Electronic Supplementary Material (ESI) for Journal of Materials Chemistry C

Supporting Information

Simple Metal/SiO_2/Si Planar Photodetector Utilizing Leakage Current Flows through SiO_2 Layer

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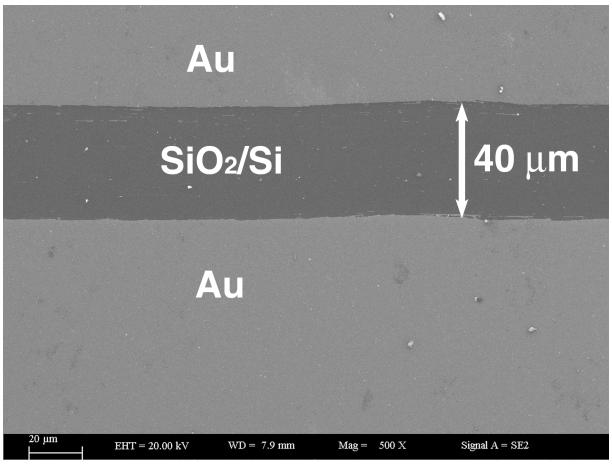

Fig. S1 SEM top view of the Au/SiO_2/Si photodetector.

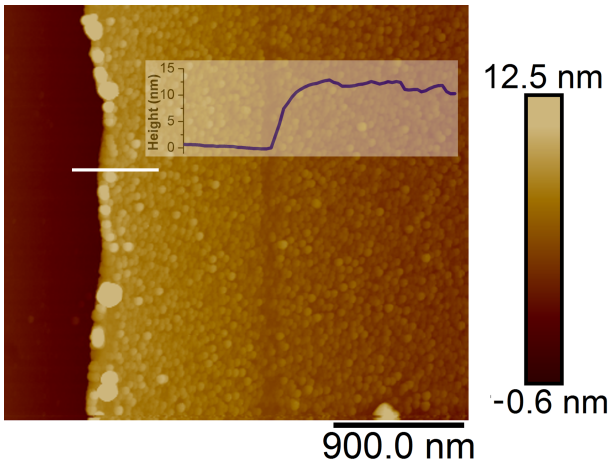

Fig. S2 AFM characterization of the gold nanofilm electrodes.

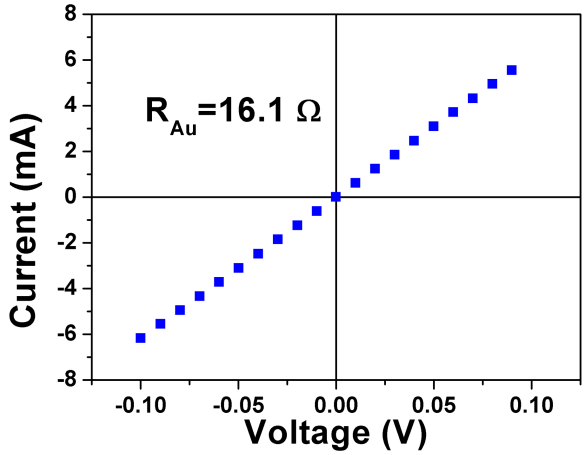

Fig. S3 I–V characteristic of the gold nanofilm.

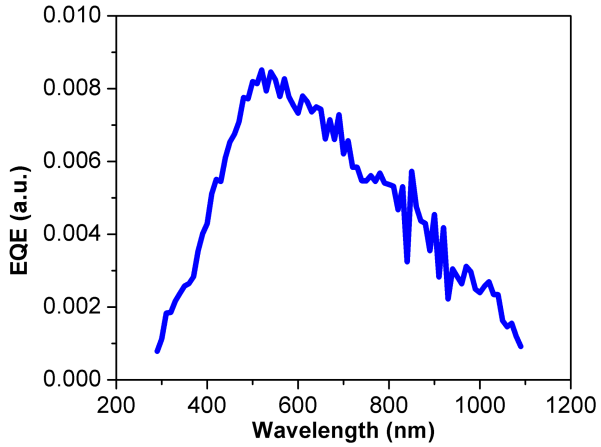

Fig. S4 External quantum efficiency (EQE) of Au/SiO_2/Si substrate as a photodetector by measuring a dc current at different wavelengths from 300 to 1100 nm.

