Supporting Information:

Self-assembled KCu_7S_4 nanowires monolayer for self-powered near-infrared photodetector

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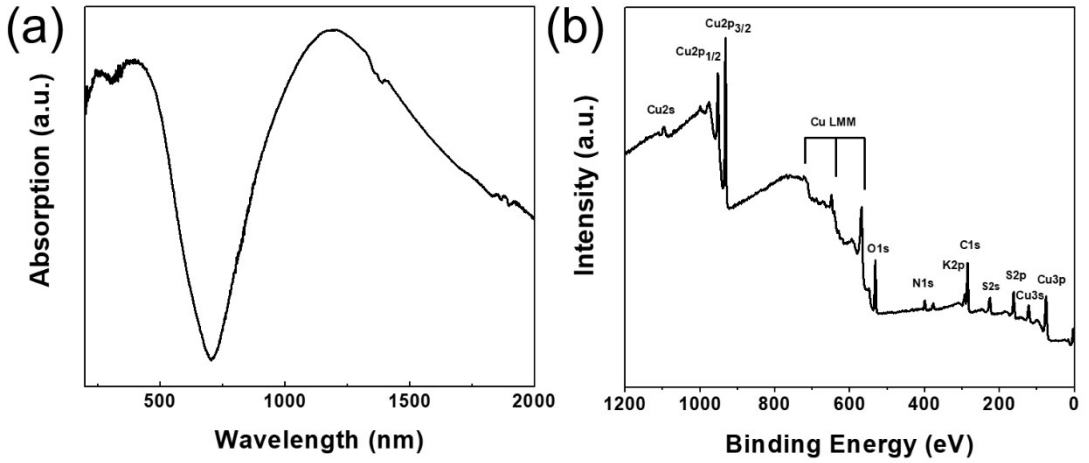

Figure S1. (a) UV-vis absorption spectrum of KCu_7S_4 nanowires. It presents a strong absorption in NIR region, which leads to efficient photovoltaic performance when illuminated by NIR light; (b) XPS survey spectrum of PVP-coated KCu_7S_4 nanowires.

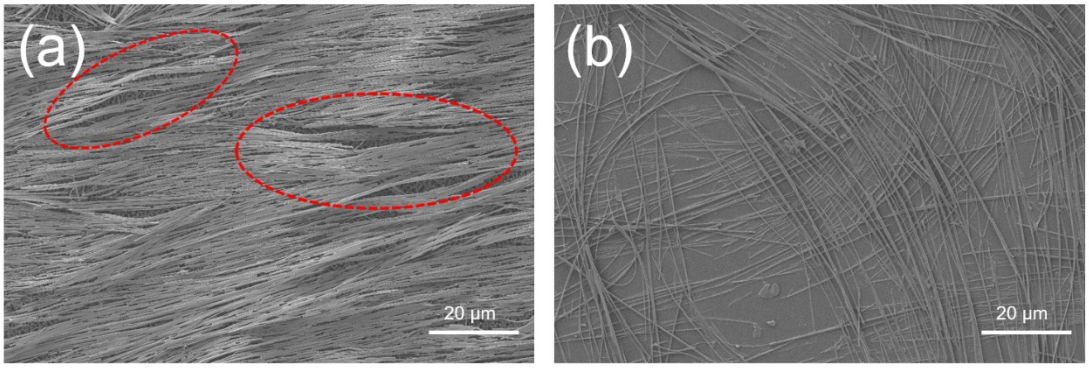

Figure S2. SEM images of KCu_7S_4 nanowires. (a) When the surface pressure value exceeds 25 mN/m (27.5 mN/m), some overlaps and folds that parallels the barrier direction sequentially formed; (b) Equivalent mass per square centimeter of PD3 disordered KCu_7S_4 nanowires film fabricated by spray-assisted technique.

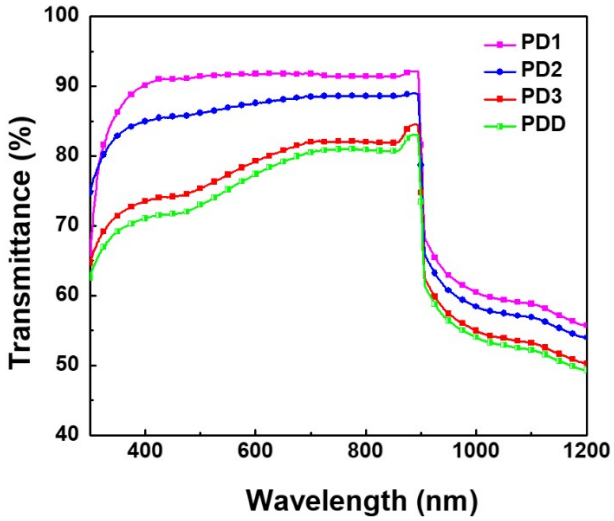

Figure S3. Transmittance of different KCu_7S_4 nanowires monolayers on PET substrate.

