Supporting Information

Stannous oxide promoted charge separation in rational designed heterojunction photocatalysts with controllable mechanism

Shaolong Huang[a], Zhengyuan Jin[a], Huan Yi[a], Ziyu Yang[a], Yaojia Long[a], Qiufan Liao[a], Jiaqi Chen[a], Yaan Cao[b], Shuangchen Ruan[a], Yu-Jia Zeng[*a]

[a]*Shenzhen Key Laboratory of Laser Engineering, Guangdong Provincial Key Laboratory of Micro/Nano Optomechatronics Engineering, College of Optoelectronic Engineering, Shenzhen University, Shenzhen, 518060, People's Republic of China*

[b]*MOE Key Laboratory of Weak-Light Nonlinear Photonics, Ministry of Education, TEDA Applied Physics Institute and School of Physics, Nankai University, Tianjin, 300457, People's Republic of China*

[*]*Corresponding author.*

E-mail address: yjzeng@szu.edu.cn.

Table of contents

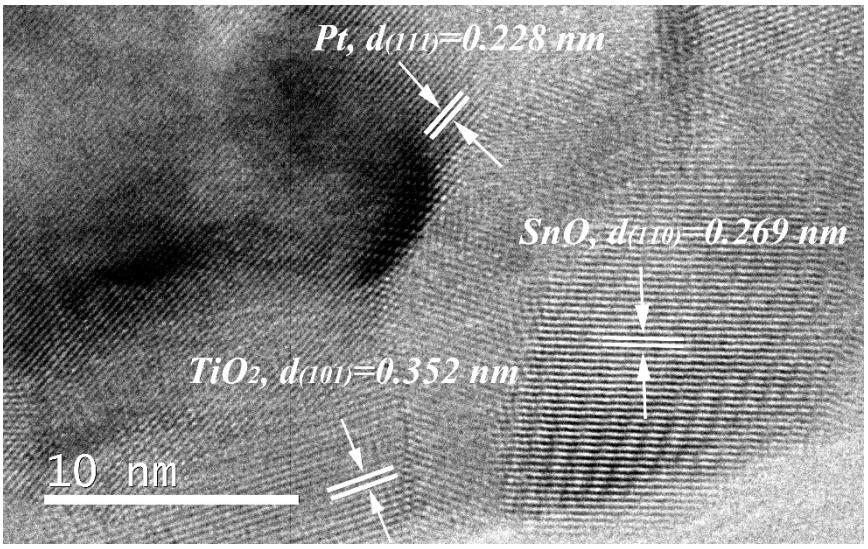

Fig. S1 HRTEM image of SnO/TiO_2 with Pt.

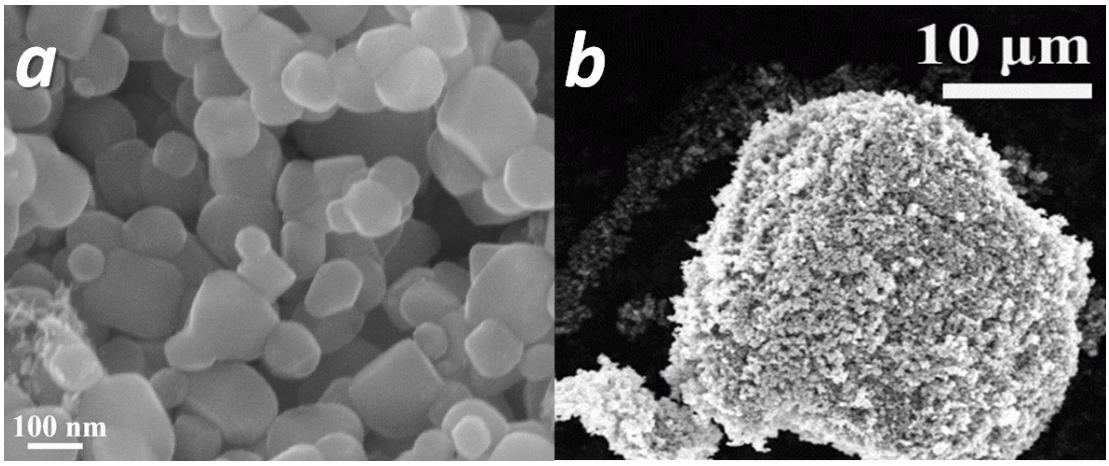

Fig. S2 SEM of a) TiO_2 nanoparticles and b) SnO/TiO_2 heterojunction.

