Electronic Supplementary Information (ESI)

Formation of uniform carrot-like $Cu_{31}S_{16}$-$CuInS_2$ heteronanostructures assisted by citric acid at the oil/aqueous interface †

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Figure S1

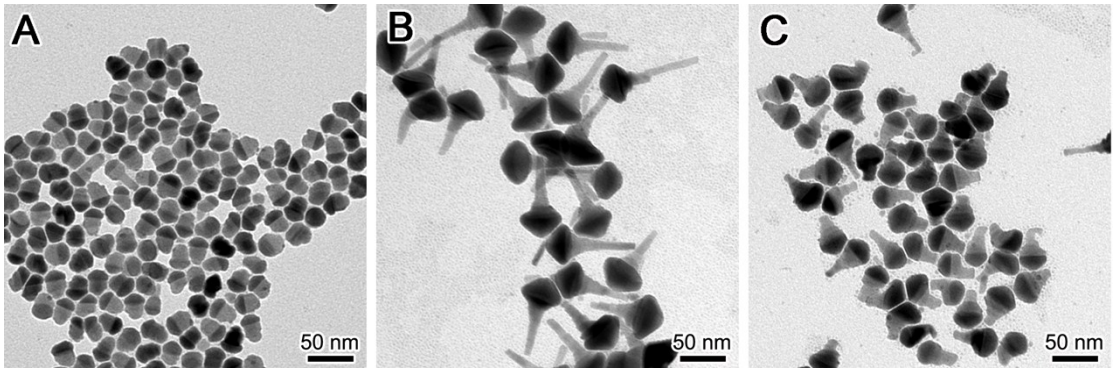

Fig.S1 TEM images of $Cu_{31}S_{16}$-$CuInS_2$ HNS synthesized by using different DDT dosage when the Cu/In precursor ratio is kept at 1:1: (A) 3 mL, (B) 5 mL and (C) 8 mL.

Figure S2

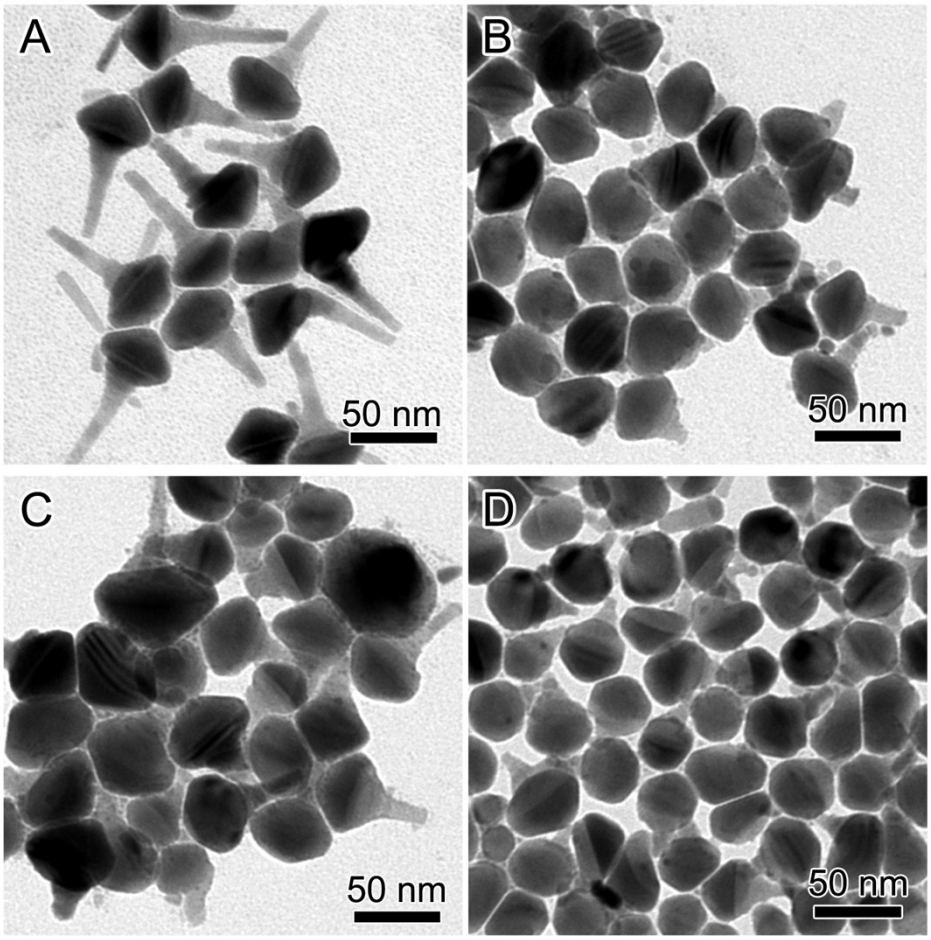

Fig.S2 TEM images of $Cu_{31}S_{16}$-$CuInS_2$ HNS synthesized by using different Cu/In precursor ratios in the presence of 5 mL of DDT: (A) 1:1; (B) 1:1.3; (C) 1:1.7 and (D)1:2.

