Supplementary Information

Photoelectric properties and charge dynamics for a set of solid state solar cells with $Cu_4Bi_4S_9$ as absorber layer†

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Supplementary Tables

Table SI1 The efficiencies of four types of cells with different carrier mobility in sensitized electrodes.

sensitized electrodes	carrier mobility ($cm^2V^{-1}s^{-1}$)	efficiency (%)	carrier mobility ($cm^2V^{-1}s^{-1}$)	efficiency (%)
In_2O_3 electrode	11.8	5.6	14.2	6.2
ZnO electrode	12.7	4.2	16.4	4.8
TiO_2 electrode	26.4	5.0	38.5	5.5
SnO_2 electrode	10.5	3.3	12.6	3.9

Supplementary Figures

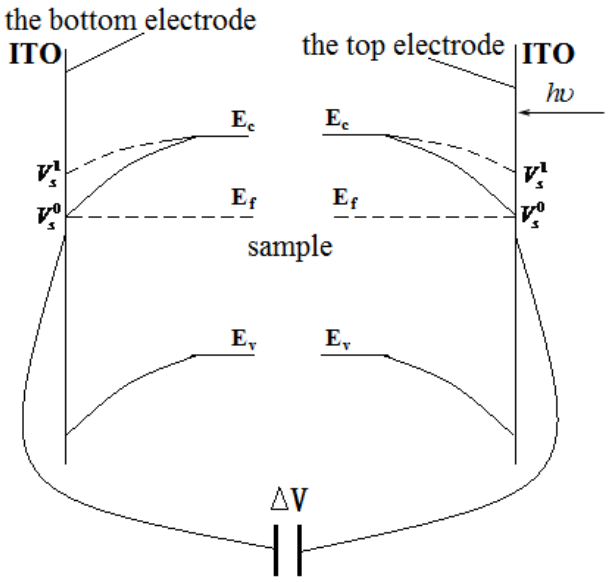

Fig. SI1 The schematic diagram of sandwich structure consisting of ITO (indium tin oxide) and sample in the steady state and electric field induced-surface photovoltage spectroscopy. (E_c : the bottom of conduction band; E_v : the top of valence band; E_f : the Fermi energy level; ΔV : the difference 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; $h\upsilon$: the incident photon energy).

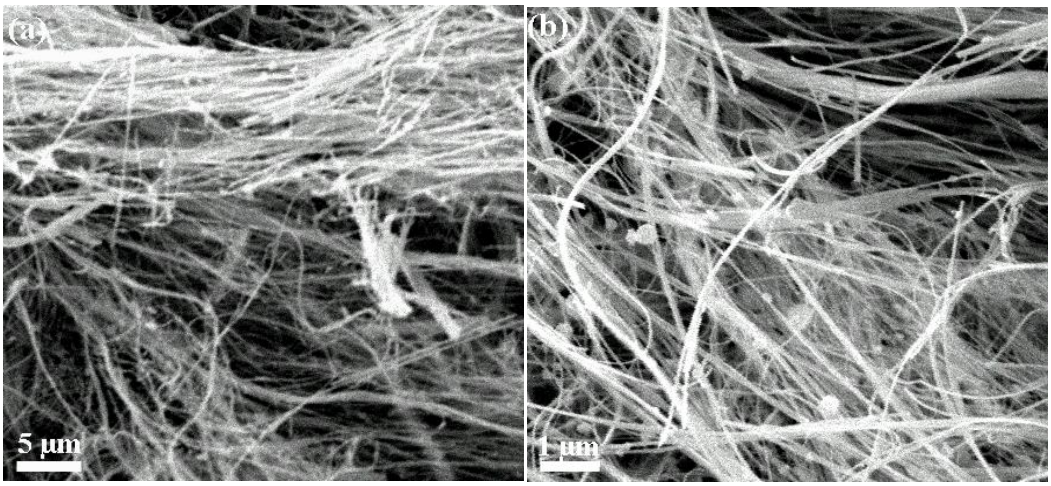

Fig. SI2 ((a) and (b)) Low-magnification SEM images of CBS nanoribbons.

