Supporting Information

Synthesis of High-Quality I-III-VI Semiconductors Supported Au Particles and Their Catalytic Performance

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Experimental Section:

Synthesis of CIS and AIS NCs:

CIS nanodisks were prepared via Brian's method.[1] 0.5 mmol CuCl, 0.5 mmol $InCl_3$, 1 mmol thiourea and 10 mL oleylamine were mixed together in a 50 mL flask. The mixture was held under vacuum at 60 ^oC for 30 min to remove water and oxygen followed by heated to 240 ^oC slowly and kept at the temperature for anther 30 min. The reaction was stopped by removing the heating source and cooled down to room temperature naturally. Ethanol was used as anti-solvent to precipitate the products, which were then collected by centrifugation and re-dissolved in 150 mL chloroform for further use. For preparing AIS polyhedrons the process was kept in the same case with that of CIS except for the usage of $AgNO_3$ instead of CuCl.

Synthesis of Au-CIS and Au-AIS HNCs:

0.05 mmol $HAuCl_4$ was dissolved in 5 mL oleylamine under ultrasound treatment. The oleylamine solution was then mixed quickly with the nanodisks/chloroform solution and stirred over night, followed by addition of ethanol and then centrifugation to deposite the products.

Synthesis of Au NCs.

The Au NCs were obtained from Au-CIS HNCs after hydrochloric acid treated for over night.

Phase Transfer of CIS/AIS nanodisks and Au-CIS/-AIS HNCs:

The as-prepared Au-CIS (or Au-AIS) HNCs were transferred into an aqueous solution by exchanging the organic capping ligands with mercaptopropionic acid (MPA). Typically, 2.0 mL MPA was added to the nanodisks/chloroform solution under ultrasonication for about 30 min followed by centrifugation at 8000 rpm for 5 min. The obtained products were washed using chloroform for twice. Then diluted Na_2CO_3 aqueous solution was added. The mixture was ultrasonicated until a clear aqueous solution was formed. Methanol was used as the anti-solvent to precipitate the water-soluble products. The products were dried in vacuum at room temperature overnight. The final products were dispersed in water for further catalytic test.

Catalytic tests:

All catalytic tests were used water-soluble samples.

Reduction of nitrophenol into aminophenol by $NaBH_4$:

The aqueous solutions of 4-nitrophenol (0.1 mmol/mL) and $NaBH_4$ (0.5 mmol/mL) were freshly prepared. 20 μL 4-nitrophenol and 1 mL $NaBH_4$ aq were mixed in 3 mL H_2O. Then 40 μL catalysts were quickly added. The intensity of the absorption peak at 400 nm was monitored by UV-vis spectroscopy along with time. The whole reaction was taken under sunlight irradiation. The TOF values were based the mass of Au.

Peroxidase-like catalytic experiments:

The peroxidase-like activities of the products were examined in acetate buffer (2 mL, pH = 4.5) containing Au-CIS or Au-AIS NCs (2 mg/mL, 50 μL), in the presence of H_2O_2 (10 μL) and TMB (6.8 mM, 100 μL) at 40 ^{o}C. The reactions were monitored in a wavelength-scan mode at 652 nm by using a Shimadzu UV-3600 spectrometer.

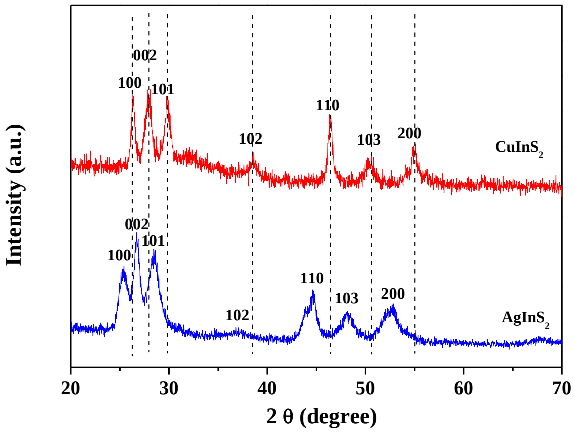

Fig. S1 XRD patterns of the pure CIS and AIS nanodisks.