Figure S3

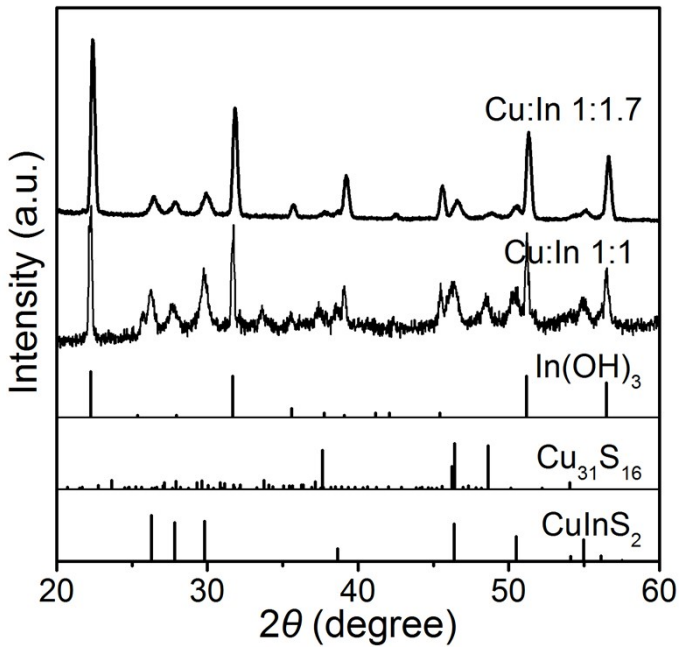

Fig.S3 XRD patterns of the $Cu_{31}S_{16}$-$CuInS_2$ HNS synthesized by using different Cu/In precursor ratios of 1:1 and 1:1.7 in the presence of 5 mL of DDT, and the bottom vertical lines represent the standard diffraction lines of cubic $In(OH)_3$ (JCPDS No.16-0161), monoclinic $Cu_{31}S_{16}$ (JCPDS No.23-0959) and stimulated wurtzite $CuInS_2$.

Figure S4

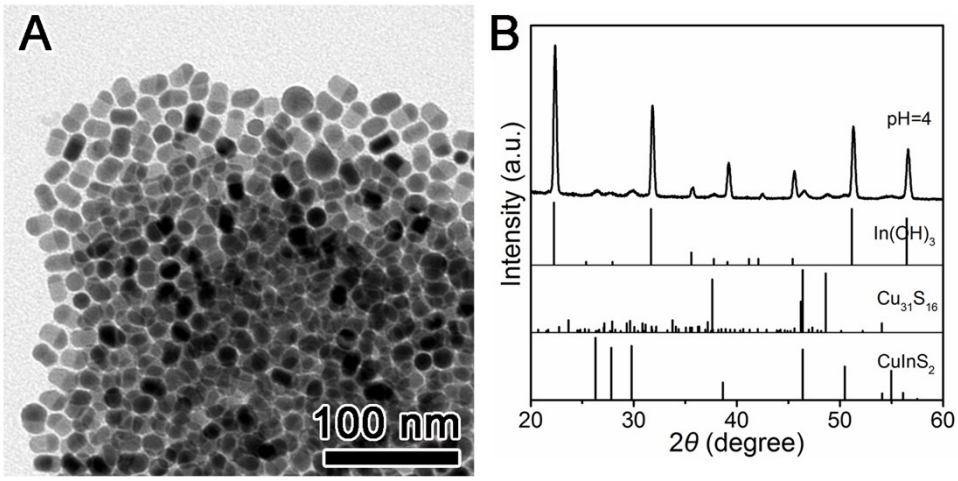

Fig.S4 (A)TEM image and (B) XRD patterns of the $Cu_{31}S_{16}$-$CuInS_2$ HNS synthesized using 3 mL of DDT and the Cu/In precursor ratio of 1:1.7 at 190 ^{o}C, in which the pH value of aqueous solution by adding diluted HNO_3.

