Electronic Supplementary Material (ESI) for Journal of Materials Chemistry C.

Controlled Growth of $Cu_{2-x}S$ Sheet-like Nanoshells and $Cu_{2-x}S$–CdS p-n Junctions on Au Nanorods with Coupled Plasmon Resonances and Enhanced Photocatalytic Activities

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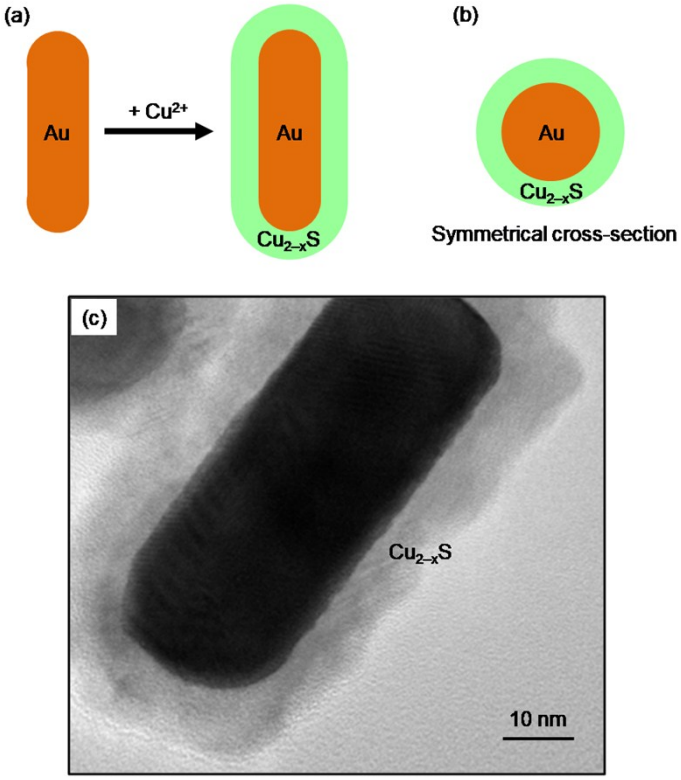

Figure S1 Structural diagram and TEM image of the general Au/$Cu_{2-x}S$ core-shell heterorods with symmetric vertical cross-section. (a) The schematic diagram of uniformly growing the $Cu_{2-x}S$ shells on Au nanorods. (b) The symmetric cross-section of Au/$Cu_{2-x}S$ core-shell nanorods. (c) TEM image of Au/$Cu_{2-x}S$ nanorods with uniform $Cu_{2-x}S$ shells.

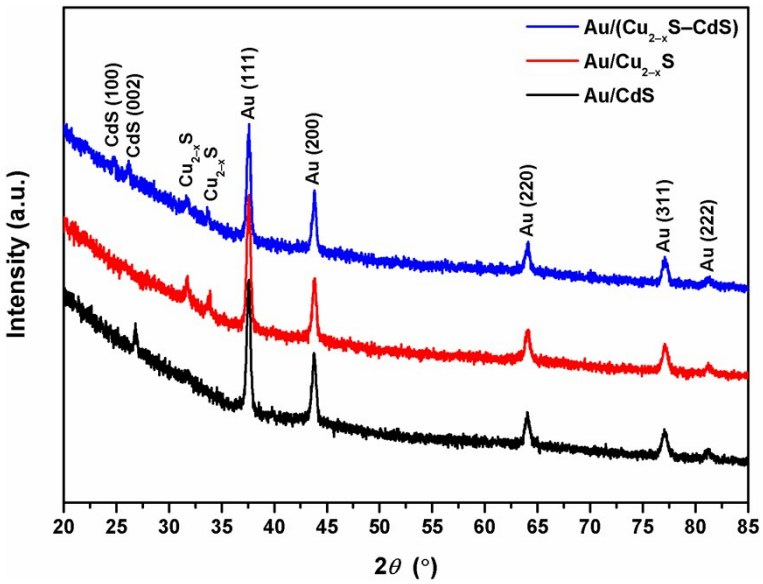

Figure S2 XRD patterns of the three core-shell heterorods of Au/CdS (μ_{Cd} = 20 μL), Au/$Cu_{2-x}S$ (μ_{Cu} = 20 μL) and Au/($Cu_{2-x}S$–CdS) (μ_{Cu} = 20 μL, μ_{Cd} = 20 μL).

