Supporting Information

Hot Electron Generation in Silicon Micropyramids Covered with Nanometer-Thick Gold Films for Near-Infrared Photodetectors

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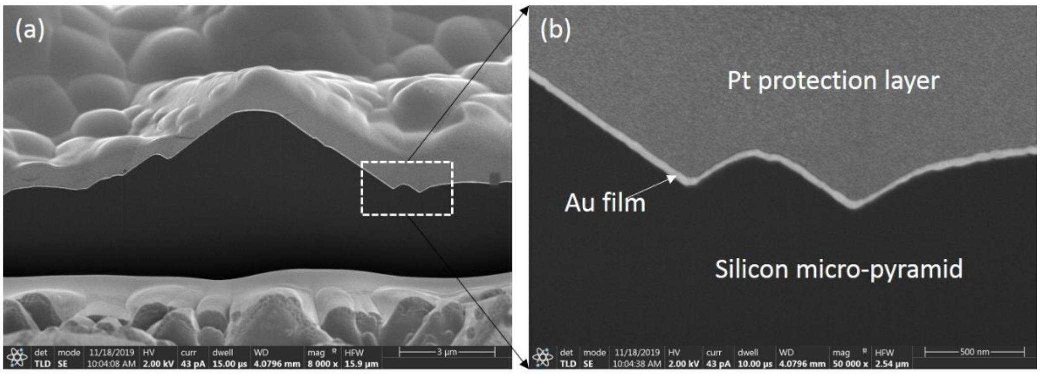

Fig.S1 (a)The cross-sectional SEM image of the gold film covered silicon pyramid (b) the enlarged cross-sectional SEM image.

Fig.S1 show the cross-sectional SEM image of the gold film covered silicon pyramid, from the picture, we can find that the gold film covered the topside and the bottom of the silicon micro-pyramid.

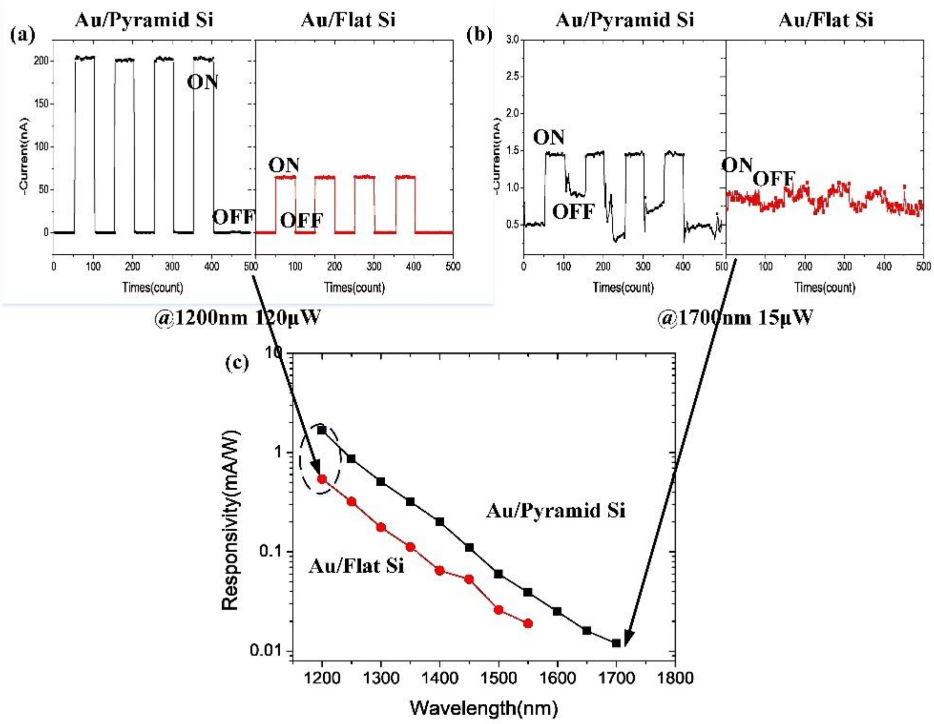

Fig.S2 Photoresponse characteristics of the proposed and reference photo detector for different wavelenght.(a)the photocurrent induced by the 1100nm and 1700nm(b) light for the Au/pyramid Silicon and the Au/flat Si respectively.

Fig.S2 shows the photoresponse characteristics of the proposed and reference photodetector under different wavelenght. From the Fig.S2(a), we can fin that, both the gold film cover micro-pyramid and flat silicon substrate obviously shows the photoresponse, but the photocurrent of the flat reference devices is much smaller than that of the pyramid device. For the illumination of 1700nm, the pyramid devices can also show the recognizable photocurrent under the alternative illuminaiton(1700nm), while the flat reference device cannot distinguish the photosignal from the dark current(due the limitation of the measurement system). So the micro-pyramid devices can detect more weakness incident light than the referece flat device.

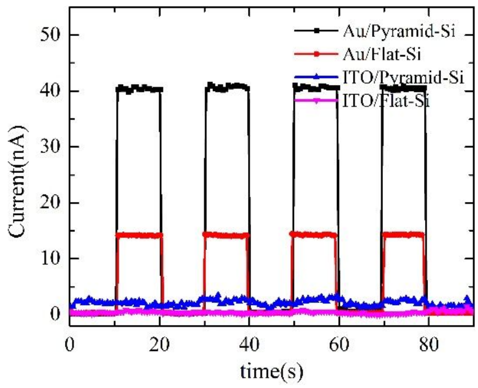

Fig.S3 The I-t curve(0.1V bias) of ITO film and gold film covered Pyramid and flat silicon sustrate under 1200 nm light illumination, respectively.

Fig.S3 shows the I-t curves(0.1V bias) of the ITO film and gold film covered silicon micro-pyramid and flat silicon sustrate under 1200 nm light illumination, respectively. From the picture, we can find that, unlike the gold film covered silicon, the ITO film covered Silicon almost not show any photoresponse, which demonstrate that the photoresponse in gold film covered silicon is caused by the Au/Si heterojunciton rather than the surface defect of the wet etching silicon micro-pyramid.

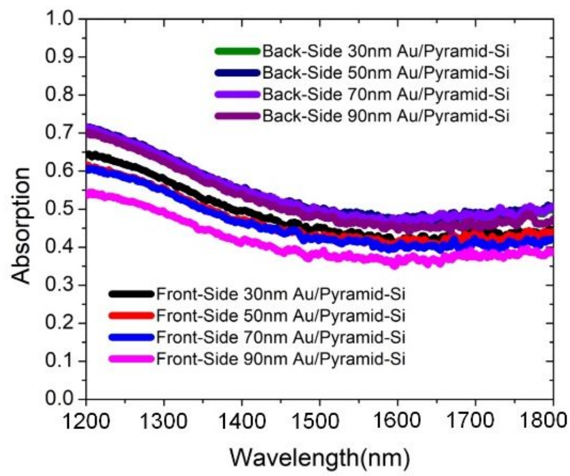

Fig.S4 The absorption spectra of the different thickness film covered Silicon pyramid under frontside illumination and backside illumination.

Fig.S4 shows the absorption spectra of the different thickness film covered Silicon pyramid under front-side illumination and backside illumination. From the picture, we can find that the absorption of all the four samples under backside illumination are larger than that of front-side illumination mode. For specifically, the absorption of the 30 nm thickness gold film covered silicon pyramid under backside illumination is about 1.1 fold than that of devices under the front-side illumination at 1200 nm. For the other thickness film covered device, the absorption under backside illumination is about 1.1~1.3 fold than that of the devices under the front-side illumination.