Supporting Information

Boosting the Photoelectrochemical Activities of All-inorganic Perovskite $SrTiO_3$ Nanofibers by Engineering Homo/hetero Junctions

Zhao Liang[1,2,ζ], Huilin Hou[2,ζ], Kai Song[2], Kan Zhang[3], Zhi Fang[2], Fengmei Gao[2], Lin Wang[2], Ding Chen[1,4,*] and Weiyou Yang[2,*] and Haibo Zeng[3,*]

[1]School of Materials Science and Engineering, Hunan University, Changsha City, 410082, P.R. China

[2]Institute of Materials, Ningbo University of Technology, Ningbo City, 315016, P.R. China

[3]School of Materials Science and Engineering, Nanjing University of Science and Technology, Nanjing, China.

[4]State Key Laboratory of Advanced Design and Manufacturing for Vehicle Body, College of Mechanical and Vehicle Engineering, Hunan University, Changsha City,410082, P.R. China

Table S1 The main experimental parameters of electrospinning process

Stainless steel nozzle type	DC voltage	The distance between collector screen and nozzle tip	Injection speed	Humidity
21G	10 KV	15 cm	0.08 mm/min	<40 %

Table S2 The technological conditions of ALD ZnO

Operating pressure 0.15 torr			
Heater	150 ℃	Hottrap	400 ℃
Purge1/Purge2	120 ℃/80 ℃	Pumpline	100 ℃
Dose Diethyl Zinc		0.02 s	
Purge		30 s	
Dose H_2O		0.015 s	
Purge		30 s	