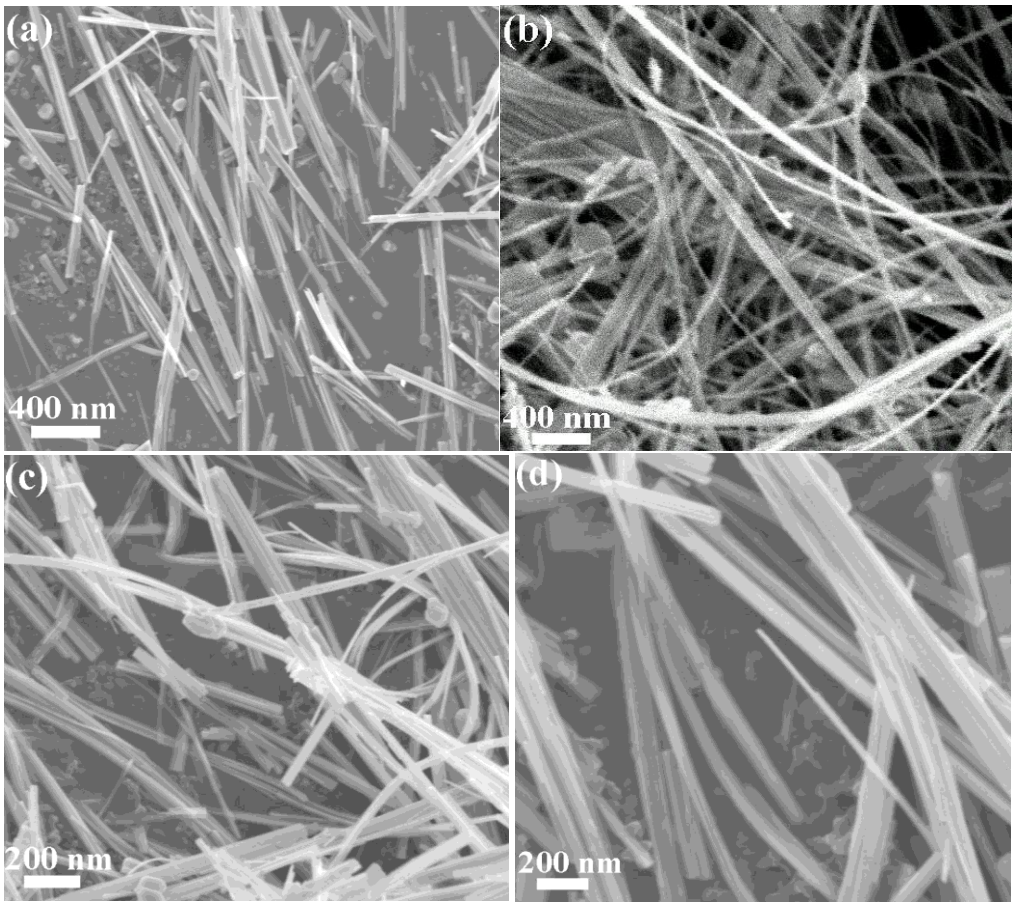

Fig. SI3 ((a), (b), (c) and (d)) High-magnification SEM images of CBS nanoribbons.