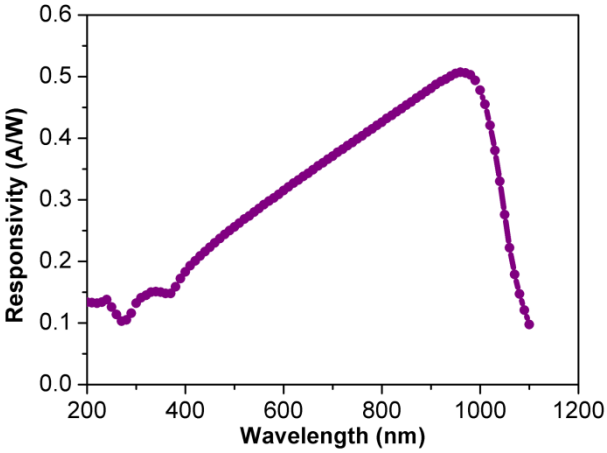

Fig. S5 Responsivity of the UV-Si photodiode sensor (Flange Mount Calibrated UV-Si Photodiode Sensor, 71675, Oriel).

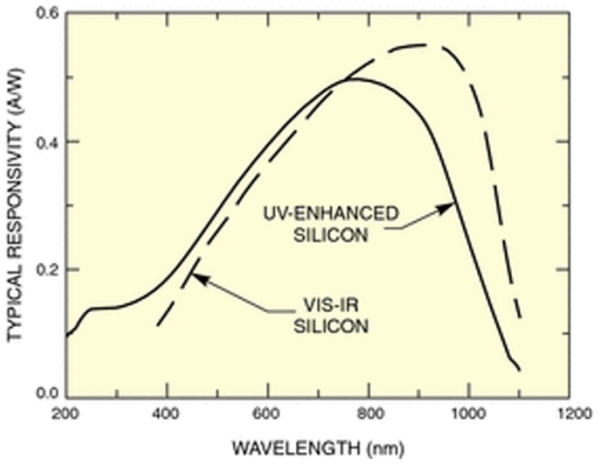

Fig. S6 Typical responsivity of silicon detectors (reproduced from http://www.newport.com).

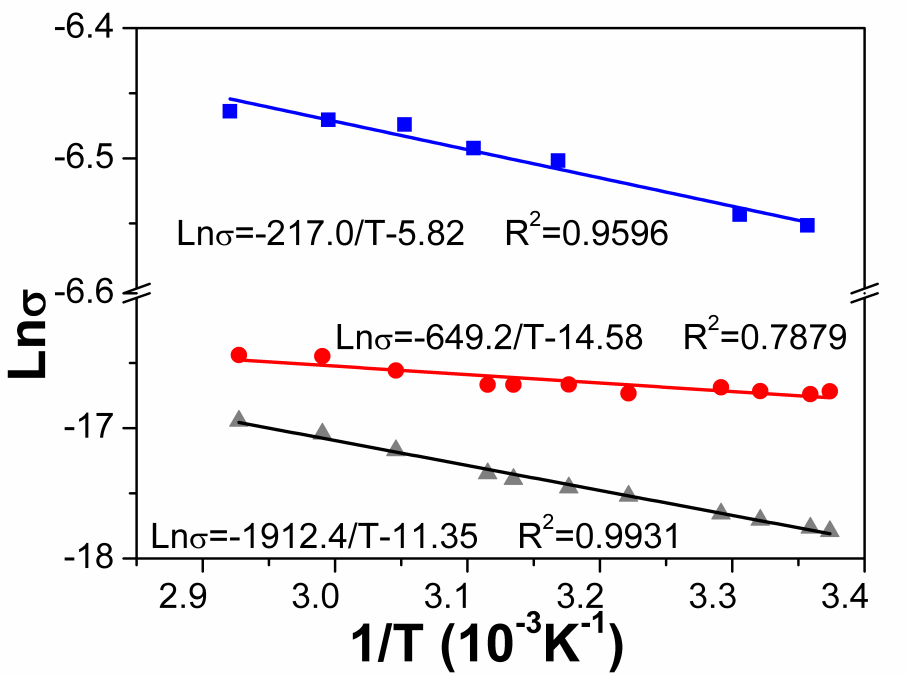

Fig. S7 Lnσ *versus* 1/T for Au/SiO_2/Si photodetector (▲ in dark condition and ● under 367 nm illumination with a light intensity of 0.8 mW/cm^2), and for the same configuration without the SiO_2 insulating layer (■ in dark or under light illumination), the measuring temperature range is from 23 to 69 ^oC.