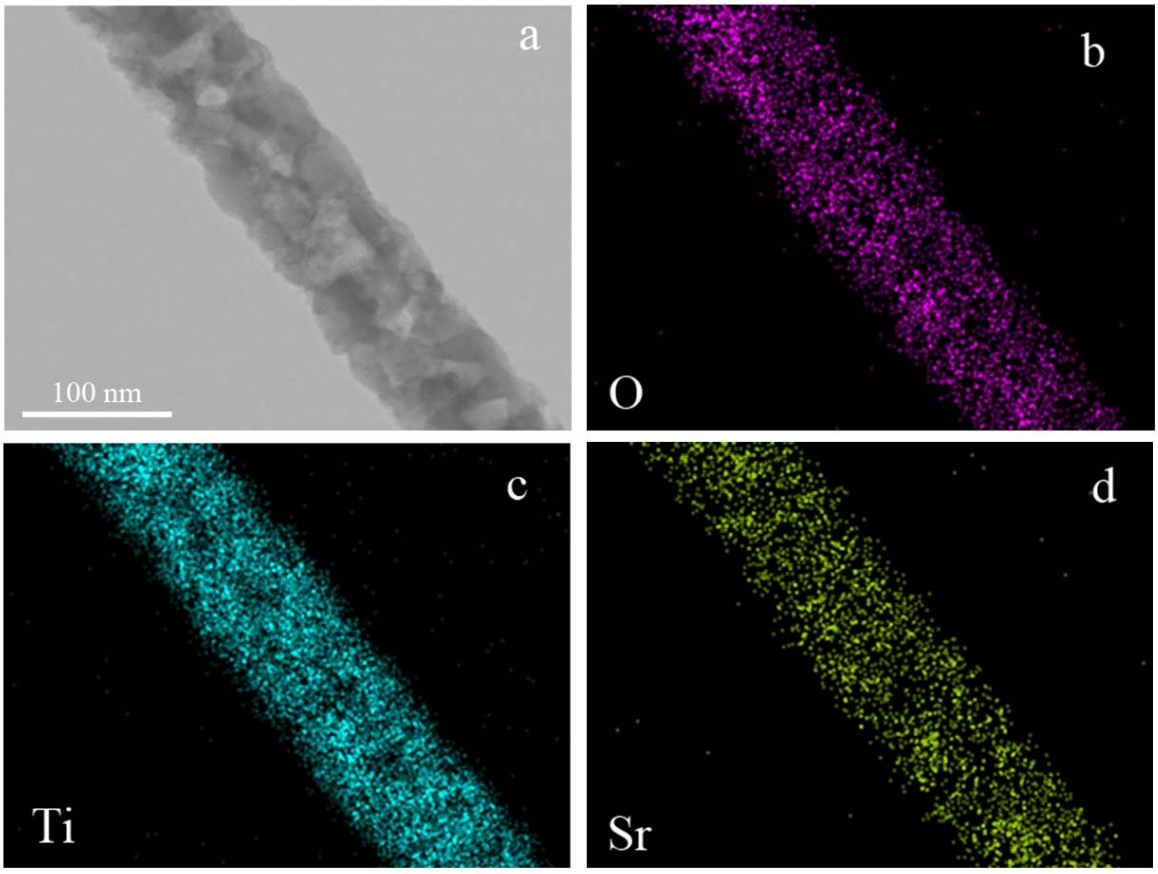

Fig. S1. (a) A typical TEM image of a single STO nanofiber. (b-d) The element mappings of O, Ti and Sr, respectively.

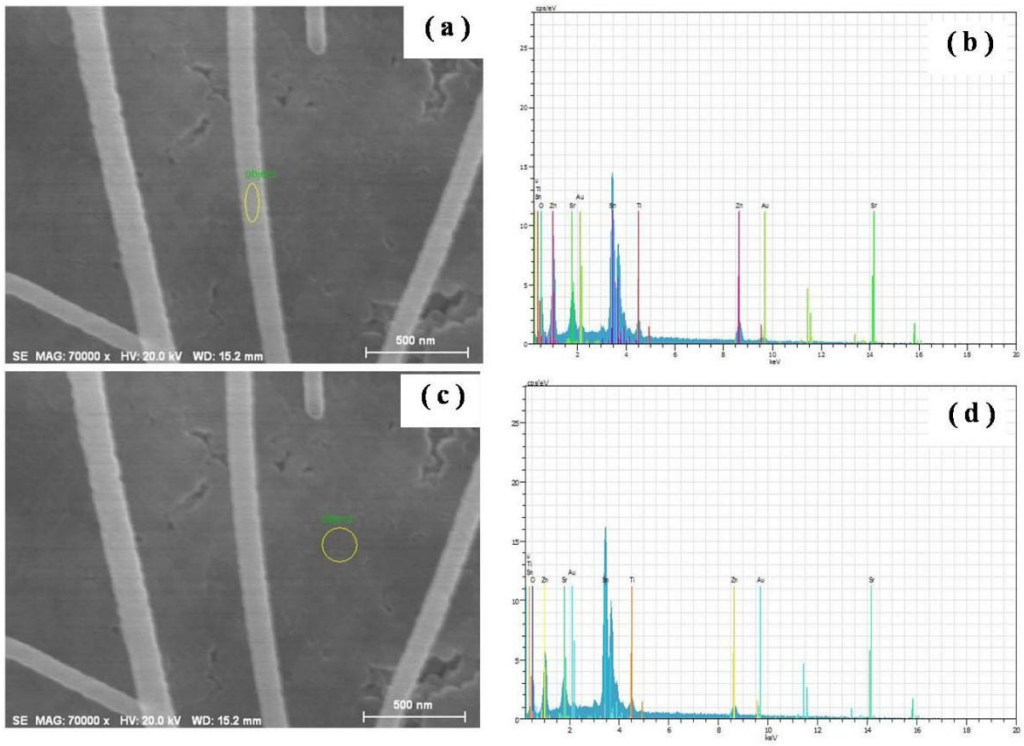

Fig. S2. (a-b) Typical SEM image and corresponding EDX spectrum of STO nanofibers after ALD of ZnO, respectively. (c-d) Typical SEM image and corresponding EDX spectrum of STO nanofilm after ALD of ZnO, respectively.