Table S1 The atomic concentration of each constituent element in Au/(CdS–Ag_2S) (μ_{Cd} = 20 μL, μ_{Ag} = 15 μL), Au/($Cu_{2-x}S$–Ag_2S) (μ_{Cu} = 20 μL, μ_{Ag} = 15 μL) and Au/($Cu_{2-x}S$–CdS) core-shell heterorods (μ_{Cu} = 20 μL, μ_{Cd} = 20 μL).

	S 2p (%)	Cd 3d (%)	Cu 2p (%)	Au 4f (%)	Ag 3d (%)	Other elements (%)
Au/($Cu_{2-x}S$–CdS)	14.53	5.58	3.67	7.68	2.71	65.84
Au/($Cu_{2-x}S$–Ag_2S)	11.47	---	4.96	7.98	5.63	69.96
Au/(CdS–Ag_2S)	12.26	5.18	---	7.44	5.17	69.95

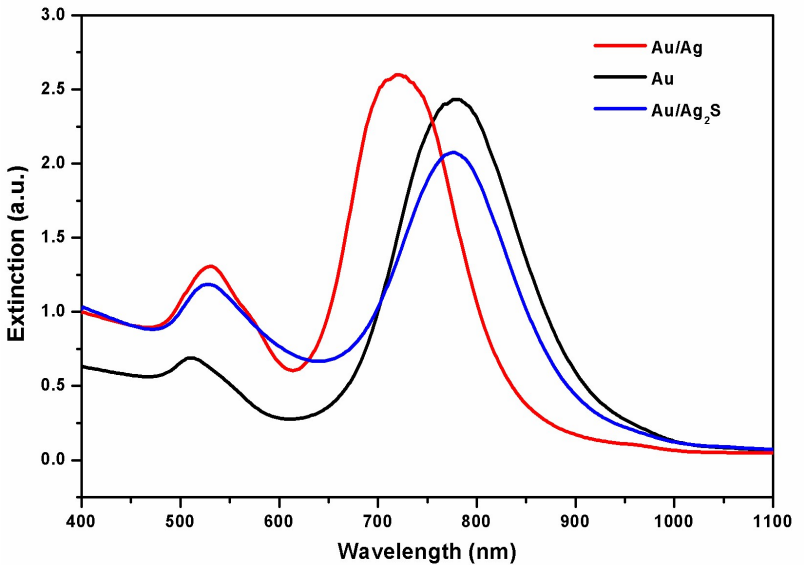

Figure S3 Extinction spectra of Au, Au/Ag, and Au/Ag_2S nanorods used in the growth process of $Cu_{2-x}S$ nanosheets and $Cu_{2-x}S$–CdS p-n heterojunctions on Au nanorods.