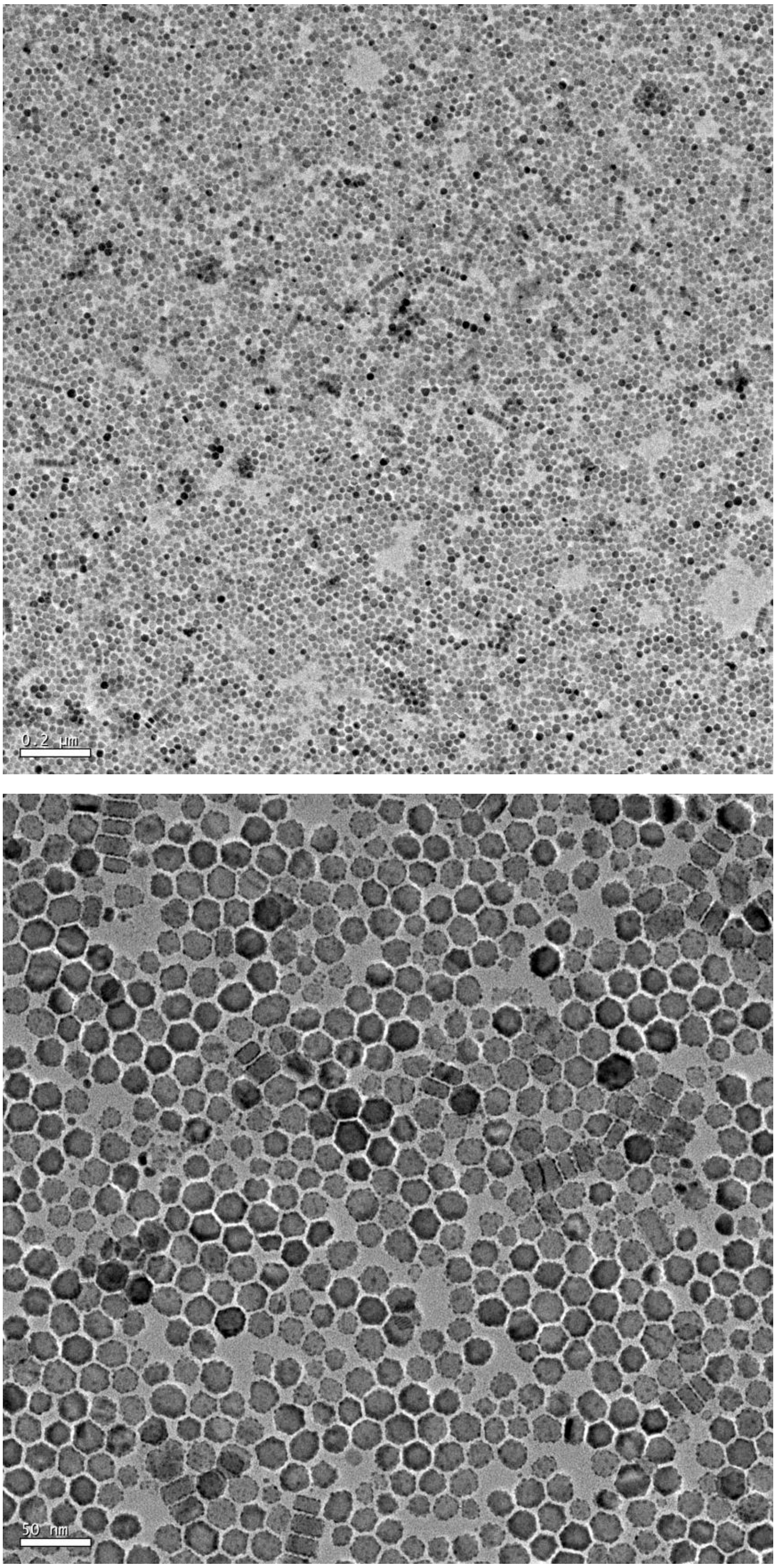

Fig. S2 TEM images of the Au-CIS HNCs.