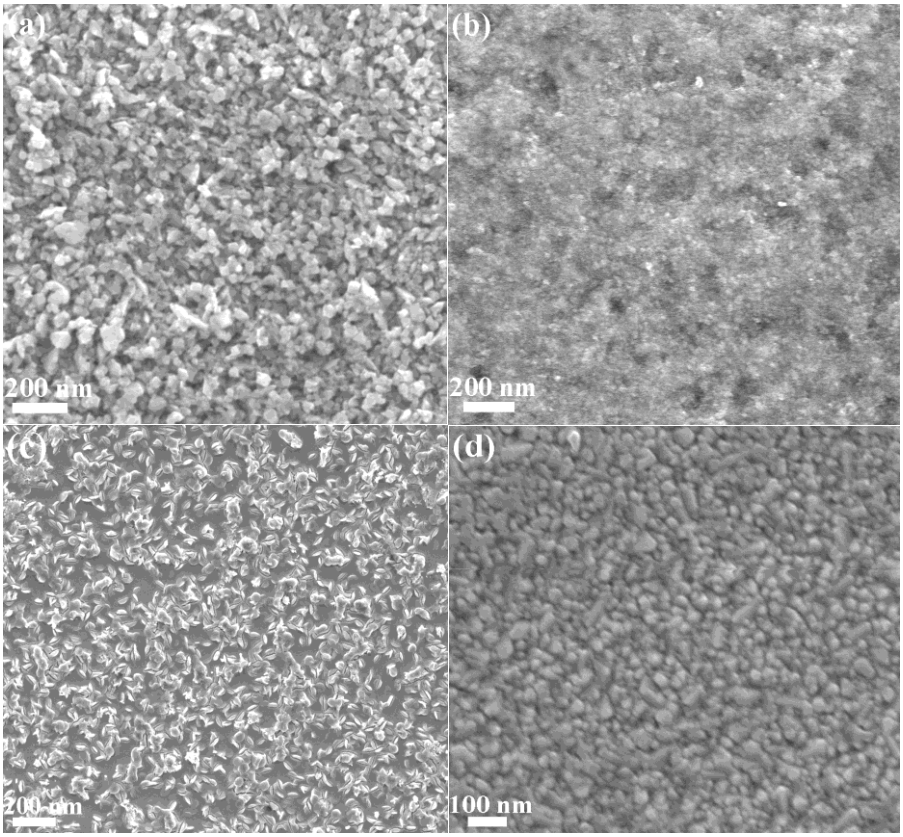

Fig. SI4 SEM images of (a) In_2O_3, (b) ZnO, (c) TiO_2, and (d) SnO_2 thin films, respectively.