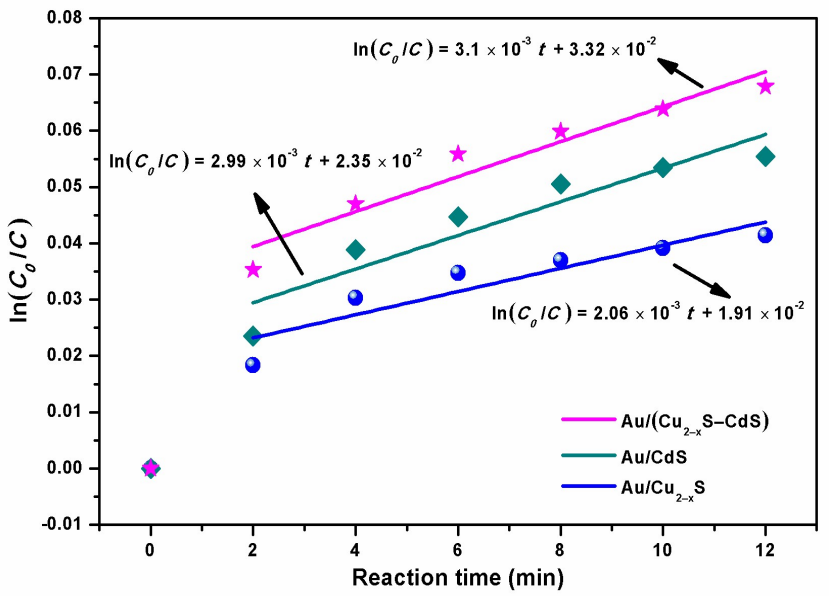

Figure S4 Kinetics fitting of $\ln(C_0/C)$ versus time (t) for the degradation of RhB by Au/($Cu_{2-x}S$–CdS), Au/CdS and Au/$Cu_{2-x}S$ photocatalysts.

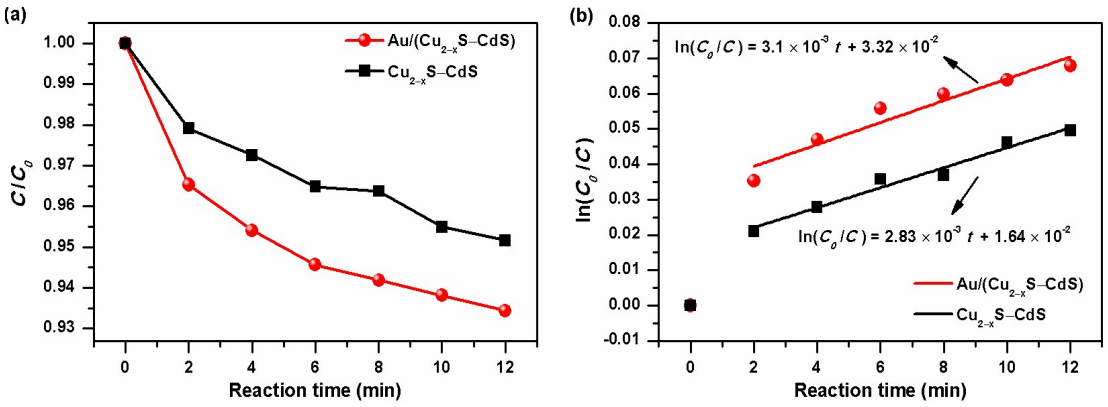

Figure S5 Comparison of photocatalytic performances between Au/($Cu_{2-x}S$–CdS) heterorods and $Cu_{2-x}S$–CdS p-n junctions (μ_{Cu} = 20 μL, μ_{Cd} = 25 μL). (a) Photocatalytic degradation curve. (b) Kinetics fitting of $\ln(C_0/C)$ versus time (t) for the degradation of RhB. The measurement method of photocatalytic activity of $Cu_{2-x}S$–CdS p-n junctions without Au component is the same as that of photocatalytic reactions of Au/($Cu_{2-x}S$–CdS).