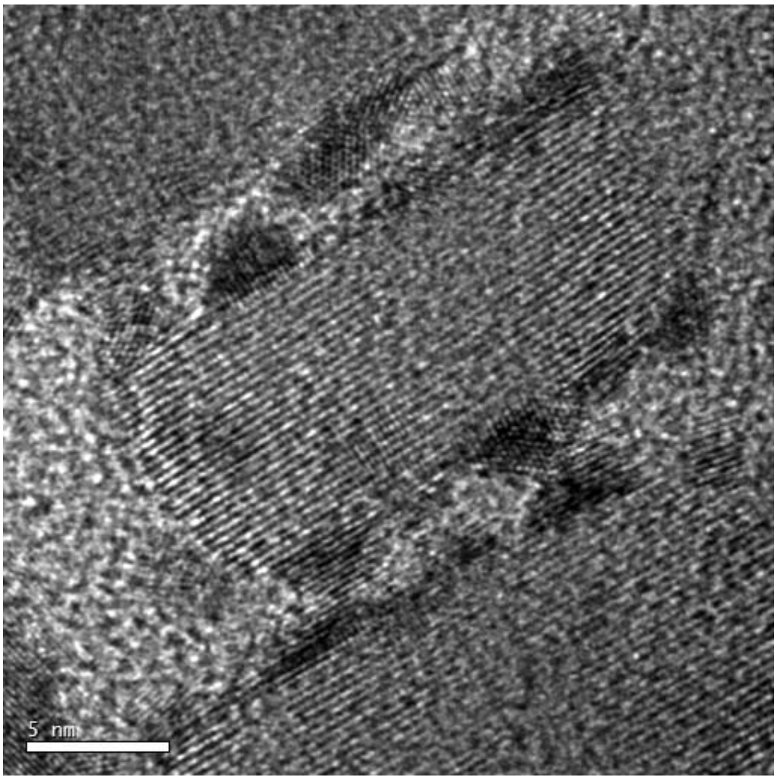

Fig. S3 Side view HRTEM image of the Au-CIS HNCs.

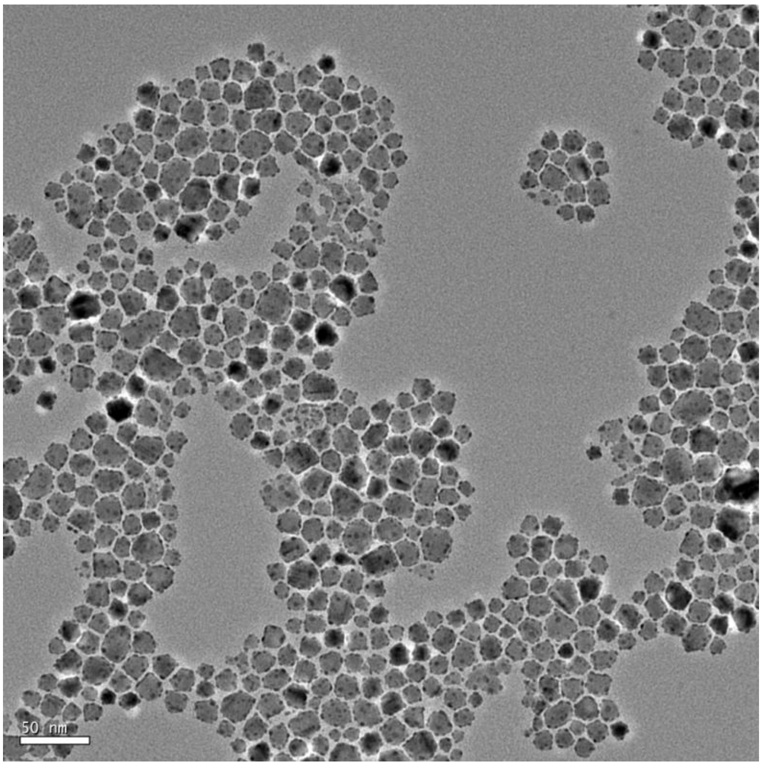

Fig. S4 TEM images of the Au-AIS HNCs.