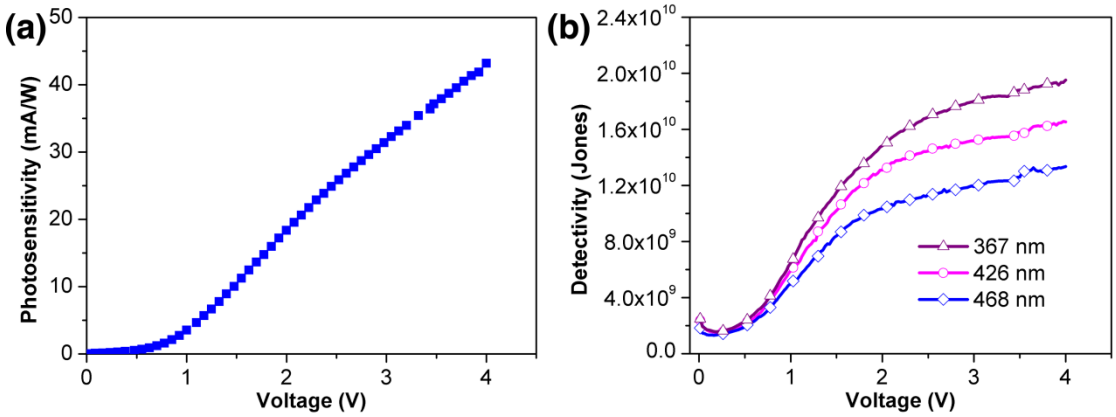

Fig. S8 (a) Photosensitivity calculated according to the I–V characteristics of the photodetector illuminated at 367 nm shown in Figure 2a. (b) Detectivity calculated according to the I–V characteristics of the photodetector illuminated at 367, 426 and 468 nm shown in Figure 2a.

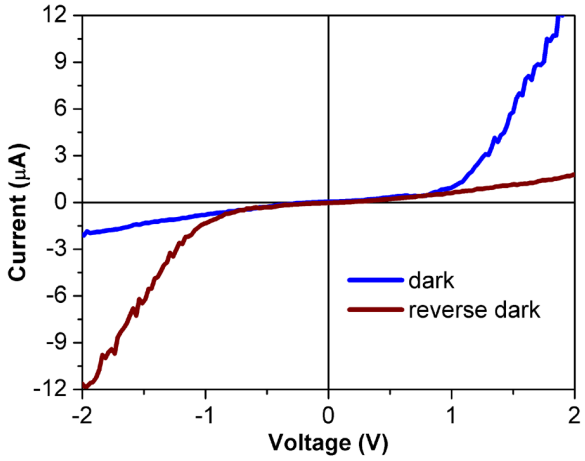

Fig. S9 Forward and reverse I–V curves comparison of an Au/SiO_2/Si photodetector. "Reverse dark" means we exchanged the two electrodes and then did the I-V scan in dark condition.

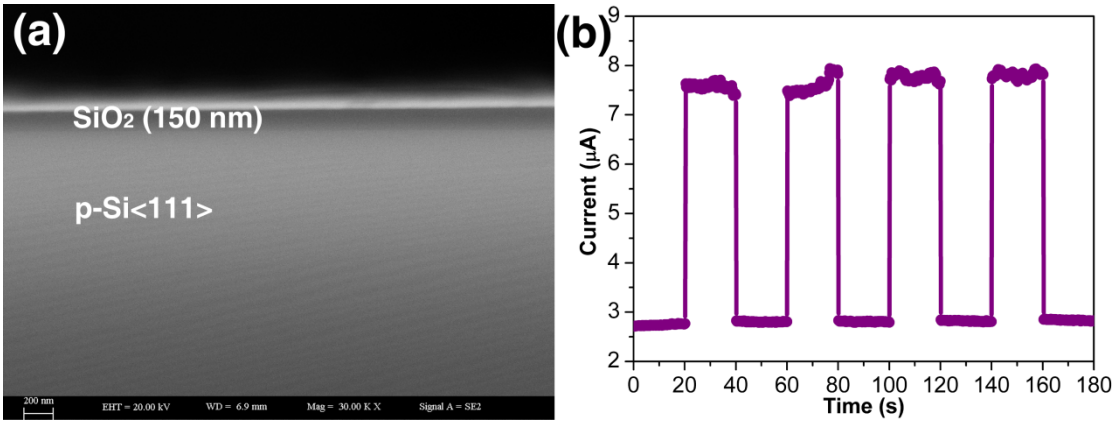

Fig. S10 (a) SEM image of the cross section of a SiO_2(150 nm)/Si substrate, and (b) Time-dependent photoresponse of the corresponding Au/SiO_2/Si photodetector measured by periodically turning on and off a 367 nm light (0.8 mW/cm^2) at a bias of 2 V.

