Supplementary Information

Transport of photogenerated charges and photoelectric properties in two types of heterostructures with different ZnO microstructures †

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Supplementary Figures

Fig. SII The schematic diagram of sandwich structure consisting of ITO (indium tin oxide) and sample in the steady state and electric field induced-surface photovoltage spectroscopy. (E$_c$ : the bottom of conduction band; E$_v$ : the top of valence band; E$_f$ : the Fermi energy level; $\Delta V$ : the difference of different surface potential; $V_s^0$ : the surface potential before illumination; $V_s^1$ : the surface potential after illumination; $V_s^0$, $V_s^1$ > 0; h$\nu$ : the incident photon energy).
Fig. S12 The schematic diagrams of sandwich structure for (a) SPS, EFISPS, (b) and (c) TSP measurements with the direction of illumination ($h\nu$: the incident photon energy).
Fig. S13 SEM images of ZnO (a) nanoparticles, (b) nanowires arrays, (c) nanorods arrays and (d) nanotubes arrays.
Fig. SI4 UV-Vis spectra of (a) Cu$_4$Bi$_3$S$_9$, (b) Cu$_4$Bi$_3$S$_9$, (c) Cu$_4$Bi$_3$S$_9$, ZnO, ZnO/Cu$_4$Bi$_3$S$_9$ (only showing one nanostructure of ZnO), (d) Cu$_4$Bi$_3$S$_9$, In$_2$O$_3$, ZnO, ZnO/In$_2$O$_3$/Cu$_4$Bi$_3$S$_9$ (only showing one nanostructure of ZnO).
Fig. S15 The plots of $F(R)\nu$ against the photo energy about (a) $\text{In}_2\text{O}_3$ and (b) ZnO with different nanostructures, respectively.
Fig. S16 The transport mechanism of photogenerated charges under zero and positive bias in four sensitized electrodes ($E_c$: the bottom of conduction band; $E_v$: the top of valence band; $E_f$: the Fermi energy level; $\Delta E_c$: the difference of conduction band edges at the interface; $\Delta E_v$: the difference of valence band edges at the interface; $NHE$: the normal hydrogen electrode; $AVS$: the absolute vacuum energy scale; $h\nu$: the energy of photon).