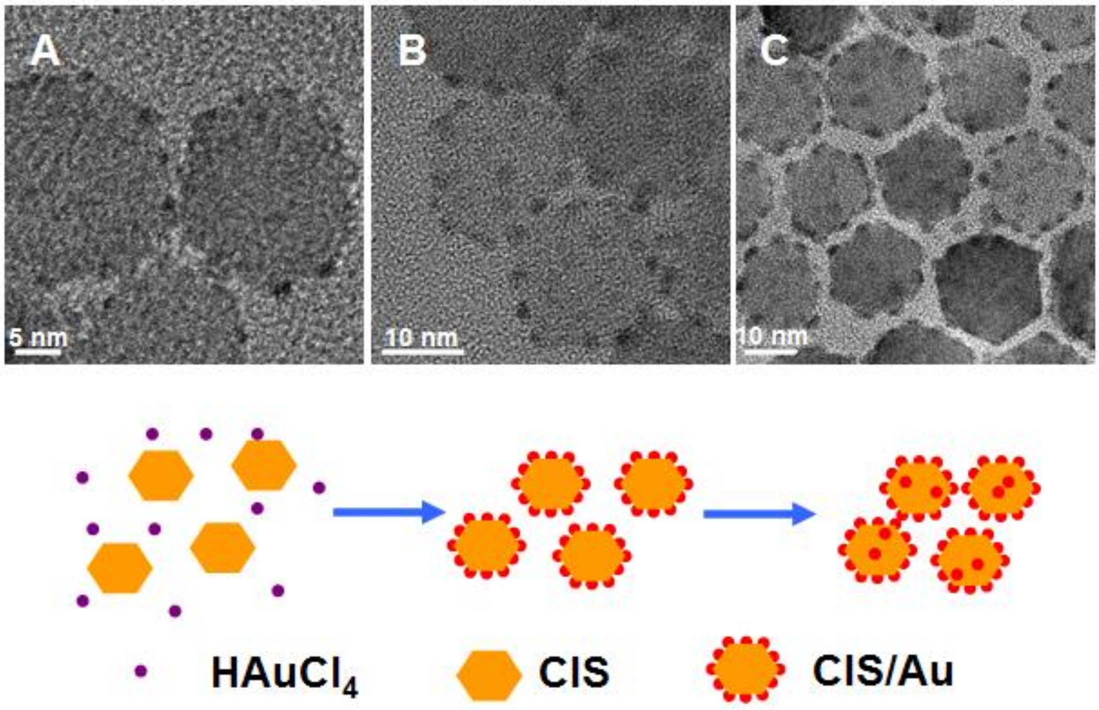

Fig. S5 TEM images of the Au-CIS HNCs obtained at different reaction time: (A) 4 h, (B) 8 h, (C) 12 h.

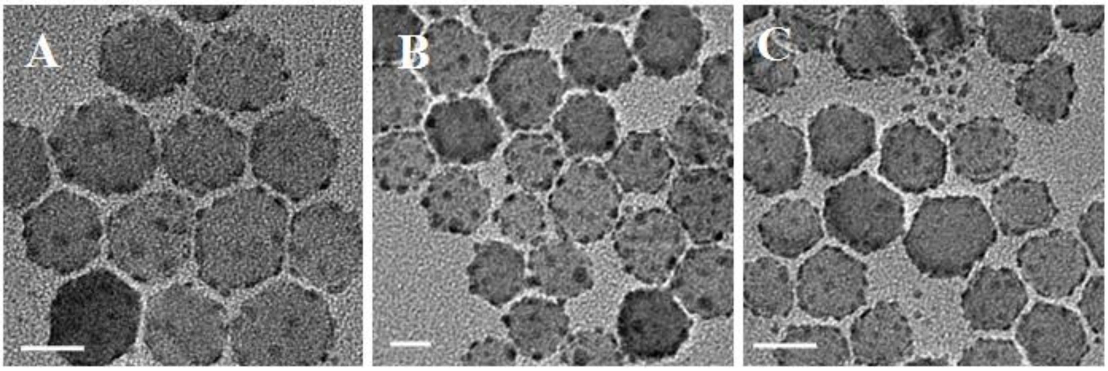

Fig. S6 TEM images of the Au-CIS HNCs obtained by using different amount of $HAuCl_4$: (A) 0.03 mmol, (B) 0.05 mmol, (C) 0.1 mmol. Scale bar is 10 nm

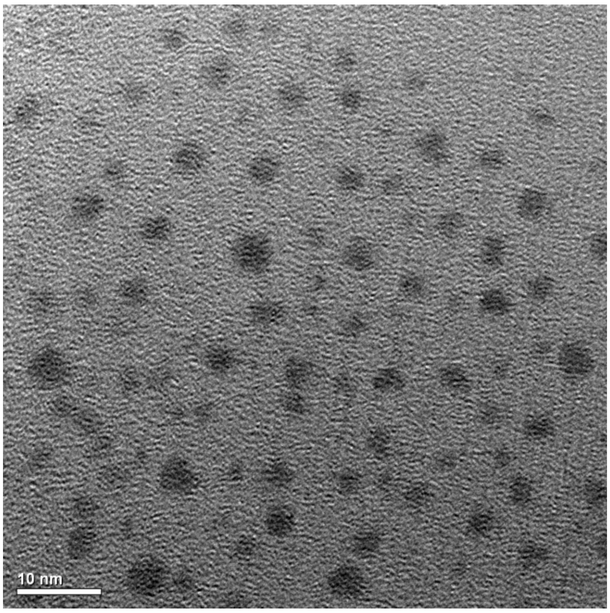

Fig. S7. TEM image of the Au nanopaticles.

1. B. Koo, P. N. Patel, B. A. Korgel, *Chem. Mater.* 2009, **21**, 1962.