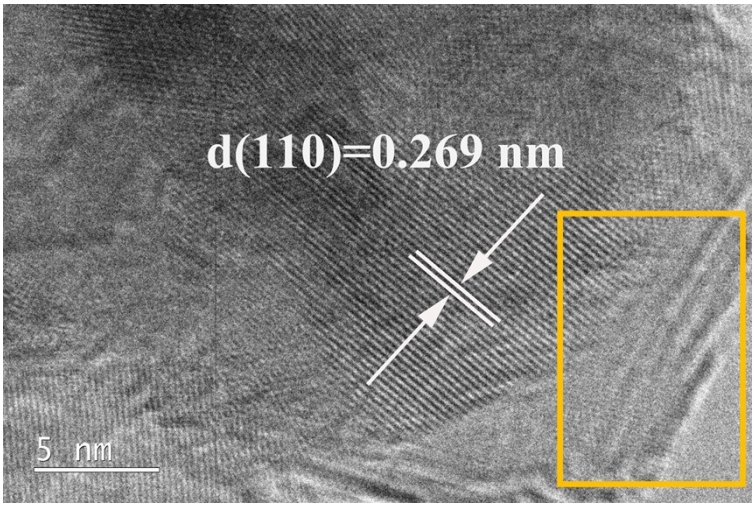

Fig. S3 HRTEM of as-prepared SnO.

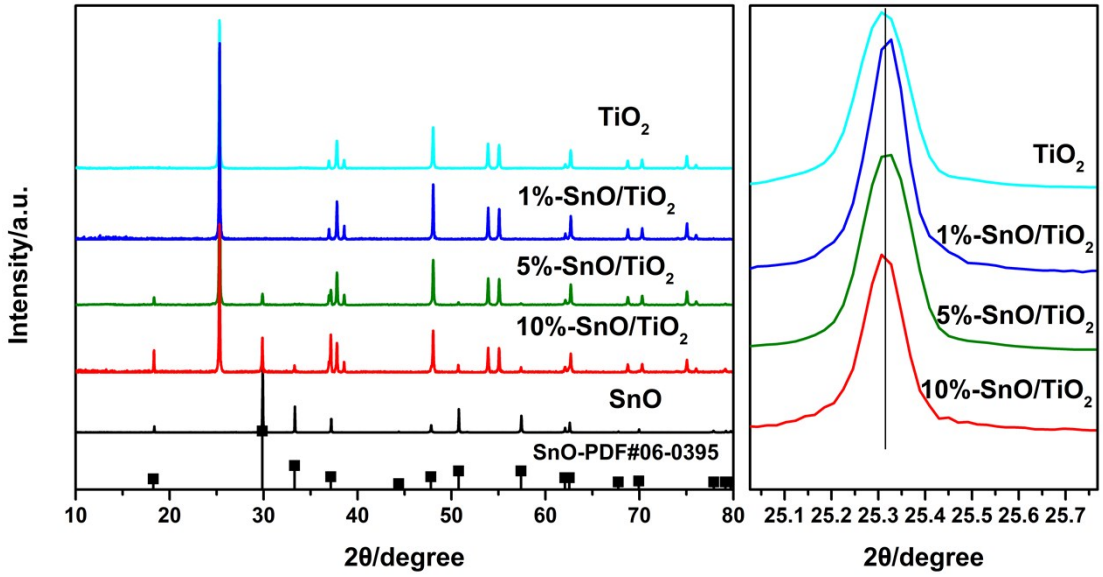

Fig. S4 XRD patterns of all samples.