Table S3 Chemical compositions of STO nanofibers after 300 cycle ALD of ZnO

Element	Weight %	Atom %
Sr	8.49	4.04
Ti	3.83	3.33
Zn	10.38	6.61
O	26.36	68.62
Sn	47.49	16.66
Au	3.45	0.73

Table S4 Chemical compositons of STO film after 300 cycle ALD of ZnO

Element	Weight %	Atom %
Sr	7.29	3.85
Ti	3.32	3.21
Zn	6.10	4.31
O	22.59	65.29
Sn	58.71	22.87
Au	2.00	0.47

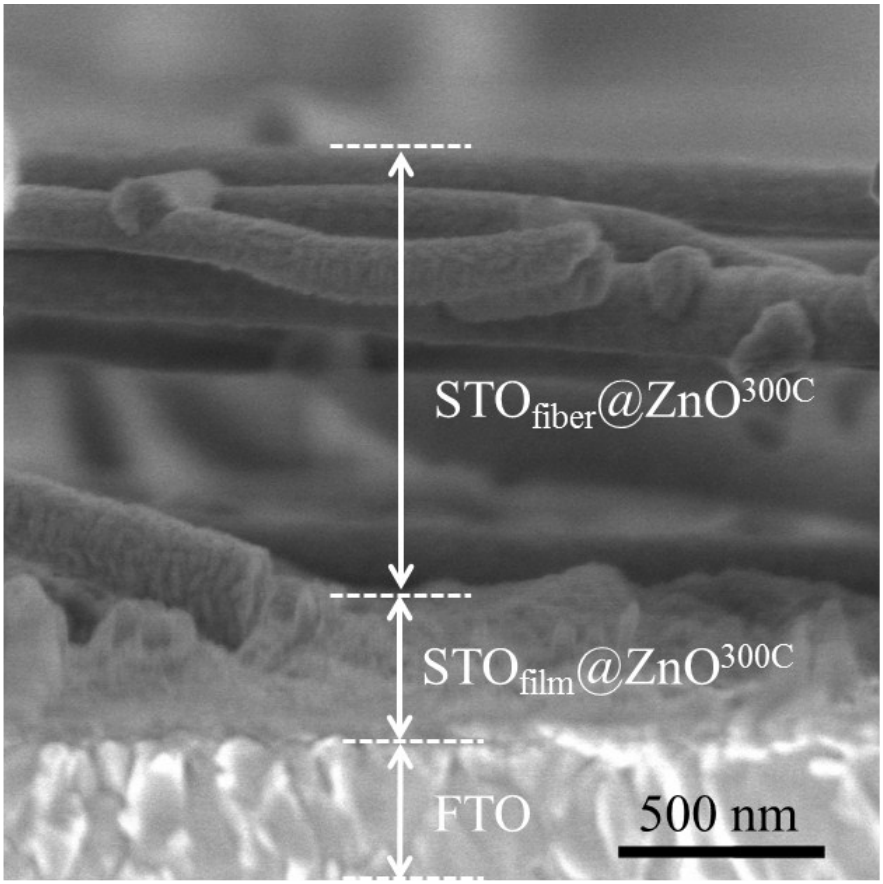

Fig. S3. SEM cross sectional photograph of STO@ZnO^{300C}

