

Supplementary Materials

“Scalable Production of Graphene-Semiconducting Single-wall Carbon Nanotube Film Schottky Broadband Photodiode Array with Enhanced Photoresponse”

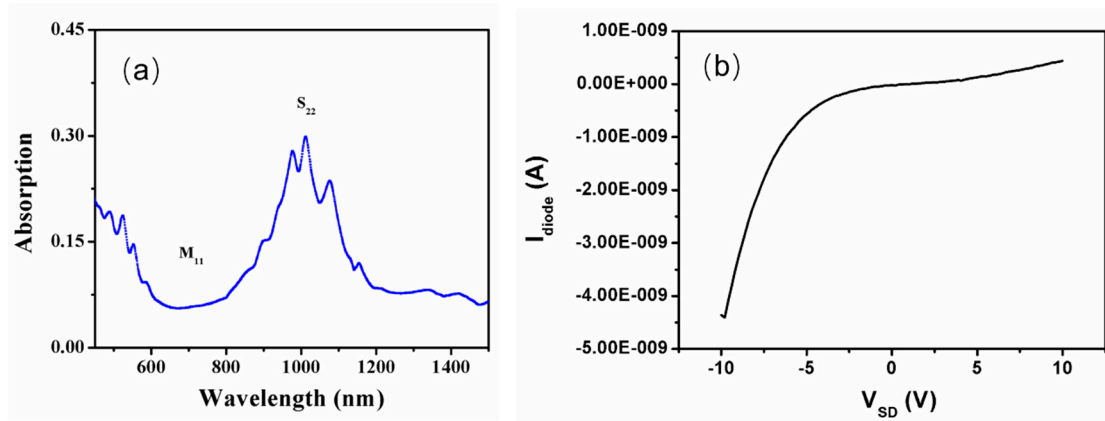


Figure S1. (a) Ultraviolet-visible-infrared absorbance spectrum of the SWCNTs (b) The output curve of the s-SWCNTs-based device.

The ultraviolet-visible-near infrared (UV-Vis-NIR) absorption spectrum of the as-deposited SWCNTs is shown in Figure S1a. The observed broadband absorption spectrum exhibits a high absorption peak around 1010 nm, which corresponds to the S_{22} exciton transitions in the semiconducting SWNTs (s-SWCNTs). Moreover, there is no peak at ~700 nm corresponding to the M_{11} exciton transitions in metallic SWNTs, which also confirms the high purity of the as-fabricated s-SWCNT films. Based on the as-deposited s-SWCNTs film, thin-film transistors (TFTs) with a channel length of 1 μm and a width of 1.5 μm were fabricated on SiO_2 (285 nm)/Si substrate. The source-drain electrodes were deposited with Ti/Au metal contacts. The titanium tends to form good Schottky contact with SWCNTs film. The output curve of the s-SWCNTs-based device is shown in Figure S1b, in which typical rectification behavior is observed.