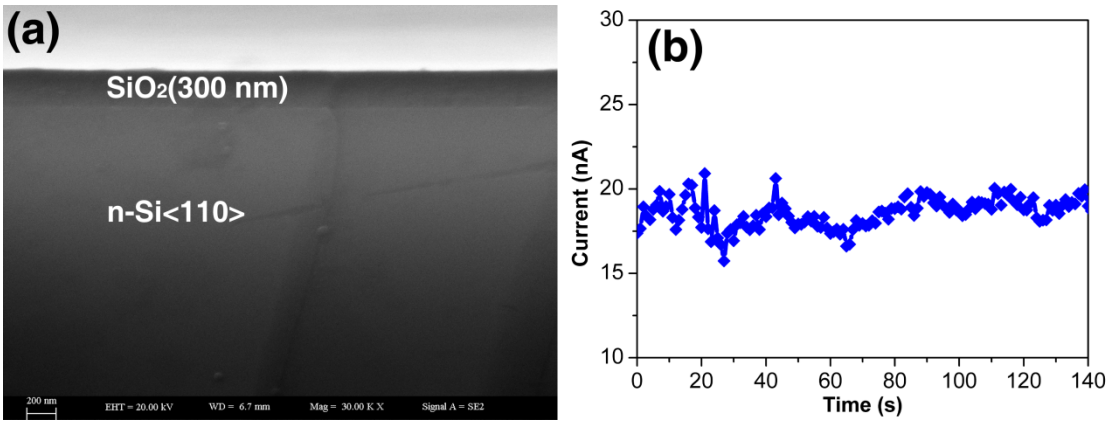

Fig. S11 (a) SEM image of the cross section of a SiO_2(300 nm)/Si substrate, and (b) Time-dependent photoresponse of the corresponding Au/SiO_2/Si device measured by periodically turning on and off a 367 nm light (0.8 mW/cm^2) at a bias of 2 V.

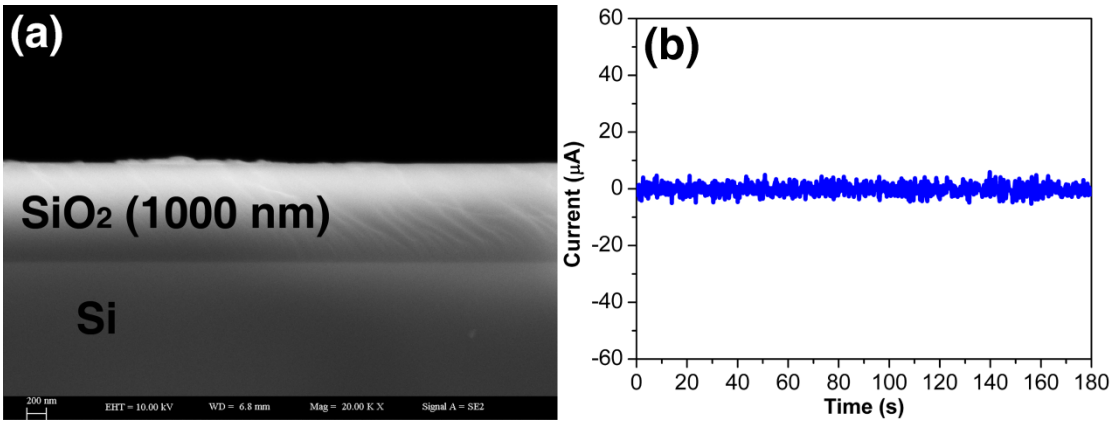

Fig. S12 (a) SEM image of the cross section of a SiO_2(1000 nm)/Si substrate, and (b) Time-dependent photoresponse of the corresponding Au/SiO_2/Si device measured by periodically turning on and off a 367 nm light (0.8 mW/cm^2) at a bias of 2 V.

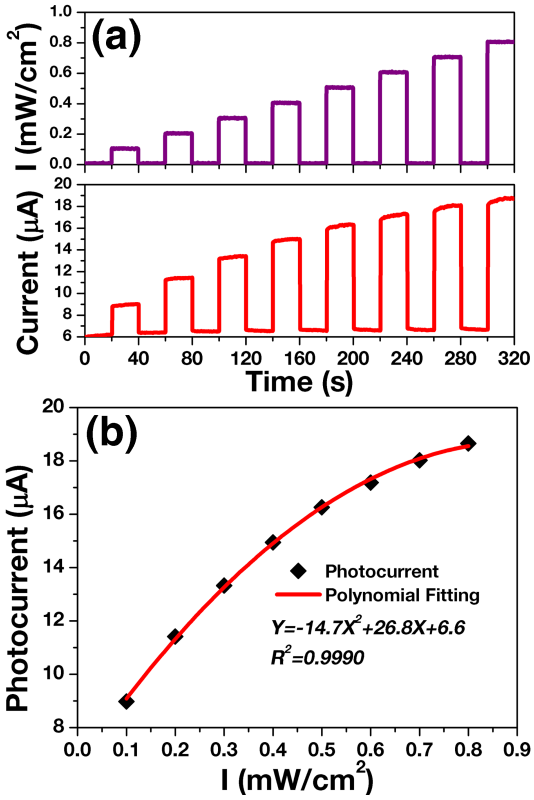

Fig. S13 (a) Light intensity (367 nm light illumination, 0.1 mW/cm^2 to 0.8 mW/cm^2) *versus* time and corresponding current *versus* time of the Au/SiO_2/Si photodetector at a forward bias of 2 V, (b) Photocurrent as a function of light intensity and the corresponding polynomial fitting.