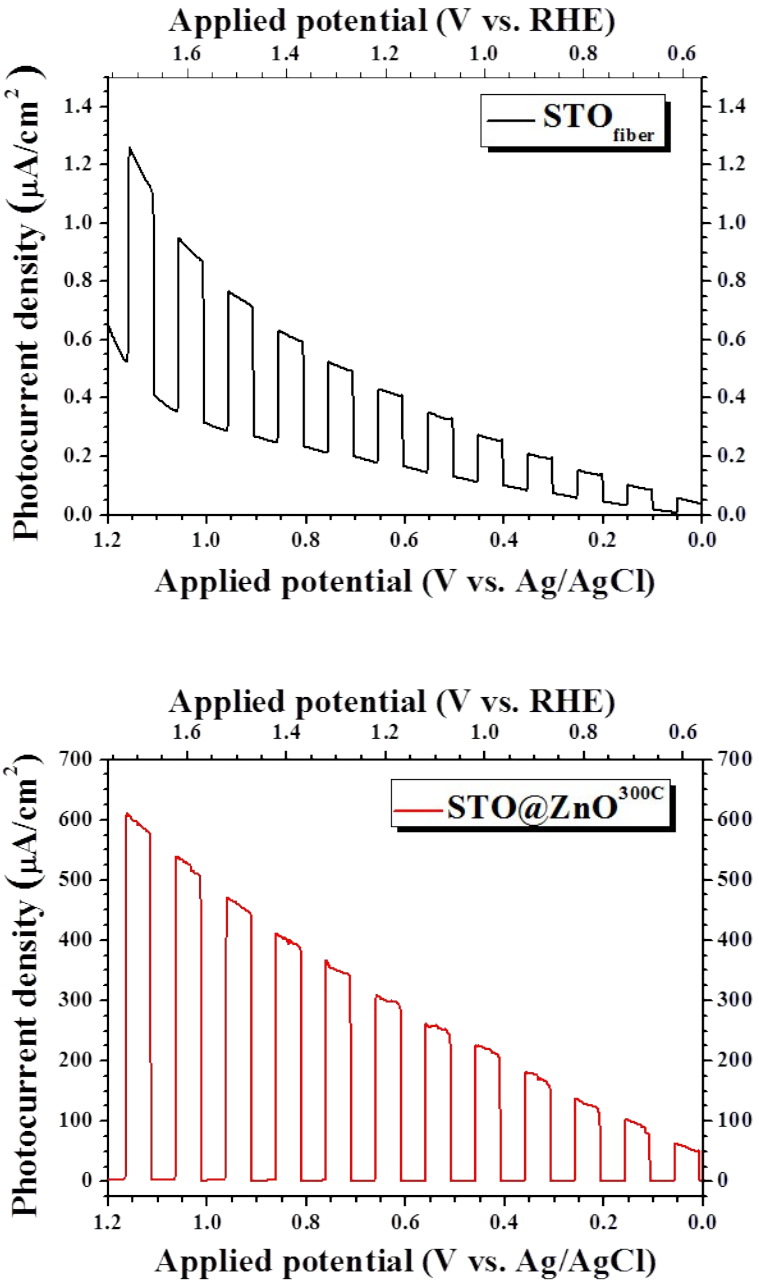

Fig. S4. (a-b) Photocurrent density *vs.* applied potential plots of samples STO_{fiber} and $STO@ZnO^{300C}$, respectively.

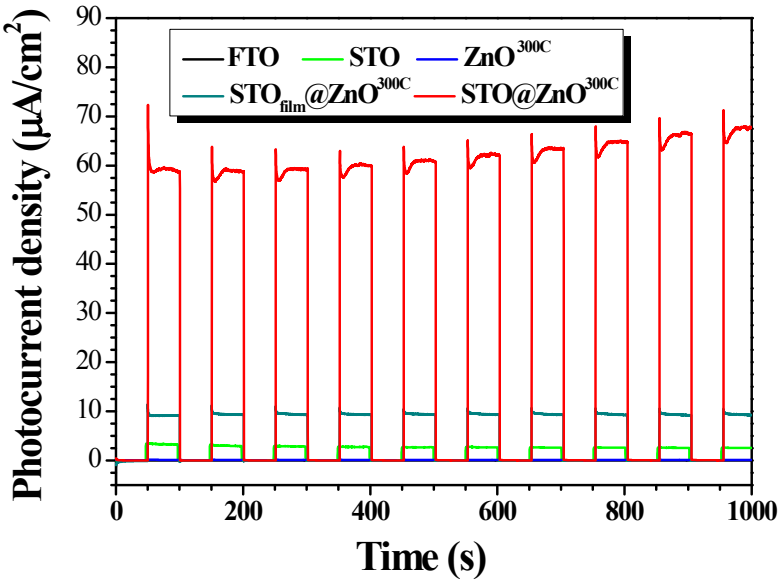

Fig. S5. The chopped transient photocurrent density *vs.* time recorded from the photoanodes of FTO, STO, ZnO^{300C}, STO_{film}@ ZnO^{300C} and STO@ZnO^{300C} under 0 V*vs.* Ag/AgCl, respectively.