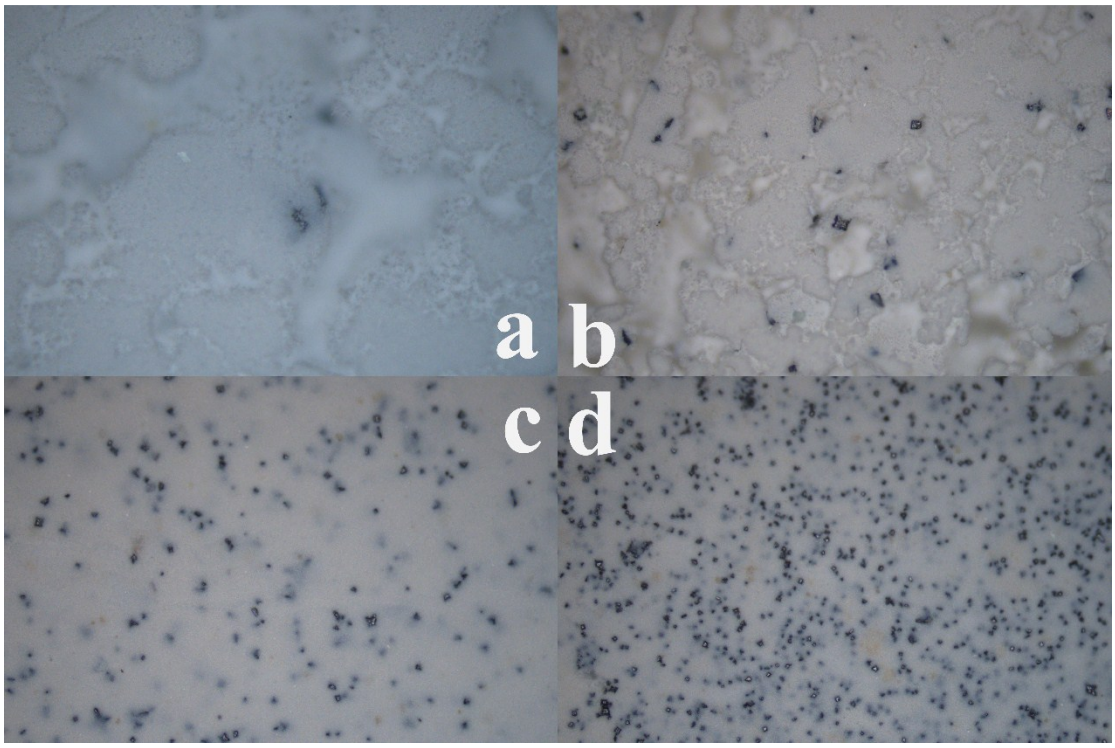

Fig. S5 Optical Microscope images of all samples.

