Electronic Supplementary Information

Flexible SnO_2 Hollow Nanosphere Film Based High-Performance Ultraviolet Photodetector

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Experimental

Synthesis of SnO_2 hollow nanospheres: In a typical synthesis of SnO_2 hollow nanospheres, 0.5 mL of concentrated hydrochloric acid (concentration: 36.5–38%) was added to ethanol/distilled water (volume ratio: 10:1). The mixture was stirred under ambient conditions for 10 min before 0.19 g of $SnCl_2{\cdot}2H_2O$ was added. Then the turbid precursor was ultrasonicated for 30 min. The resulting solution was transferred to a Teflon-lined stainless steel autoclave of 40 mL volume and kept at 200 °C for 24 h. The final products were centrifuged, rinsed with distilled water and ethanol several times to remove any impurities that remained in the final products.

Materials Characterization. X-ray powder diffraction (XRD) patterns were recorded on a Philips X'Pert PRO MPD X-ray diffractometer operated at 35 KV and 45 mA with Cu Kα radiation. Transmission electron microscopy (TEM) images were obtained on a JEOL JEM-3000F transmission electron microscope with an accelerating voltage of 300 kV. FE-SEM analysis was carried out with a field-emission microscope (JSM-6700F) operated at an acceleration voltage of 10 kV.

Device Fabrication and Characterization: SnO_2 sphere film were self assembled at a "hexane-water" interface using the following procedure: 5 mg of SnO_2 hollow spheres were dispersed in 40 mL of distilled water by a magnetic stirring for 10 min. Hexane

(10 mL) was added to the vessel to produce a hexane-water interface. Next, 2.0 mL of ethanol was slowly added to the interface at a low rate by a syringe, and the SnO_2 hollow spheres were gradually trapped at the interface. Then most of the hexane at the top of the vessel was carefully removed by a syringe. Then the as-assembled film was transferred to a PET substrate by pulling the substrate out of the liquid phase at a slow speed. The SnO_2 sphere film was transported to an electric gun deposition system (ULVAC UEP-3000-2C), the Cr/Au (20nm /150 nm) electrodes were deposited using a shadow mask. The current–voltage (I–V) characteristics of the photodetectors were measured using an Agilent 4156C Semiconductor Parameter Analyzer. A spectroscopic response for different wavelengths was recorded using a 500 W Ushio xenon lamp with an illumination bandwidth of 2 nm, and an Acton Research monochromator with order sorting filters was used. A photocurrent was measured by fixing certain light wavelengths with adjustable light intensity. The light intensity was modulated through an aperture and calibrated by using a UV-enhanced Si photodiode. The time responses of photodetectors to light irradiation were measured by a current meter after shutting the UV-light.

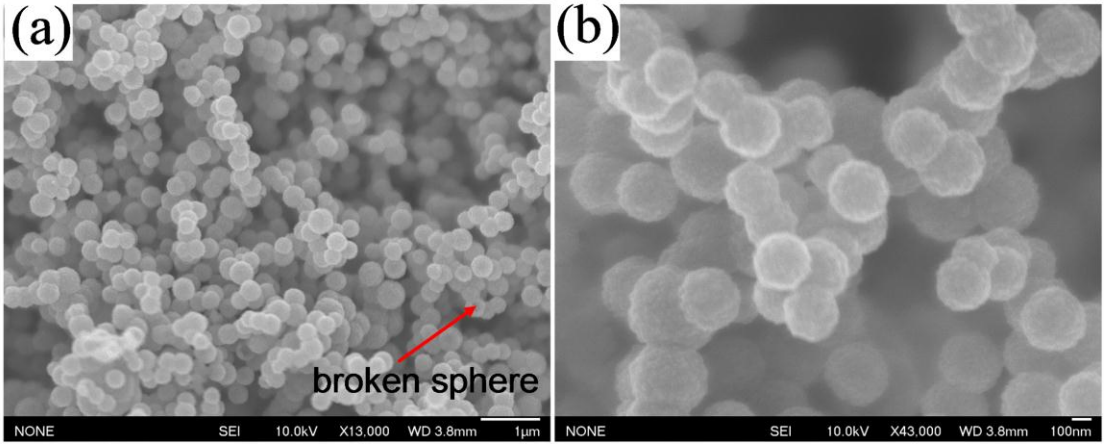

Fig. S1 The magnified SEM images of SnO_2 spheres.

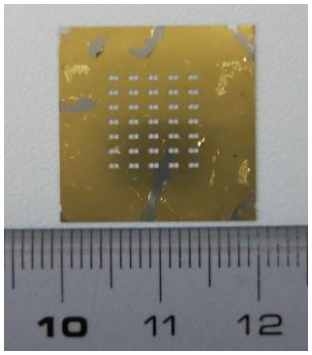

Fig. S2 Photograph of shadow mask.

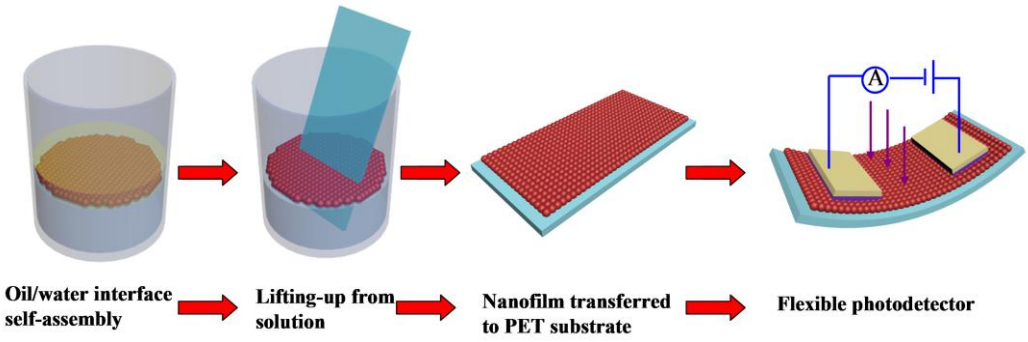

Fig. S3 Schematic illustration of the fabrication procedure of flexible SnO_2 nanofilm photodetector.