Table S5 Typical photocurrent densities of STO-based photoanodes at 0 V *vs.* Ag/AgCl in the previously reported works

Synthesis approach	Electrolyte	Photocurrent densities ($\mu A/cm^2$)	References
Pure STO nanocube by nonaqueous ionic liquid route	0.1 M Na_2SO_4	0.5	1
STO film by sol-gel method	0.1 M KOH	1.7	2
STO film and STO nanofibers	0.5 M Na_2SO_4	2.73	Current work
Ho-doped STO film	0.1 M KOH	3	2
NiO nanoparticle-decorated STO nanocube	0.1 M Na_2SO_4	3.5	1
First Ho-doped STO film and the deposite Pt nanoparticles	0.1 M KOH	4	2
STO-TiO_2 eutectic composite	Na_2SO_4	7.75	3
STO with ALD ZnO film	0.5 M Na_2SO_4	61.3	Current work

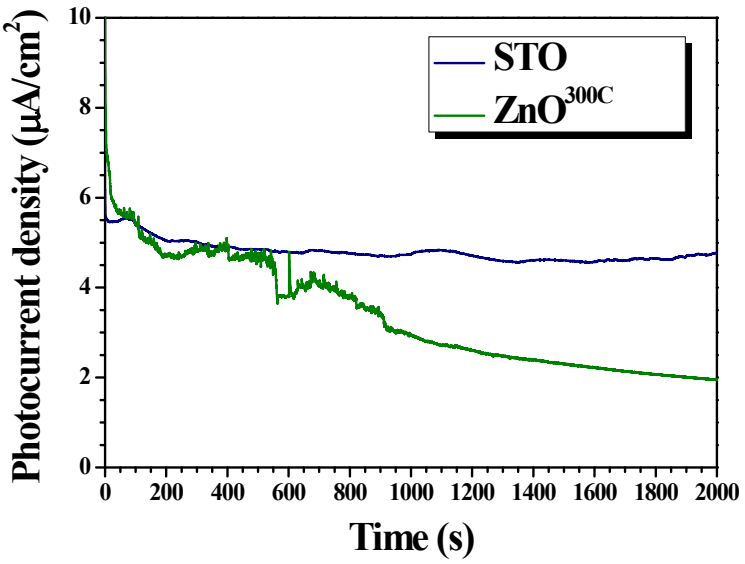

Fig. S6 The PEC stabilities of pure STO and ZnO^{300C} photoanodes measured at 0.1 V *vs.* Ag/AgCl.

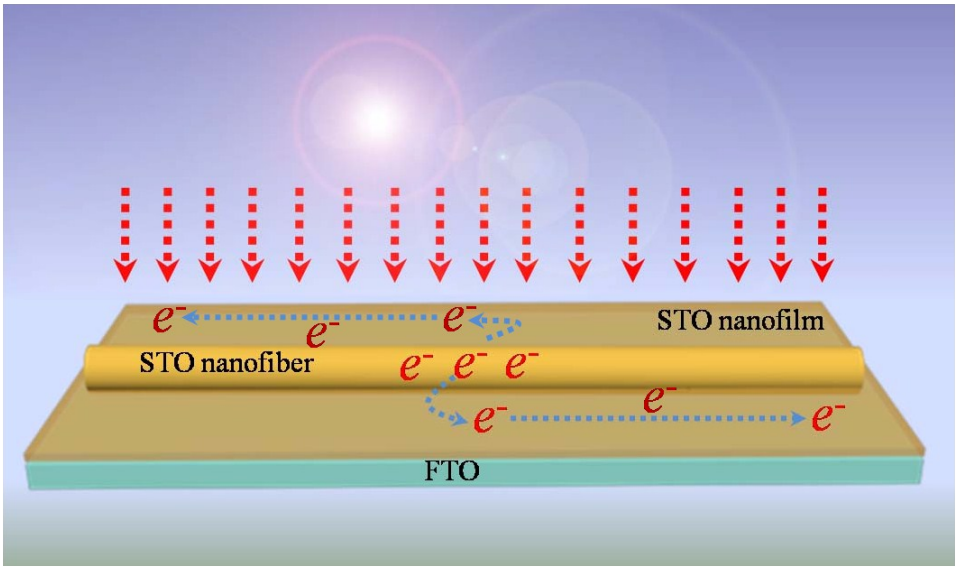

Fig. S7. Schematic illustration for the enlarged contact area to allow the high electron-hole mobility across the interface with a solid contact between the as-spun STO fibers and FTO substrate.