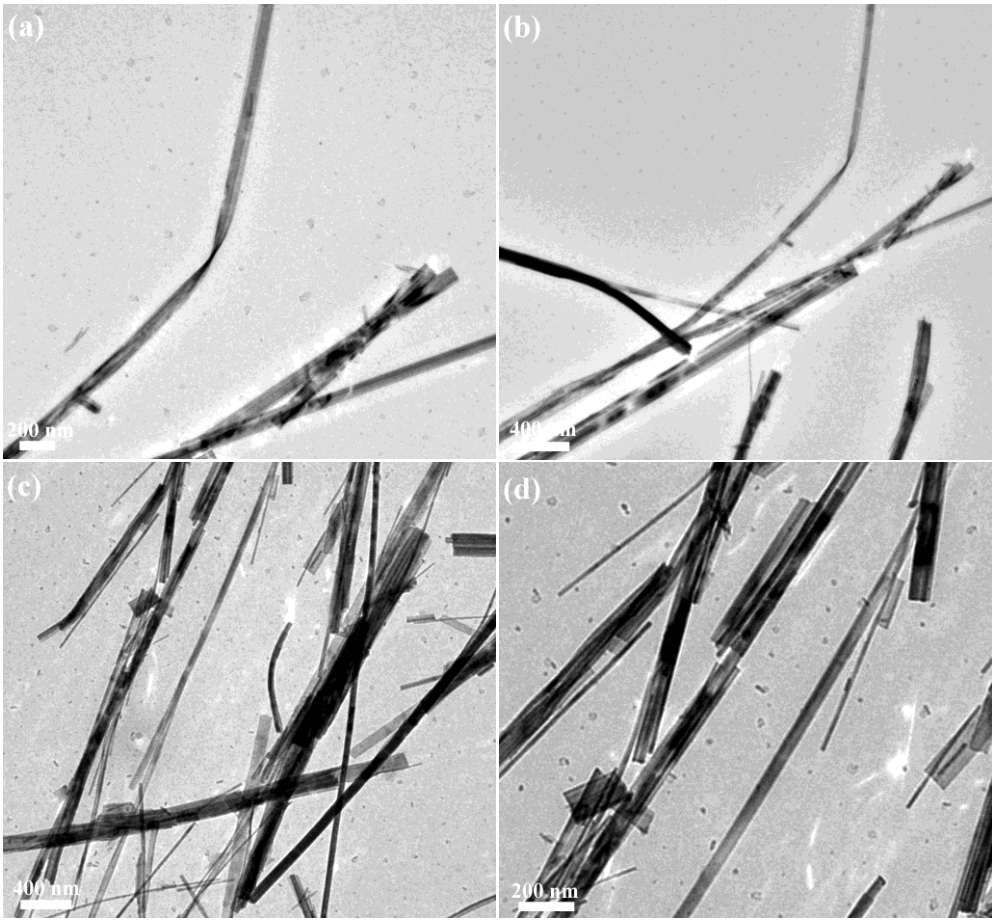

Fig. SI5 ((a), (b), (c) and (d)) TEM images of CBS nanoribbons.

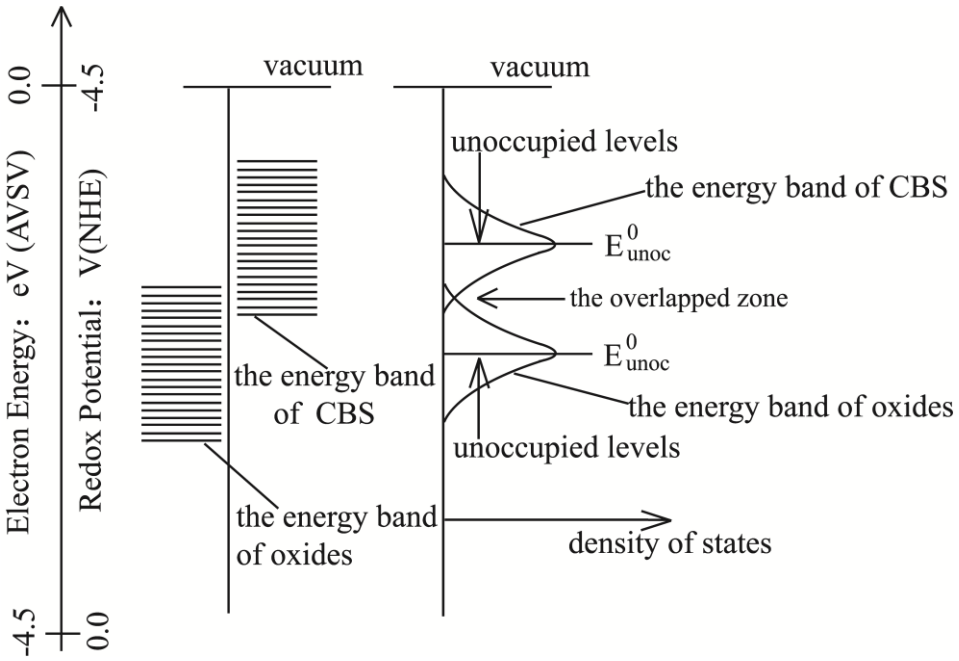

Fig. SI6 The transport mechanism of photogenerated charges under zero and positive bias in four sensitized electrodes (E_c: the bottom of conduction band; E_v: the top of valence band; E_f: the Fermi energy level; ΔEc: the difference of conduction band edges at the interface; ΔEv: the difference of valence band edges at the interface; *NHE*: the normal hydrogen electrode; *AVS*: the absolute vacuum energy scale; *hv*: the energy of photon).

