Supporting Information

Broadband (Ultraviolet to Near-Infrared) Photodetector Fabricated in n- ZnO/p-Si Nanowires Core−Shell Arrays with Ligand-Free Plasmonic Au Nanoparticles

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Supporting figures

The crystalline structure of the sample is identified through XRD shown in figure S1. The diamonds, asterisks and squares show peak belonging to Au NPs, ZnO and p-Si NWs respectively.

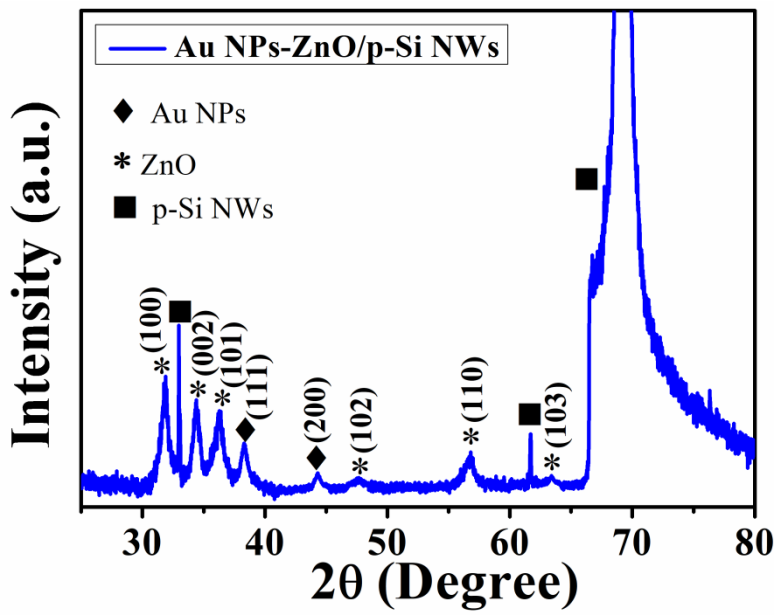

Figure S1. The XRD of Au NPs decorated ZnO/p-Si NWs heterostructure arrays.

In order to establish the physical structure of photo detector, we characterised the sample through the cross sectional TEM along with elemental analysis (EDS). Scanning tunnelling electron microscopy high angle annular dark-field (STEM-HAADF) imaging of the cross-section lamellar is shown in figure S2 (a). A composition profile of the device was obtained by EDS line scan marked by yellow arrow and the data are shown in figure S2 (b). The line scan of the ZnO/Si NWs shows the contents of Au, Zn, Si and O. There is a clear top ZnO layer on the NWs array, which is followed by the conformal coating of ZnO through the Si NWs array and the concentration of Au NPs layer with thickness of about 30 nm is maximum on the top of ZnO/Si NWs and then concentration is uniform throughout the heterostructure arrays.

The STEM-EDS mapping for the Au M shell, Zn L shell, O K shell and Si K shell are given in Figure S3 (a) - (d) respectively.