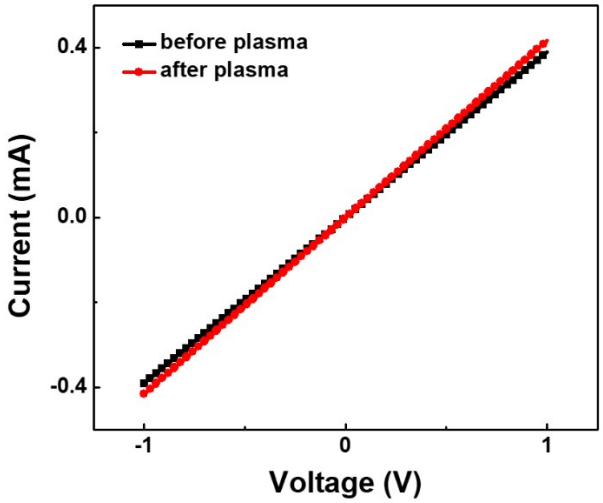

Figure S4. The typical current (I) - voltage (V) curve of the close-packed KCu_7S_4 nanowire film (PD3) before and after plasma treatment upon illumination (980 nm, 300 μW cm^{-2}). PVP is used as surfactant to improve the nanowire assembly. The amount of PVP coated on the surface of KCu_7S_4 nanowire is tiny. We removed the PVP by plasma treatment. In fact, the difference of current before and after plasma treatment is slight.

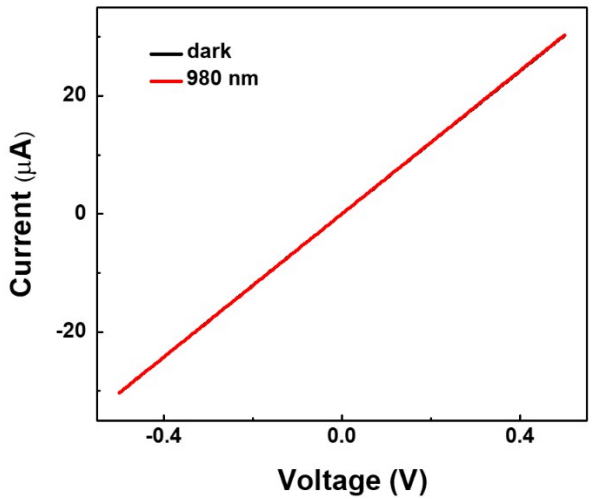

Figure S5. The typical current (*I*) - voltage (*V*) curve of the KCu_7S_4 single nanowire in dark and upon illumination (980 nm, 295.3 μW cm^{-2}). The linear behavior shows the well *Ohmic* contact between Au electrodes and KCu_7S_4.