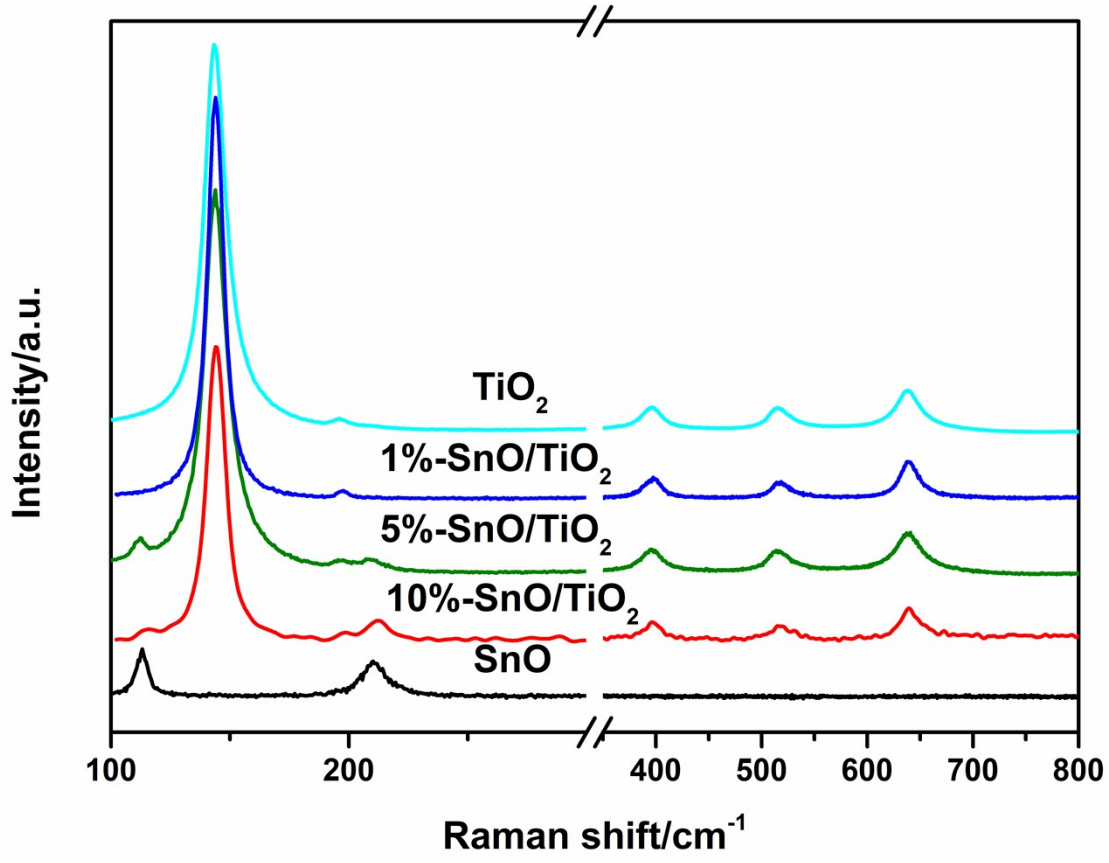

Fig. S6 Raman spectra of all samples.

