Electronic Supplementary Material (ESI) for Nanoscale

Supplemental Materials

Anomalous Quantum Efficiency for Photoconduction and Its Power Dependence in Metal Oxide Semiconductor Nanowires

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Table I. The experimental parameters including NW diameter (*d*), interdistance between two metal contact (*l*), applied bias (*V*), excitation photon energy (*E*), and light intensity (*I*) for the photoconductivity measurements of the different single-NW devices. The measured photocurrent (i_p) values of the SnO_2, TiO_2, and WO_3 NWs under the corresponding *I* ranges used for the normalized gain (Γ_n) calculations are also listed. The Γ_n value of the ZnO NW is estimated according to the i_p or Γ data in the Refs. 7.

Nanowire Material	***d*** (nm)	***l*** (μm)	***V*** (V)	***E*** (eV)	***I*** (Wm^{-2})	i_p (nA)
SnO_2	280±10	2.9	0.1	3.82	0.02–510	650–1990
TiO_2	300±30	4	0.1	3.82	0.01–510	4.1–9.3
WO_3	255±20	2.4	0.1	3.82	51–760	1.2–22
ZnO[a]	225±75	2	5	3.18	0.062–410	–

a) Ref. 7

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Table SI, The adopted parameters including the optical absorption coefficient (α), optical reflectivity (R_o), effective mass of electron (m_e^*) and hole (m_h^*), and energy bandgap (E_g) of the SnO_2, TiO_2, WO_3, and ZnO for the effective quantum efficiency (η_{eff}) and the surface depletion width (w) calculations. The α and R_o values are corresponding to the photon energy (E) in the table. D: direct bandgap ; I: indirect band gap.

Nanowire Material	E (eV)	α (cm^{-1})	R_o	m_e^* ($\times m_o$)	m_h^* ($\times m_o$)	E_g (eV)	D/I
SnO_2	3.82	~1.5×10^5[a,b]	~0.2[a]	0.28[l]	0.25[m]	3.6[r]	D
TiO_2	3.82	~2×10^5[c,d]	~0.23[i]	9[n]	2[n]	3.0[s]	I
WO_3	3.82	~2×10^5[e,f]	~0.2[e]	2.4±0.9[o]	2.4±0.9[p]	3.0[e,f]	I
ZnO	3.18	~1.5×10^5[g,h]	~0.2[j,k]	0.24[q]	0.45[q]	3.3[t]	D

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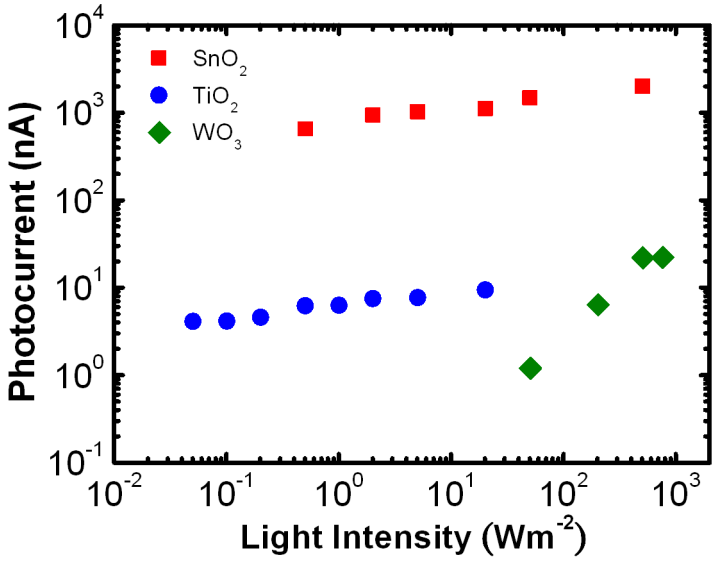

Figure S1. The photocurrent versus light intensity curves used for the normalized gain calculation for the single SnO_2, TiO_2, and WO_3 NWs under the excitation energy of 3.82 eV.

Figure S2, R. S. Chen *et al*

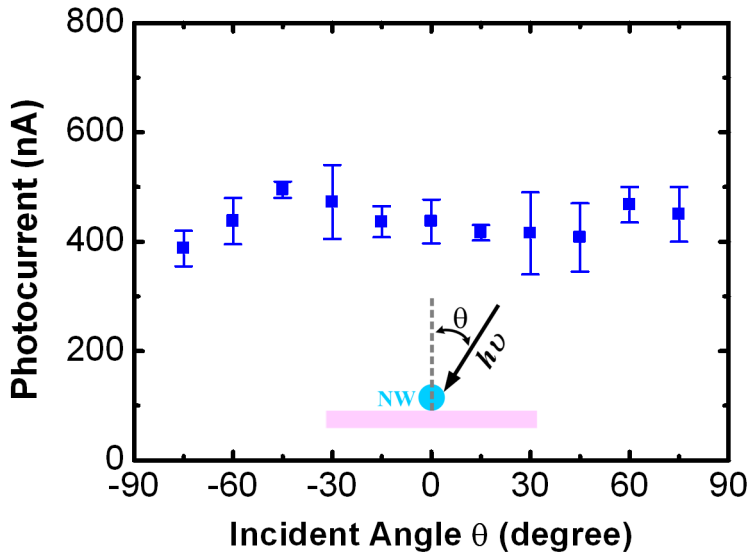

Figure S2. The typical photocurrent versus incident angle (θ) of laser beam from the normal for a single SnO_2 NW at E = 3.82 eV. The inset shows the schematic of the angle-dependent photocurrent measurement for a single NW.

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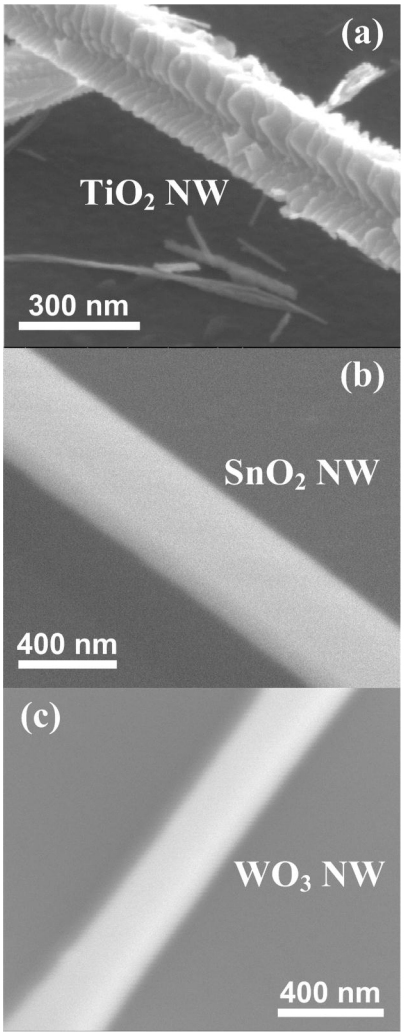

Figure S3. Typical FESEM images of the individual NWs of **(a)** TiO_2, **(b)** SnO_2, and **(c)** WO_3.