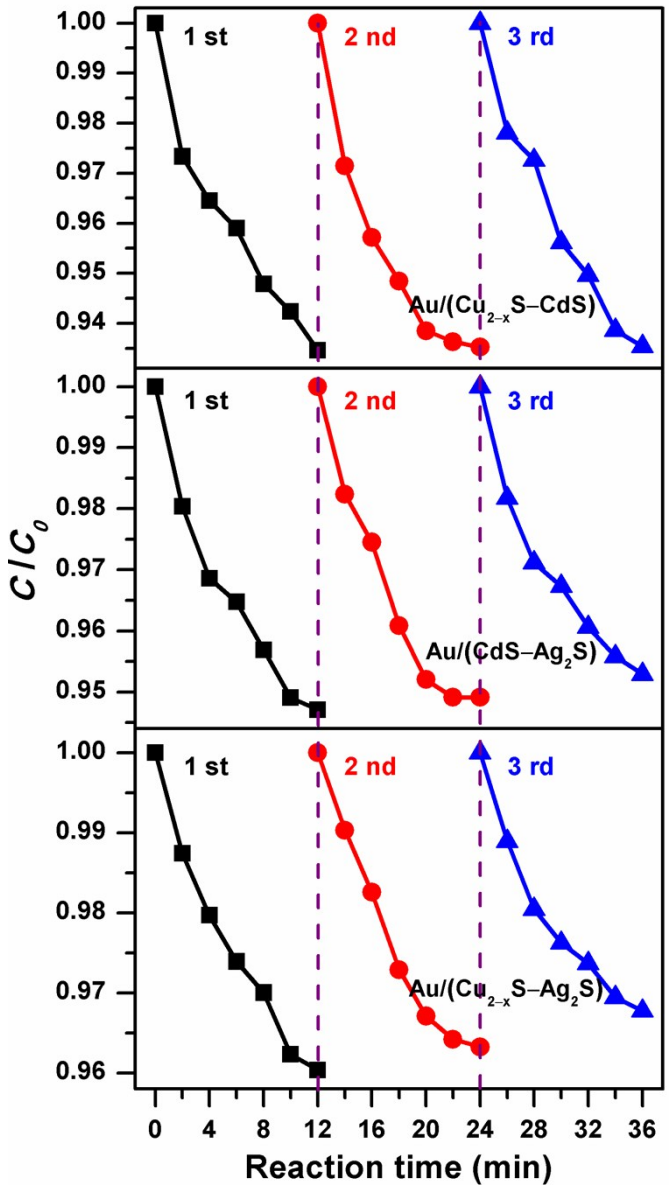

Figure S6 The recycling test for the photodegradation of RhB by the Au/($Cu_{2-x}S$–CdS), Au/($Cu_{2-x}S$–Ag_2S) and Au/(CdS–Ag_2S) heterorods under visible light irradiation (λ > 420 nm). The recycling test of the photocatalysts is performed under the same conditions as the photocatalytic test.

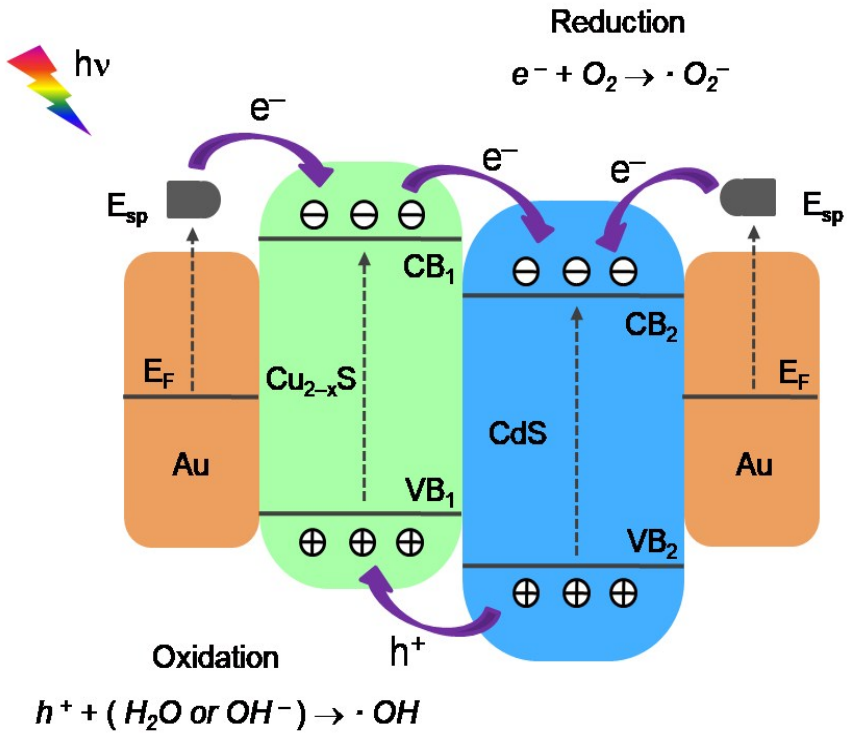

Figure S7 The possible charge transfer mechanism involved in the process of photodegradation of RhB by the Au/($Cu_{2-x}S$–CdS) core-shell heterorods. hν, photon energy; e^-, electron; h^+, hole; CB, conduction band; VB, valence band;·OH, hydroxyl radical; $\cdot O_2^-$, superoxide radical; E_F, Au Fermi level; E_{sp}, Au surface plasmon state.