Electronic Supplementary Information for

Al-doping to Synchronously Improve Conduction Band and Electron Lifetime for SnO_2 Photoanode to Enhance Dye-Sensitized Solar Cells Performances

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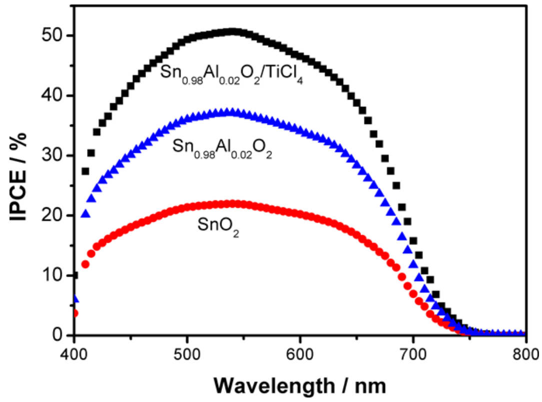

Fig. S1 IPCE of the fabricated DSSCs with SnO_2, $Sn_{0.98}Al_{0.02}O_2$, and $Sn_{0.98}Al_{0.02}O_2/TiCl_4$ as photoanodes.

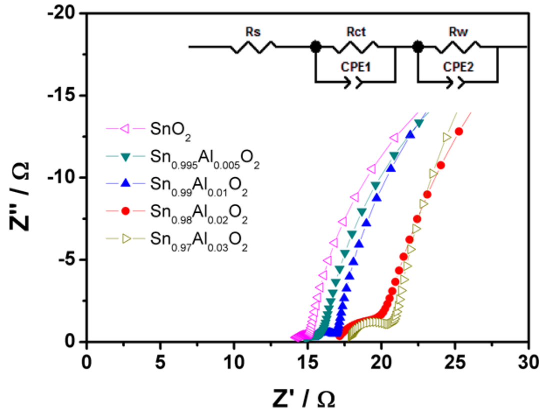

Fig. S2 EIS spectra of the SnO_2 and the Al-doped SnO_2 DSSCs. The inset of EIS plots represents the equivalent circuit for EIS.

Table S1 Comparison for the photovoltaic performance of the DSSCs based on different SnO_2 photoanode structures (SnO_2, SnO_2/TiO_2, and SnO_2/ZnO composites).

DSSCs based on SnO_2 photoanode						
Ref.	Morphology or structure	Diameter	Synthetic method or manufacturer	Film thickness	η (%) (No surface treatment)	*η (%)*(After surface treatment)[a]
S1	SnO_2 nanoparticles	10-30 nm	NanoTek, SNW15WT%-G02	6 μm	2.3	---
S2	SnO_2 nanoparticles	3-5 nm	Alfa Aesar	10 μm	1.74	MgO/7.21
S3	SnO_2 nanowire	20-200 nm	reactive vapor transport	25-30 μm	2.1	$TiCl_4$/4.1
S4	SnO_2 hollow microspheres	1-2 μm	hydrothermal	10 μm	1.4	$TiCl_4$/5.65
S5	coral-like SnO_2	300 nm×2 μm	wet-chemical	---	1.04	---
S6	SnO_2 nanoparticles	15 nm	Alfa Aesar	4 μm	0.76	Al_2O_3/3.7
S7	meso-SnO_2	20 nm pores	hard template method	3 μm	1.1	$TiCl_4$/3.8
S8	SnO_2 nanoflower	1 μm	hydrothermal	8-10 μm	3.00	$TiCl_4$/6.78

S9	SnO_2 nanoparticles	15 nm	Alfa Aesar	5 μm	1.14	NiO/1.85
S10	SnO_2 nanoparticles	15 nm	Alfa Aesar	---	1.7	$CaCO_3$/5.4
S11	nanoporous SnO_2	4 nm/＞100 nm	Alfa Aesar /Aldrich	1-5μm	2.27	---
S12	SnO_2 nanocrystals	100 nm	microwave solvothermal	10-12μm	3.16	---
S13	SnO_2 nanoarborous structure	---	electrodeposition	15μm	0.47	---
S14	SnO_2 nanopowder	＜100 nm	Sigma-Aldrich	8μm	3.65	MgO/6.40
S15	SnO_2 nanotube	110 nm	electrospinning	13μm	0.99	$TiCl_4$/5.11
S16	SnO_2 nanowires	75±25 nm	electrospinning	19±2 μm	2.53	---
S17	Zn-doped SnO_2 nano-echinus	1 μm	solvothermal	11μm	4.15	---
S18	SnO_2 nanoparticles	100 nm	hydrothermal	---	0.85	4.15
S19	SnO_2 hollow nanospheres	200 nm	hydrothermal	---	0.86	$TiCl_4$/6.02
S20	SnO_2 octahedra	0.5-1.8 μm	sonochemical	13.2 μm	---	$TiCl_4$/6.8
S21	SnO_2 nanosheet	thickness:4-6 nm	hydrothermal	4.1μm	0.23	$TiCl_4$/1.79
S22	mesoporous SnO_2 agglomerates	200-600 nm	molten salt method	8 μm	3.05	$TiCl_4$/6.23
S23	N-SnO_2 mesoporous microspheres	1.2-1.5 μm	one-pot solvothermal	---	2.3	---
S24	Sb-doepd SnO_2 aerogels	---	sol-gel	10μm	0.7	ALD TiO_2/3.5
S25	cauliflower-like SnO_2 hollow microspheres	500 nm-2 μm	hydrothermal	11μm	---	3.6
S26	SnO_2 nanofibers	200 nm	---	8.7 μm	--	$TiCl_4$/4.63
S27	SnO_2 nanoparticles	11.2-26.2 nm	microwave hydrothermal	13-15 μm	1.35	---
S28	SnO_2nanoflower	1μm	hydrothermal	--	1.05	$TiCl_4$/5.6
Our work	**Al-SnO_2 nanocrystals**	**11.6-15.9 nm**	**hydrothermal**	**8 μm**	**3.56**	**$TiCl_4$/6.91**
DSSCs based on SnO_2/TiO_2 and SnO_2/ZnO composites						
S26	SnO_2/TiO_2 composite (1:1)	---	mechanical blend	7.5 μm	---	$TiCl_4$/6.17

S29	SnO_2 nanorod@TiO_2	150 nm×40 nm	flame spray pyrolysis	12 µm	3.95	$TiCl_4$/6.98
S30	SnO_2 nanoparticles/ZnO nanotetrapods	6-10 nm/40×500 nm	hydrothermal/metal vapor transport-oxidation method	6 µm	6.31	---
S31	SnO_2 nanoparticle-ZnO nanorod	---/103-291 nm×7µm	hydrothermal	3 µm +4.4 µm	2.62	---
S32	SnO_2 NRs-TiO_2	50 nm×5 nm	solution method	150nm+10µm	8.61	---
S33	SnO_2 hollow spheres-TiO_2 nanosheets	500 nm	solvothermal reaction	8µm	8.2	---

[a]Surface treatment method and the corresponding photon-to-electron conversion efficiency.

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