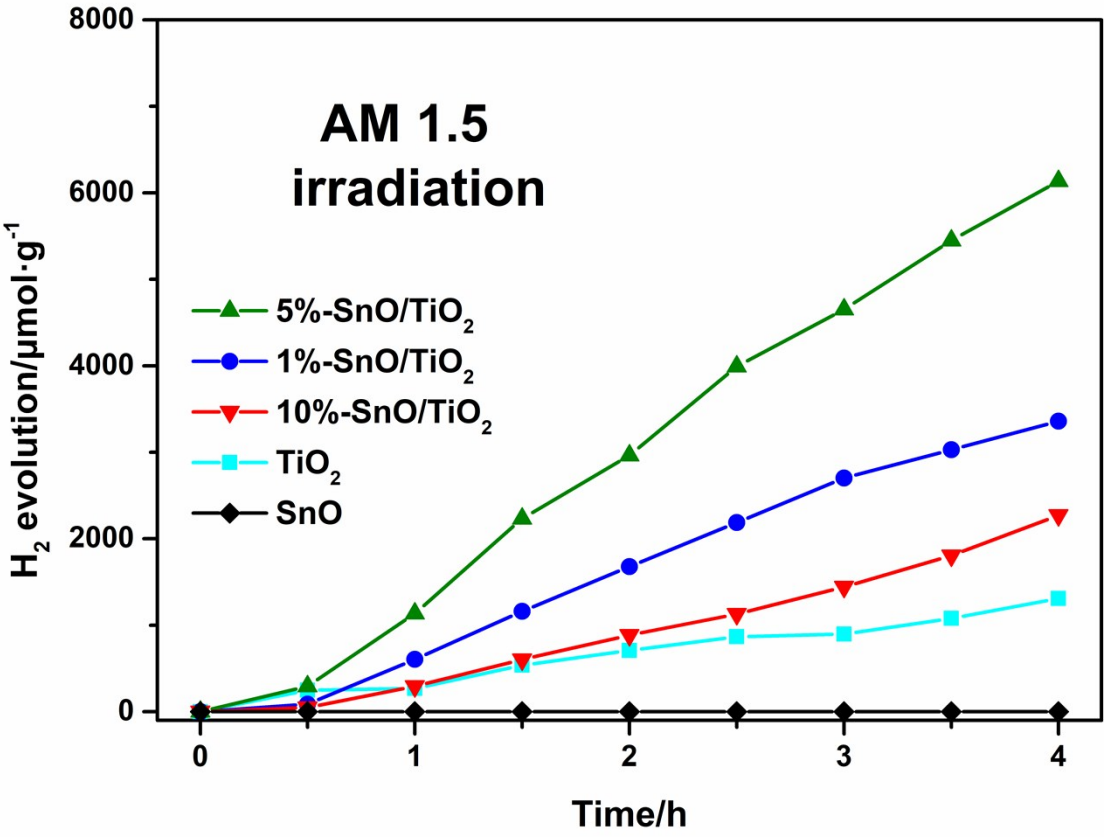

Fig. S7 H_2 evolution of all samples under AM 1.5 irradiation.

