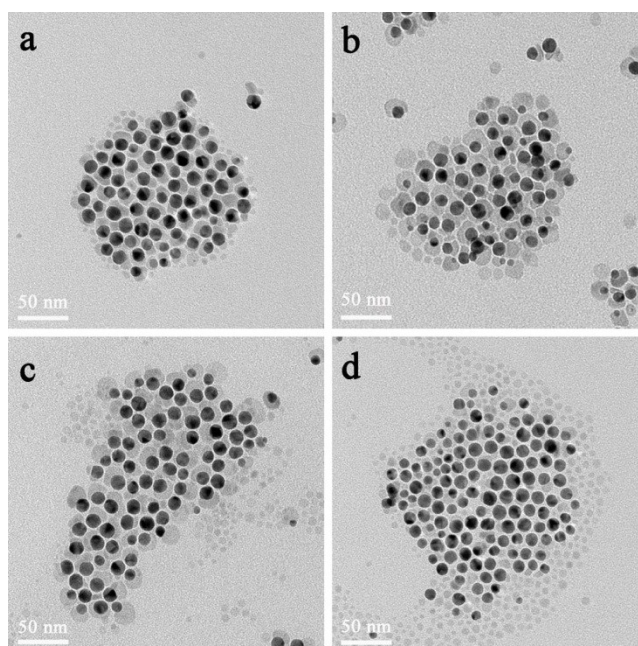
**Figure S1.** (a) Definition of the size of CuS domain; (b) The size histogram of CuS domain of Au-CuS hybrid nanocrystals synthesized with S/Cu feed molar ratio of 1/1 and using dichlorobenzene as solvent at 100 °C.



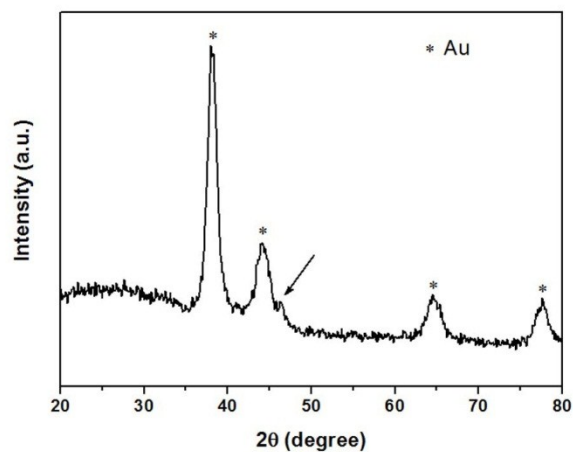
**Figure S2.** XRD pattern of the Cu sulfide nanocrystals prepared with all conditions and procedures same as described in experimental section except in the absence of Au seeds, clearly indicating the nanocrystals formed under these conditions were CuS of covellite structure.



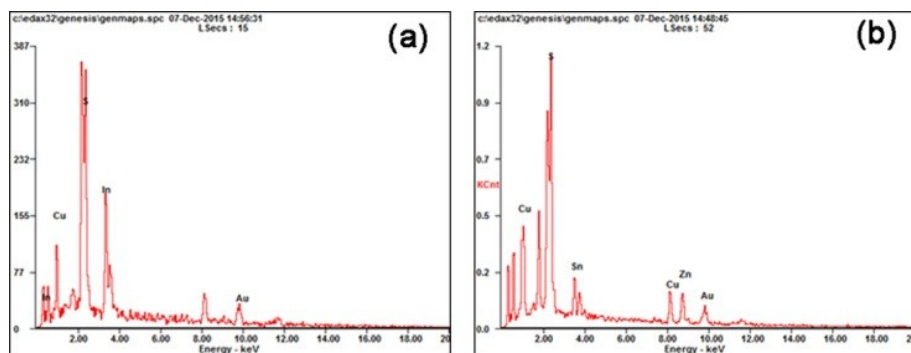
**Figure S3.** FTIR spectra of Au-CuS hybrid nanocrystals, proving the existence of oleylamine on the surface of nanocrystals.<sup>1</sup>



**Figure S4.** TEM images of Au-CuS hybrid nanocrystals synthesized with various amounts of oleylamine in dichlorobenzene: (a) 2 mL, (b) 3 mL, (c) 4 mL, and (d) 5 mL.



**Figure S5.** XRD pattern of Au-Cu<sub>2-x</sub>S hybrid nanocrystals synthesized at 180 °C. The absence of the diffraction peak at ~48° and appearance of a new peak at ~46° indicate it is either Cu<sub>1.8</sub>S or Cu<sub>1.75</sub>S rather than CuS.



**Figure S6.** EDX spectra of Au-CIS (a) and Au-CZTS (b) hybrid nanocrystals.

## Reference

1 S. Mourdikoudis and L. M. Liz-Marzán, Oleylamine in nanoparticle synthesis, *Chem. Mater.*, 2013, **25**, 1465-1476.