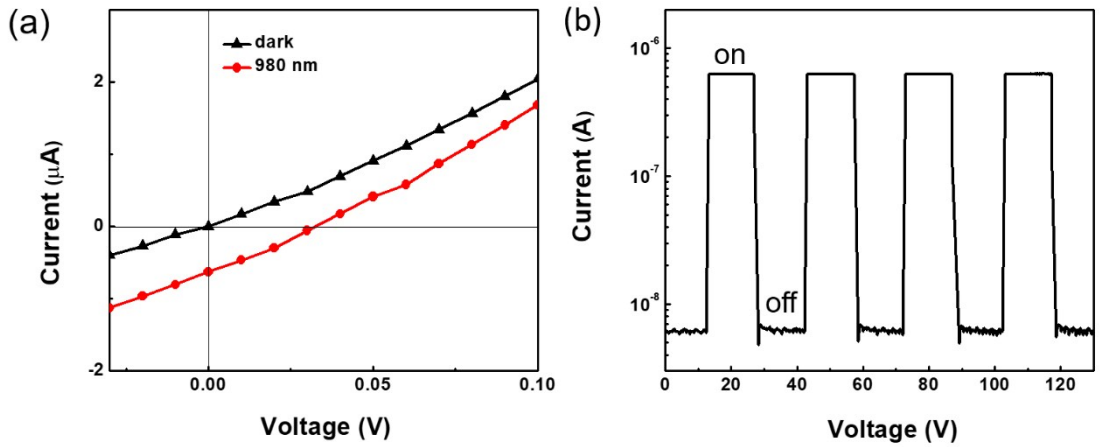

Figure S6. The typical current (*I*) - voltage (*V*) curve of the device Au/Si/In:Ga in dark and upon illumination (980 nm, 295.3 μW cm^{-2}). (a) The Au/Si Schottky junction exhibits a photovoltaic characteristics with open-circuit voltage (V_{OC}) 0.03 V and short-circuit current (I_{SC}) 0.6 μA, respectively. (b) The I_{on}/I_{off} ratio at zero bias is ~10^2.

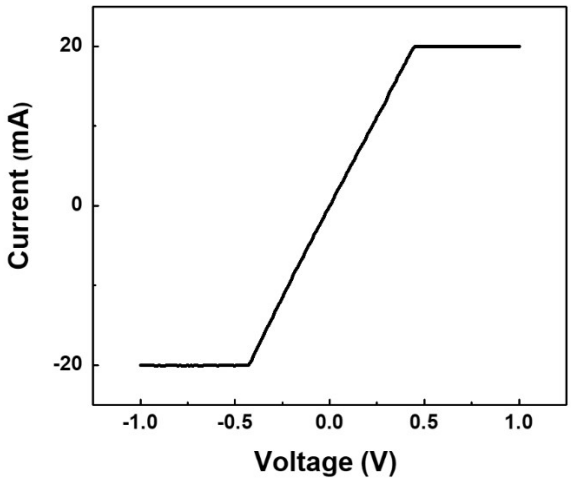

Figure S7. The typical current (*I*) - voltage (*V*) curve of the In:Ga/Si/In:Ga in dark. The linear behavior shows the well *Ohmic* contact between In:Ga electrodes and Si.

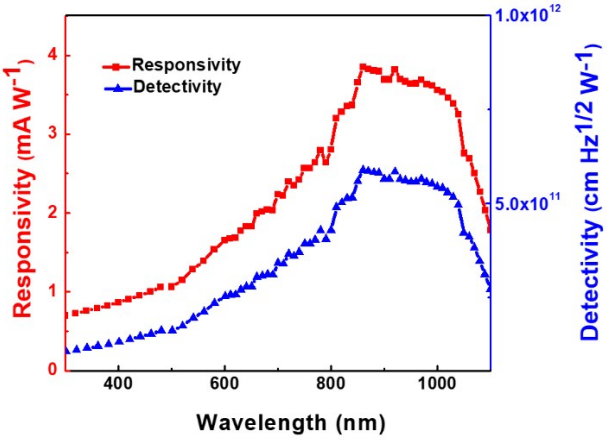

Figure S8. Plots of responsivity and detectivity at zero bias as a function of incident light wavelength.

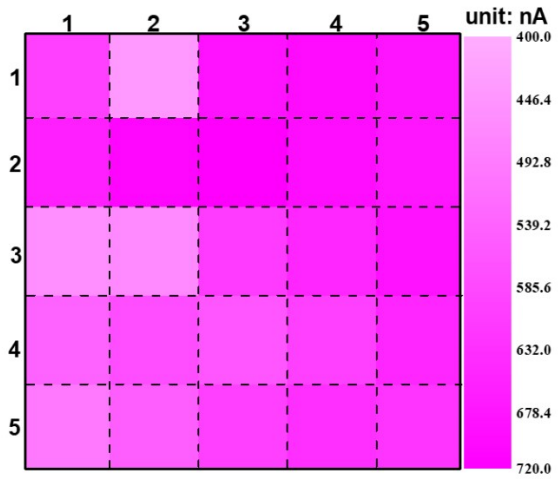

Figure S9. Photocurrent mapping of the disordered device.

Table S1. Photovoltaic characteristics of different Si/KCu_7S_4 NIR photodetectors.

heterojunction	**open-circuit voltage (V_{OC})**	**short-circuit current (I_{SC})**	**power conversion efficiency (η)**	**fill factor (FF)**
PD1	0.12V	3.27 nA	2.2×10^{-5} %	17 %
PD2	0.06 V	0.3 μA	1.5×10^{-3} %	24 %
PD3	0.14 V	1.62 μA	0.01 %	25 %
PDD	0.19 V	68.6 nA	1×10^{-3} %	24 %