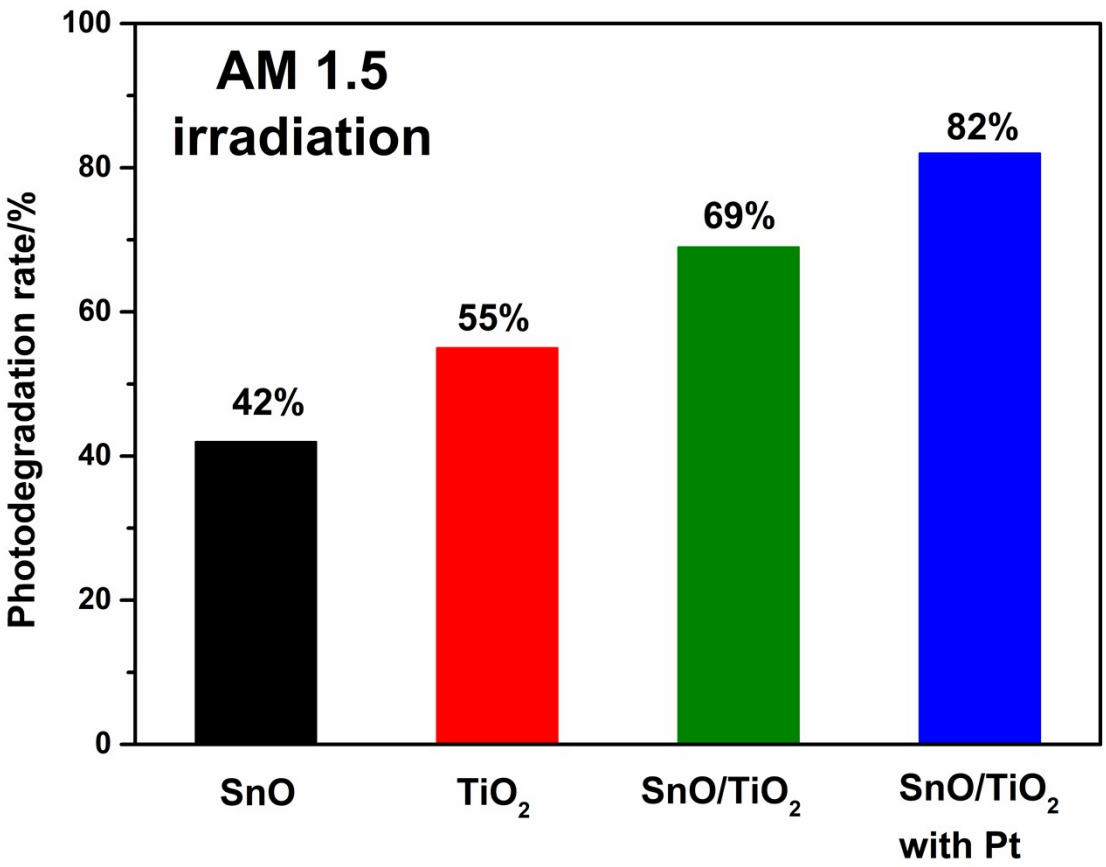

Fig. S8 Photodegradation rate of as-prepared photocatalysts.

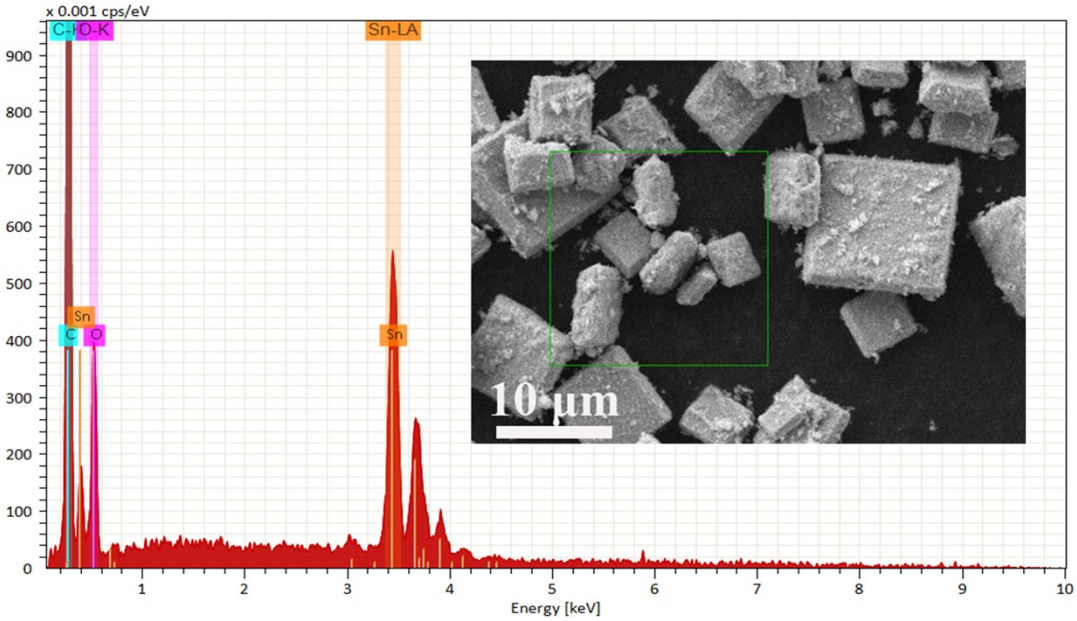

Fig. S9 EDS of SnO after H_2 evolution reaction.