Figure S5

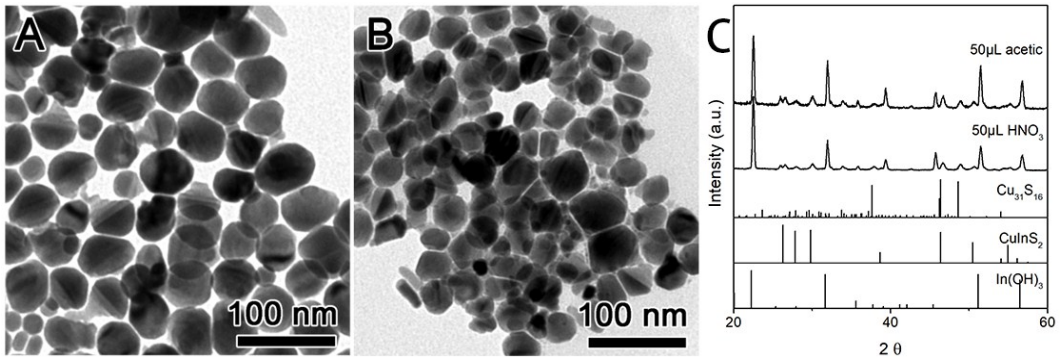

Fig.S5 TEM images of $Cu_{31}S_{16}$-$CuInS_2$ HNS synthesized in the presence of 3 mL of DDT and the Cu/In precursor ratio of 1:1.7 at 190 °C by incorporation of different types of acids: (A) 50 μL nitric acid, (B) 50 μL acetic acid, (C) the corresponding XRD patterns and the bottom vertical lines represent the standard diffraction lines of cubic $In(OH)_3$ (JCPDS No.16-0161), monoclinic $Cu_{31}S_{16}$ (JCPDS No.23-0959) and stimulated wurtzite $CuInS_2$.

Figure S6

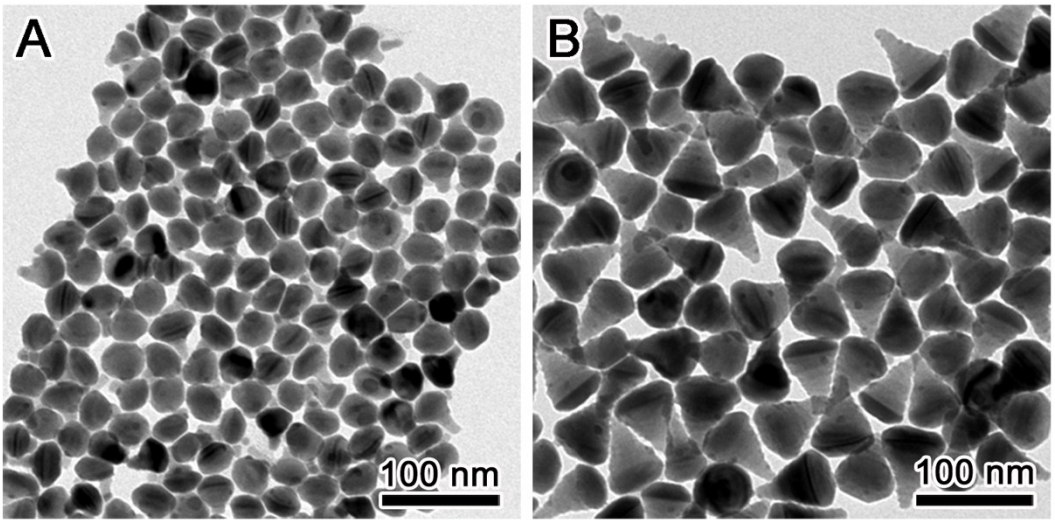

Fig.S6 TEM images of $Cu_{31}S_{16}$-$CuInS_2$ HNS synthesized with Cu/In precursor ratio of 1:1 at 190 ^oC for different DDT dosage in the presence of 0.5 g of citric acid: (A) 1.5 mL; (B) 2 mL.

Figure S7

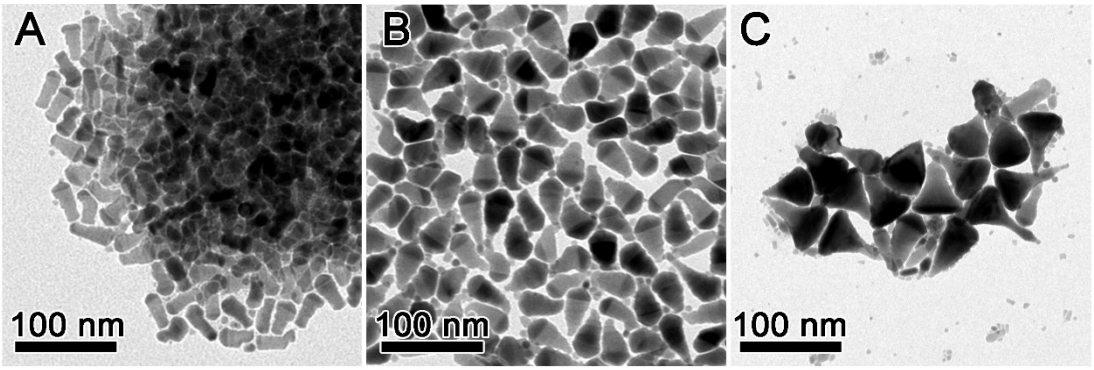

Fig.S7 TEM images of $Cu_{31}S_{16}$-$CuInS_2$ HNS under different temperatures: (A)175^{o}C, (B)190^{o}C and (C)205^{o}C, which were synthesized with Cu/In precursor ratio of 1:1 in the presence of 0.5 g of citric acid 0.5g and 3 mL of DDT.