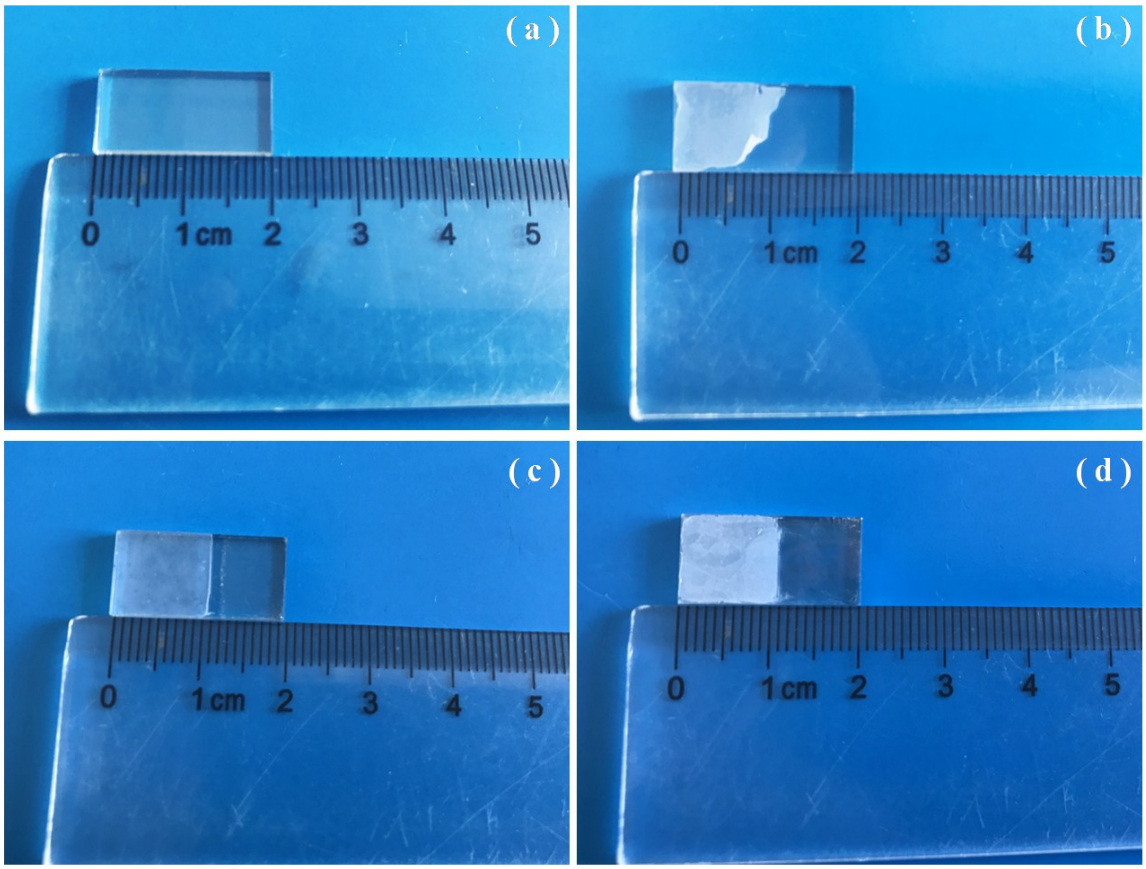

Fig. S8. Typical digital photographs of as-prepared photoanodes, disclosing that the introduced STO film brings a solid contact of as-spun STO fibers to the FTO substrate. (a) spin coated STO film on FTO substrate (sample STO_{film}). (b) electrospun STO nanofibers on FTO substrate (sample STO_{fiber}). (c) electrospun STO nanofibers on FTO substrate with the spin coated STO film (sample STO). (d) electrospun STO nanofibers on FTO substrate with the spin coated STO film (sample $STO@ZnO^{300}$).

References

1. W. Wang, W. Zhang, C. Hao, F. Wu, Y. Liang, H. Shi, J. Wang, T. Zhang and Y. Hua, *Sol. Energ. Mat. and Sol. C.* 2016, **152**, 1-9.

2. L. Zhao, L. Fang, W. Dong, F. Zheng, M. Shen and T. Wu, *Appl. Phys. Lett.*, 2013, **102**, 3593.

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