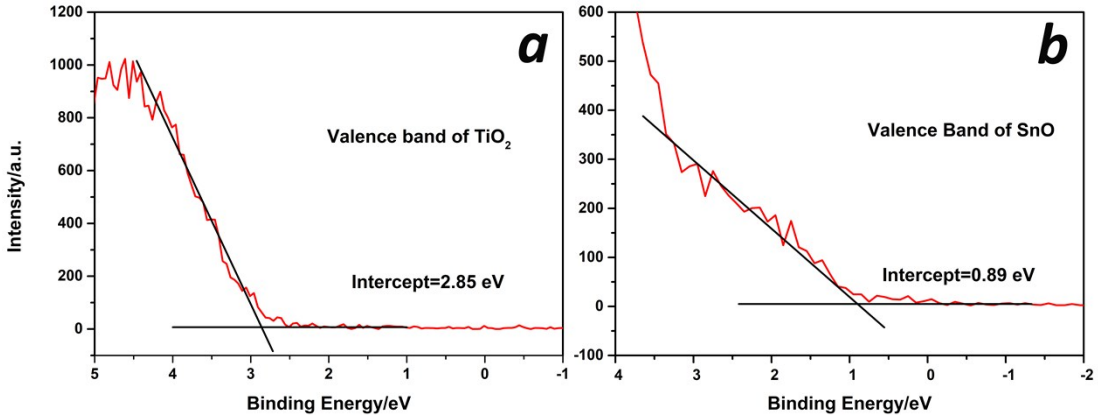

Fig. S10 Valence band of a) TiO_2 and b) SnO, respectively.

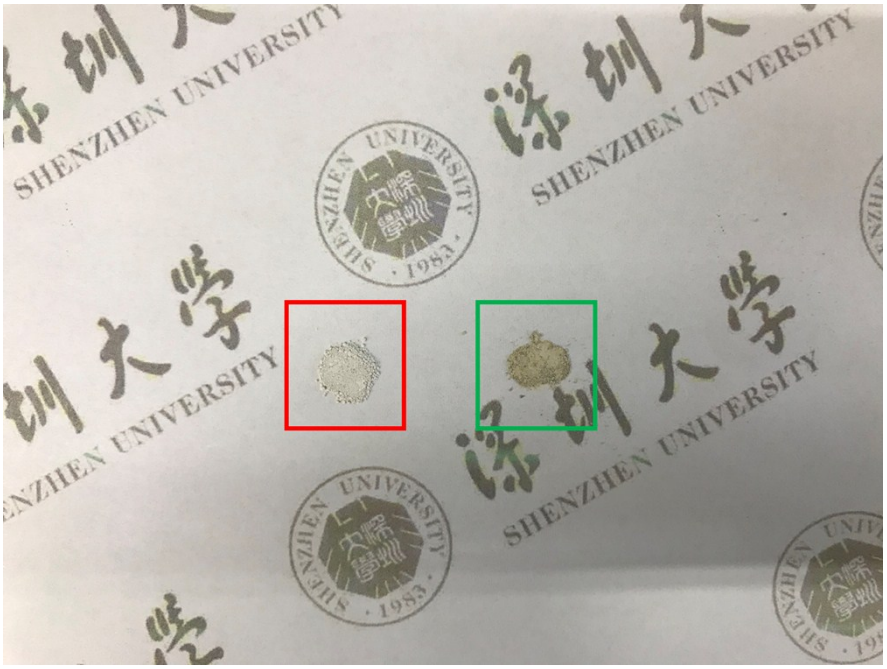

Fig. S11 Comparing the sample color between a) in-situ prepared SnO/TiO_2 heterojunction (red circles) and b) mechanical mixing TiO_2 and SnO (green circle).

Table S1. Peak position of XPS spectra.

Sample	Ti 2p (eV)		Sn 3d (eV)		O 1s (eV)			Pt 4f (eV)	
	Ti $2p_{3/2}$	Ti $2p_{1/2}$	Sn $3d_{5/2}$	Sn $3d_{3/2}$	lattice O^{2-}		OH^-	Pt $4f_{5/2}$	Pt $4f_{7/2}$
TiO_2	458.3	464.0	—	—	529.5		531.5	-	-
SnO	—	—	486.6	495.1	530.0		—	-	-
SnO/TiO_2	458.5	464.2	486.5	495.0	529.5 (TiO_2)	530.0 (SnO)	531.6	-	-
SnO/TiO_2 with Pt	458.7	464.4	486.8	495.3	-	-	-	73.3	69.9

	A_1 (%)	τ_1 (ns)	A_2 (%)	τ_2 (ns)	τ_a (ns)
TiO_2	91.2	3.4	8.8	18.7	4.8
SnO/TiO_2	90.4	3.1	9.6	69.5	9.5
SnO/TiO_2 with Pt	90.5	3.2	9.5	83.7	10.8

Table S2. Results of carriers lifetime.