Supporting information:

Core-shell silicon nanowires arrays-Cu nanofilm Schottky junction for sensitive self-powered near-infrared photodetector

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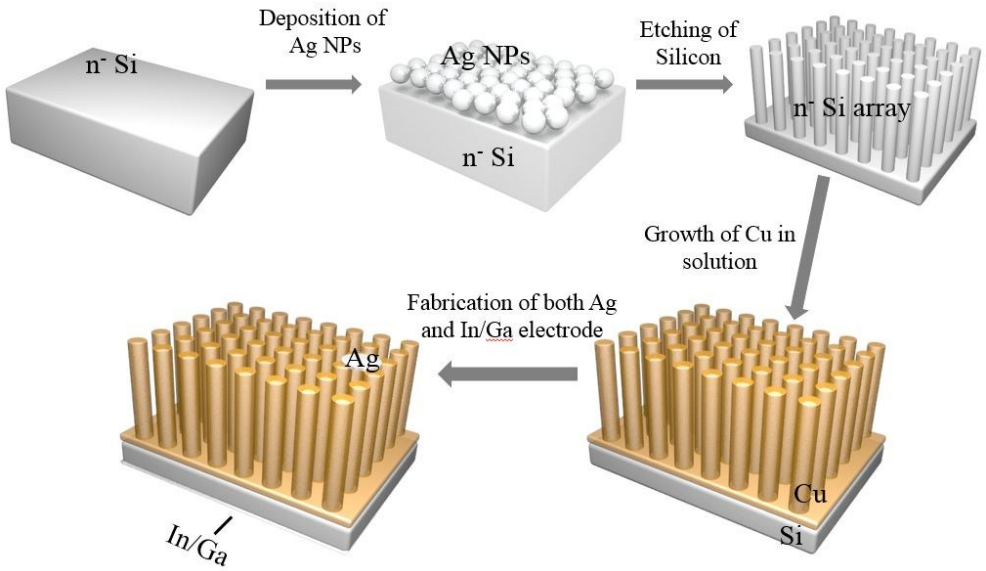

Figure S1. Detailed procedure for the fabrication of core-shell SiNWs array/Cu nanofilm NIR photodetector.

Calculation of the barrier height of the Si NW array/Cu Schottky junction: The barrier height of the Si NW array/Cu Schottky junction can be described by thermionic emission-based diode equation:[1]

$$J(T,V) = J_s(T)[exp(\frac{qV}{nK_BT}) - 1] \quad (1)$$

where $J(T,V)$ is the current density across the SiNW arrays/Cu interface, q the electronic charge, V the applied voltage, K_B the Boltzmann constant, T the temperature, and n the

ideality factor ($n = \frac{q}{kT}\frac{dV}{dlnI}$). The prefactor $J_s(T)$ is the saturation current density and is expressed by

$$J_s(T) = A^* T^2 exp(-\frac{q\Phi_{SBH}}{K_B T}) \quad (2)$$

where Φ_{SBH} is the zero-bias Schottky barrier height (SBH), A^* the Richardson constant which is theoretically estimated to be 120 A/cm^2 K^2 for *n*-type Si.

The $J_s(T)$ for Cu/Si NW array heterojunction is estimated to be about 9.2×10^{-5} A cm^{-2} from Eq. 1. By using eq 2, a barrier height (Φ_{SBH}) of 0.66 eV can be extracted from the saturation current density.

