## Supporting information

## Growth Behavior of Au/Cu<sub>2-x</sub>S Hybrids and Their Plasmon-enhanced Dual-functional Catalytic Activity

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Figure S1. XRD pattern of half-shell Au/Cu<sub>2-x</sub>S hybrids.



Figure S2. Fenton-like catalytic activity of half-shell  $Au/Cu_{2-x}S$  tested by changing the concentration of MB (a) and  $H_2O_2$  (b).



Figure S3. Schematic illustration of energy band diagram of  $Au/Cu_{2-x}S$  hybrids.



Figure S4. High magnification TEM image of half-shell  $Au/Cu_{2-x}S$  hybrids.



Figure S5. Extinction spectra of core-shell  $Au/Cu_{2-x}S$  hybrids synthesized with cupric nitrate and cupric acetate.



Figure S6. Extinction spectra of core-shell  $Au/Cu_{2-x}S$  and physical mixture of Au and  $Cu_{2-x}S$ .



Figure S7. Low-magnification TEM image of Au/Cu<sub>2-x</sub>S nanorods generated after 2 hrs of reaction