Electronic Supplementary Information (ESI)

Facile Assembly of n-SnO_2 Nanobelts/p-NiO Heterojunctions with Enhanced Ultraviolet Photoresponse

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Synthesis of SnO_2 nanobelts/NiO film heterojunctions

NiO thin films were fabricated by sol-gel spin coating technique. The solution was prepared by dissolving $Ni(NO_3)_2$ $6H_2O$ (98%, 0.4 g) in a mixed solvent (4.6 ml) of water and ethanol (the volume ratio of water to ethanol is 1:2). Poly(vinylpyrrolidone) (PVP, M_W=1,300,000) powders were then added into the solution, which was vigorously stirred at room temperature until it became a clear sol. Before spin coating, the quartz substrates were cleaned with acetone by sonification to eliminate any contaminants. The solution was then spin coated onto the substrate at a rate of 4,000 rps for 40 s. SnO_2 nanobelts were then collected and transferred onto the substrate by electrospinning. Detailed information of the electrospinning process was described in our perious work[1]. The as-assembled heterojunctions were annealed in air at 500 ℃for 2h at a heating rate of 5 ℃/min.

Characterizations

The sample morphology was characterized on field emission scanning electron

microscopy (FESEM, LEO-1530, ZEISS Corp., Germany) and transmission electron microscopy (TEM, JEM-2010, JEOL Corp., Japan). TEM samples were prepared by fabricating SnO_2 nanobelts/NiO film heterojunctions on single-crystalline NaCl substrates, which were then dissolved and dispersed in water followed by drop casting onto carbon-coated Cu grids. The TEM samples were dried before analysis. Phase compositions were examined by x-ray diffraction (XRD, D/max-2500, Rigaku Corp., Japan).

Device tests

Electrical and photoresponse properties of SnO_2 nanobelts/NiO film heterojunction devices were tested on Keithley 4200-SCS measurement system with samples placed on a probe station in a shielded box. The UV light was supplied by a low pressure mercury lamp (Philips TUV 8W, 254 nm).

Optical transmittance of the NiO film and SnO_2 nanobelts for heterojunction devices were measured with UV-vis spectrophotometer (TU-1810PC, Purkinje General Corp., Beijing, China), separately. The resultant transmittance excluded the effect of substrates.

References

1 S. Y. Huang, K. Matsubara, J. Cheng, H. P. Li and W. Pan, *Appl. Phys. Lett.*, 2013, **103**, 141108.

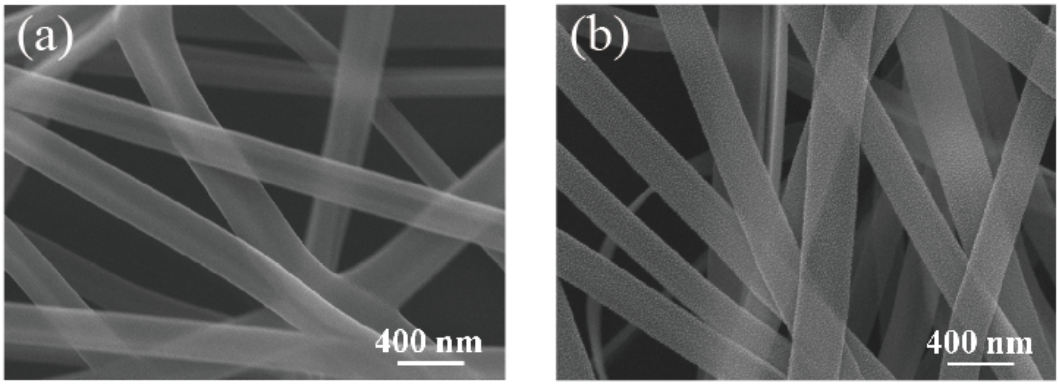

Fig. S1 SEM images of (a) electrospun $SnCl_4$/PVB composite NBs and (b) SnO_2 NBs after calcination.

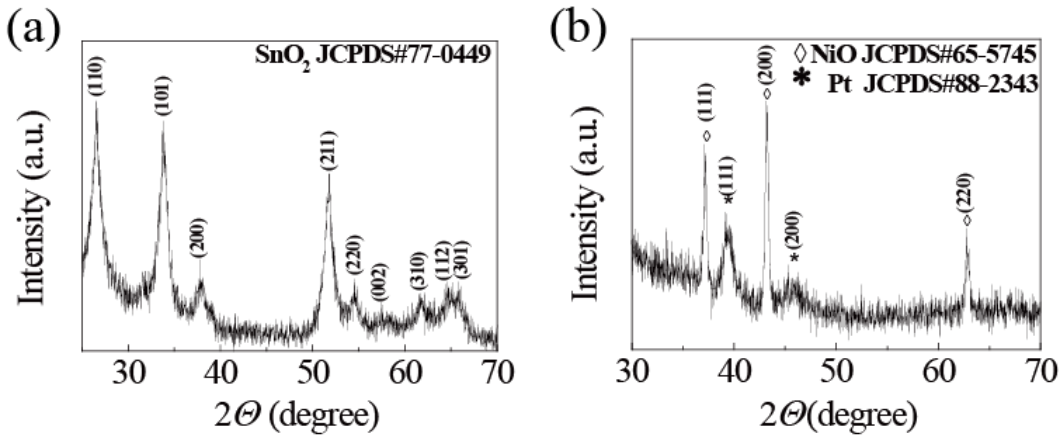

Fig. S2 XRD patterns of (a) SnO_2 NBs and (b) NiO film with Pt electrodes on top.

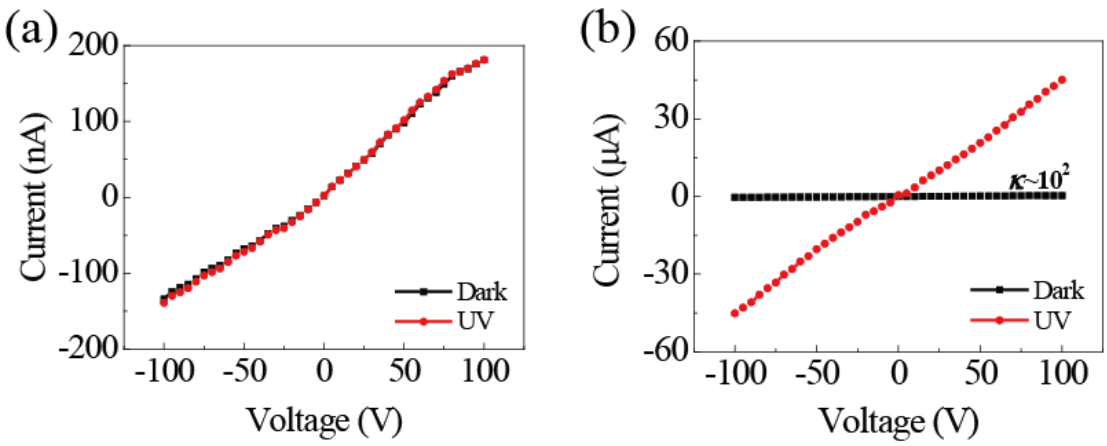

Fig. S3 *I-V* curves of (a) NiO film and (b) SnO_2 NBs under dark and UV illumination, respectively.