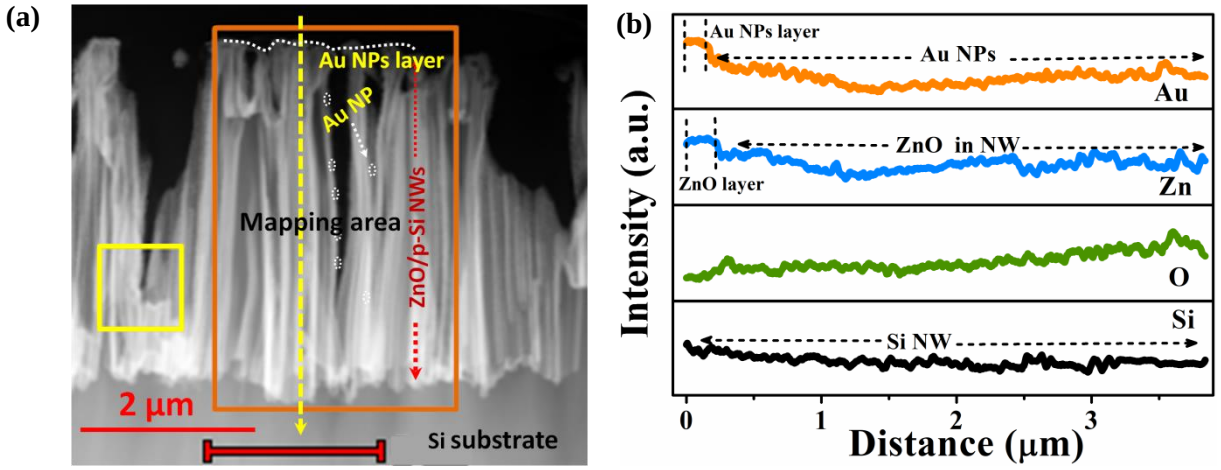

Figure S2. (a) The Cross sectional scanning tunnelling electron microscopy high angle annular dark field (STEM-HAADF) image of Au NPs decorated ZnO/Si NWs arrays. (b) Elemental composition of Au NPs on ZnO/Si NWs arrays taken by EDS line scan showing the chemical composition.

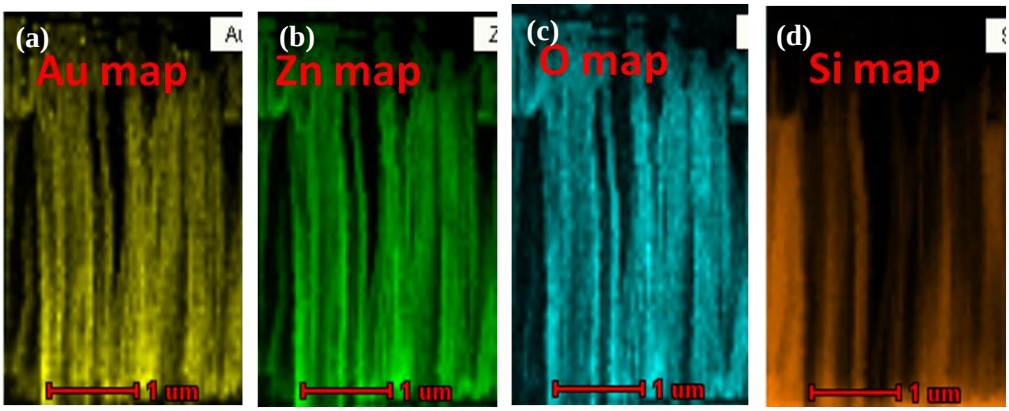

Figure S3. STEM EDS mapping of (a) Au (M shell) (b) zinc (L shell) (c) oxygen (K shell) (d) silicon (K shell) of Au NPs decorated ZnO/p-Si NWs core shell arrays.

Table S1: Comparison of device characteristics value with commercial Si photodetector

Detectors	Wavelength range	Peak wavelength	Responsivity (R)	Power dissipation
Si commercial detector	400-1100 nm	970 nm	0.65 A/W	100 mW
Au NPs-ZnO/p-Si NWs (Present work)	300-1100	800 nm	1.2 A/W	< 2 µW

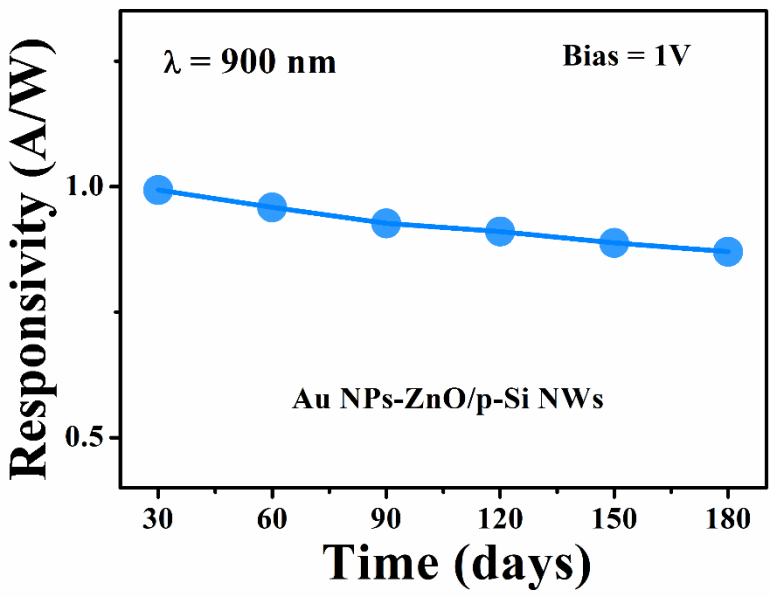

Figure S4. Stability study of photodetector during six months of time span.