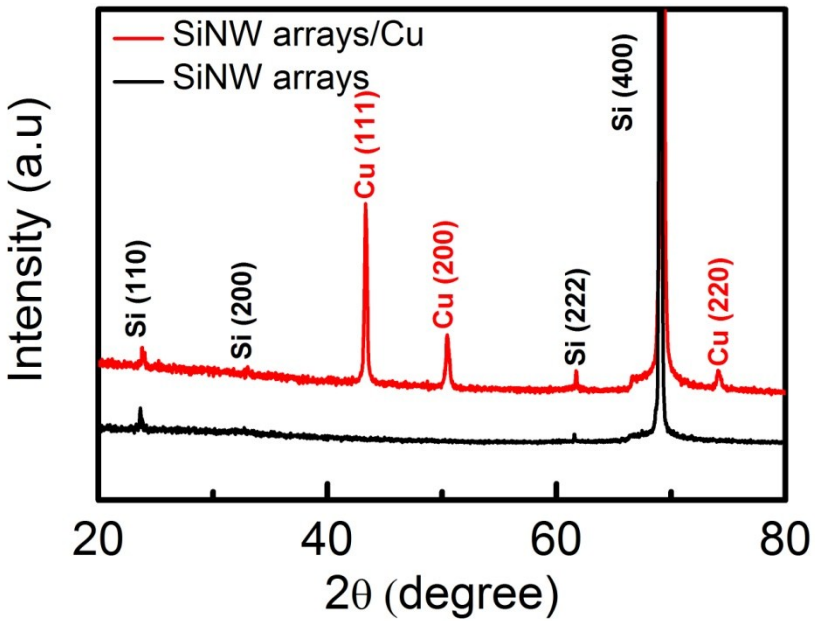

Figure S2. X-ray diffraction patterns of SiNW arrays before (black curve) and after (red curve) the deposition of Cu film.

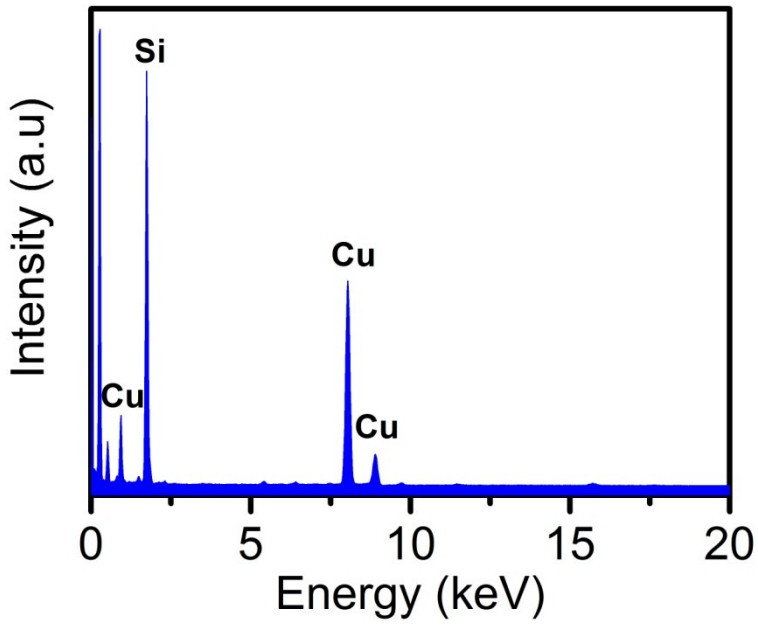

Figure S3. The energy dispersive X-ray spectrum (EDS) of the core-shell SiNW arrays/Cu Schottky junction.

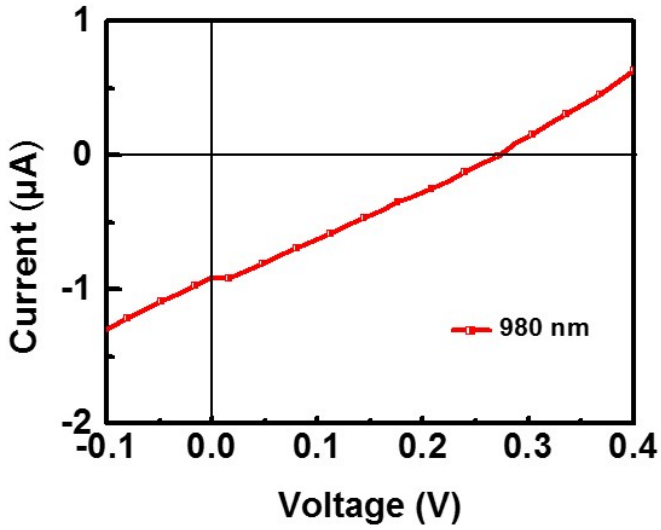

Figure S4. Electrical characteristics of the planar Si/Cu Schottky junction when illuminated with 980 nm light (0.22 mW cm^{-2}).

Reference

[1] X. Miao , S. Tongay , M. K. Petterson , K. Berke , A. G. Rinzler ,B. R. Appleton , A.

F. Hebard , *Nano Lett.* 2012, *12*, 2745.