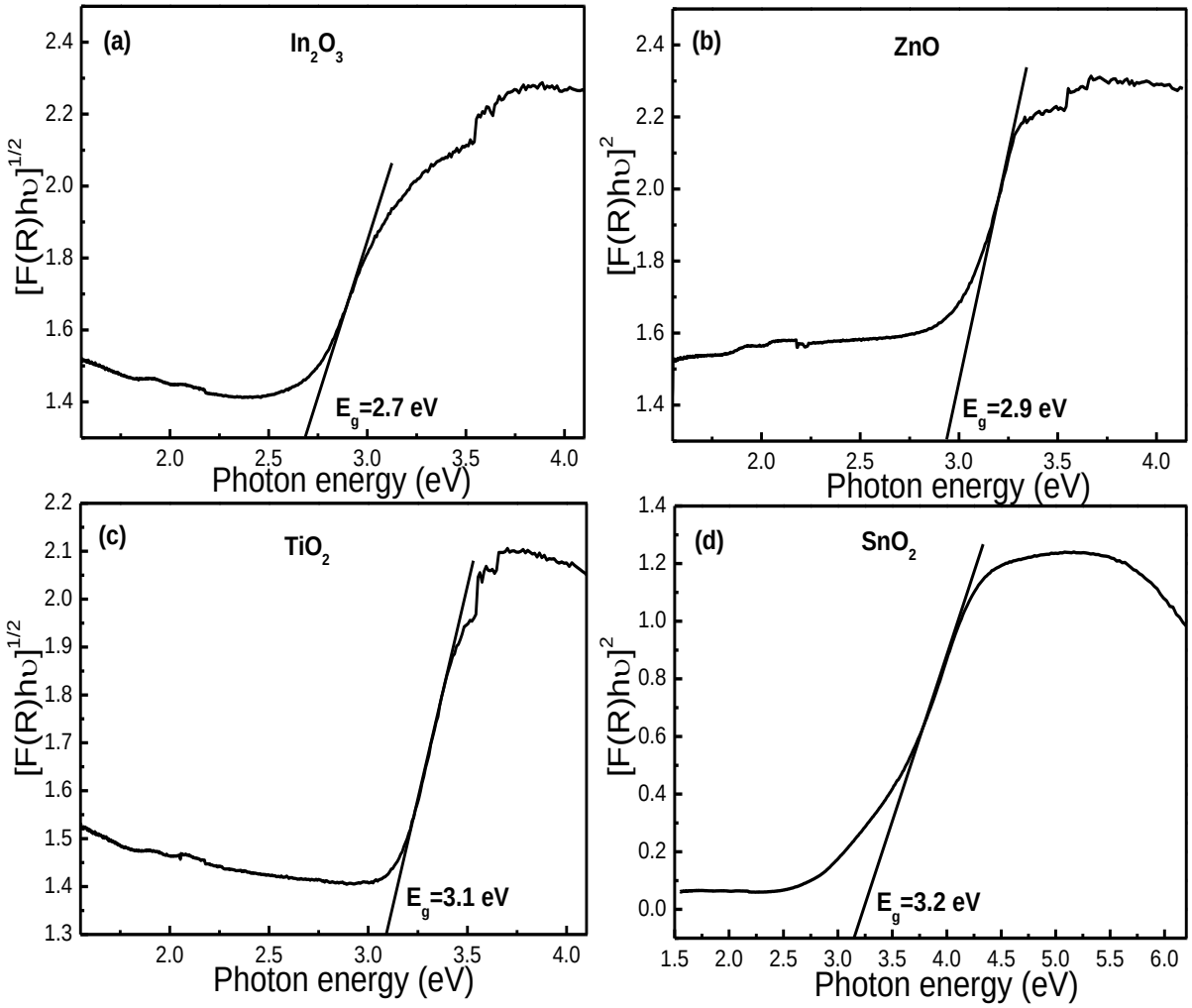

Fig. SI7 The plots of F(R)*hv* against the photo energy about (a) In_2O_3, (b) ZnO, (c) TiO_2, and (d) SnO_2, respectively.