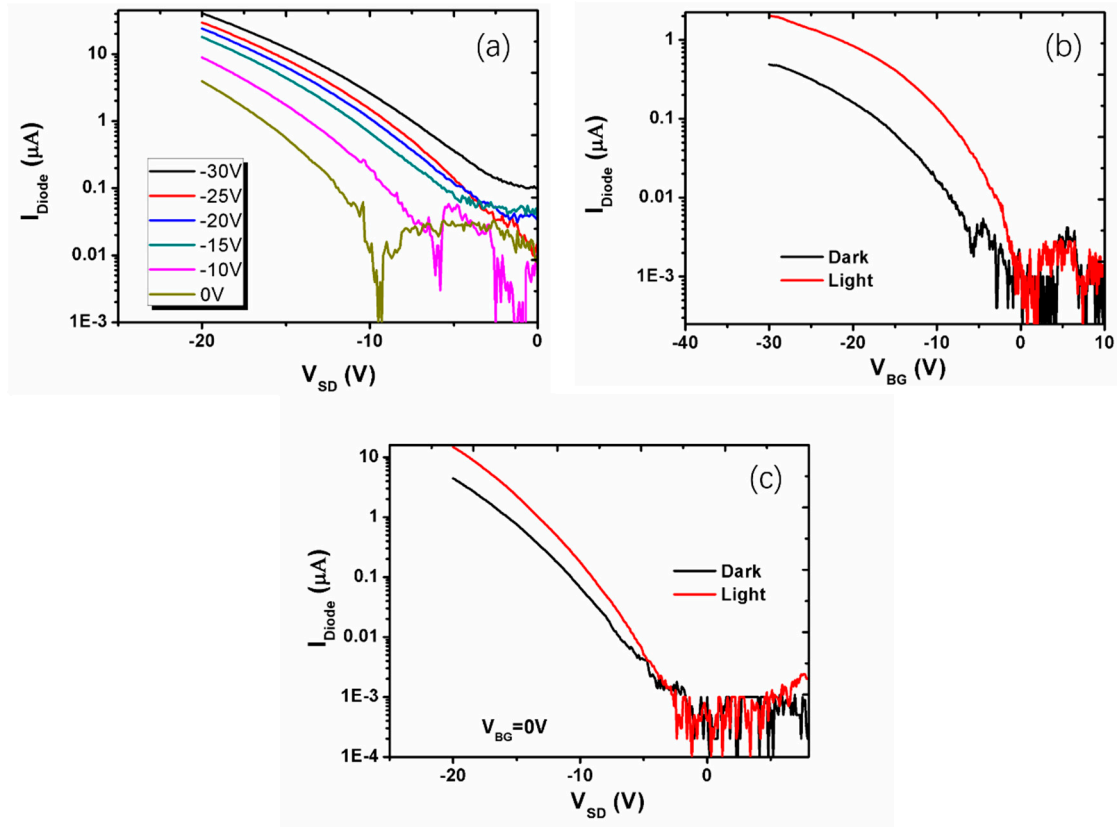


Figure S2. The electrical characteristic curves of the carbon-based devices in log scale. (a) The output characteristics curve of the as-fabricated diode at different V_{BG} . (b) The diode current as a function of back-gate bias for the Schottky device before and after under illumination ($V_{SD} = -5V$). (c) The V_{SD} -dependent diode current with and without illumination.

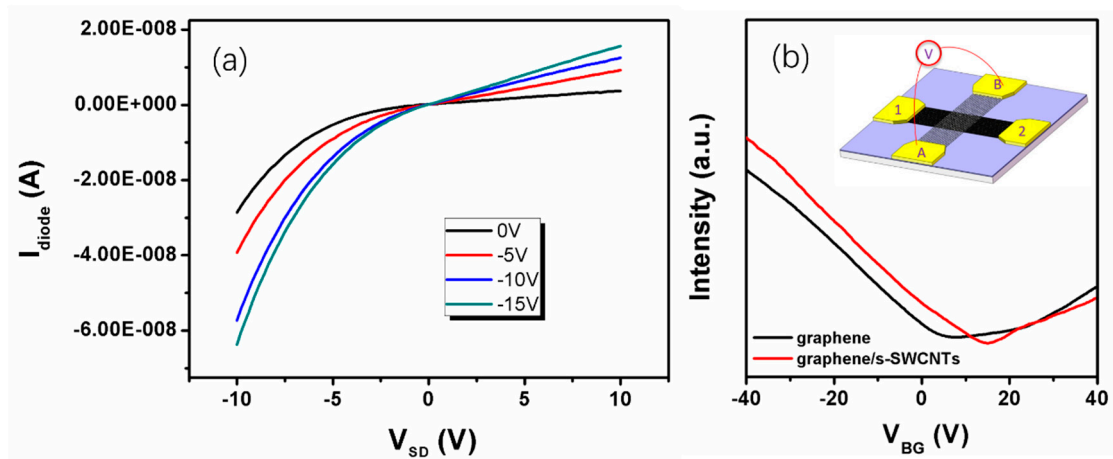


Figure S3. (a) The output curves of the Au-SWCNTs-Au device with varied V_{BG} . (b) The source-drain current of the Au-graphene-Au transistor as a function of V_{BG} .

As reported in reference, the gold tends to form good Ohmic contact with SWCNTs film. The electrical characterization of the Au-SWCNTs-Au device with a channel length of $1\ \mu m$ and a width of $1.5\ \mu m$ was performed, which was shown in Figure S2a. The result indicated that the top-contact electrode between Au and the s-SWCNTs confirms a good ohmic or near-ohmic contact. In view of the fact that there is not

obvious contact resistance between the graphene and Au metal, the Schottky characteristic observed in our device can be principally attributed to the graphene-SWCNTs junction.