Electronic Supplementary Material (ESI) for Journal of Materials Chemistry C.

Supplementary Information

Heterovalent Tin Ion-Regulated Bromobismuth Double Perovskite-Based Fully-Inorganic Solar Cell

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This file includes Figures S1-S5 and Tables S1-S2

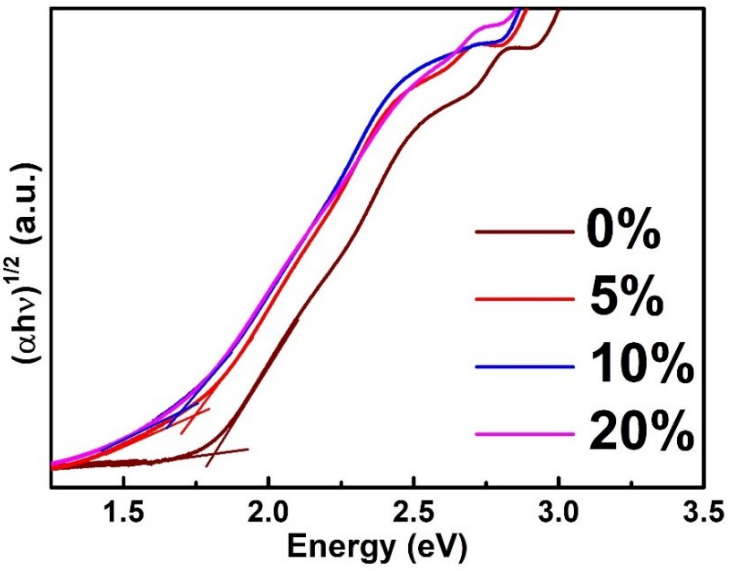

Figure S1. Tauc's plot of the perovskite films.

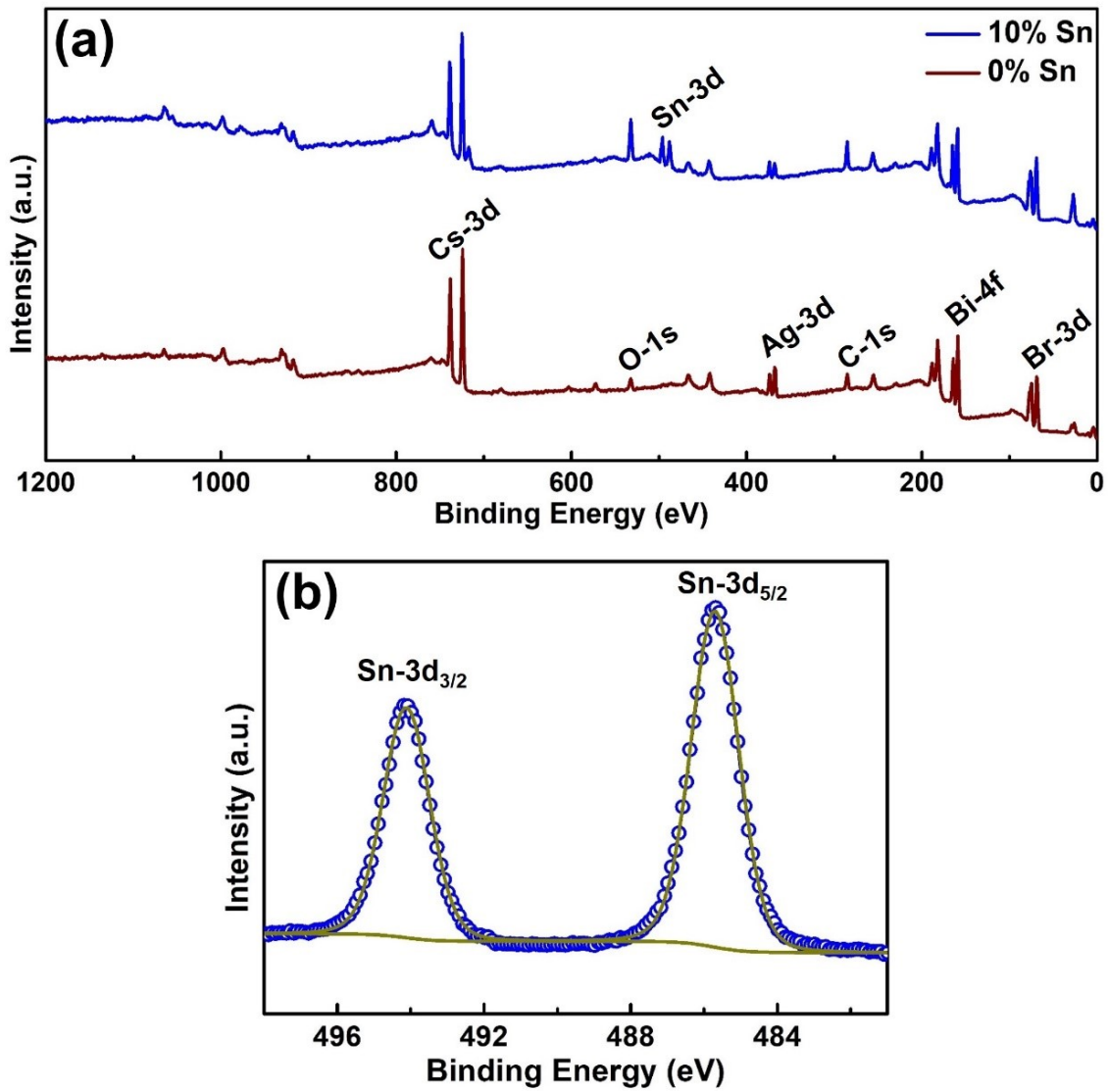

Figure S2. (a) XPS survey spectra of pristine and Sn-doped $Cs_2AgBiBr_6$ films, **(b)** high-resolution Sn-3d peaks.

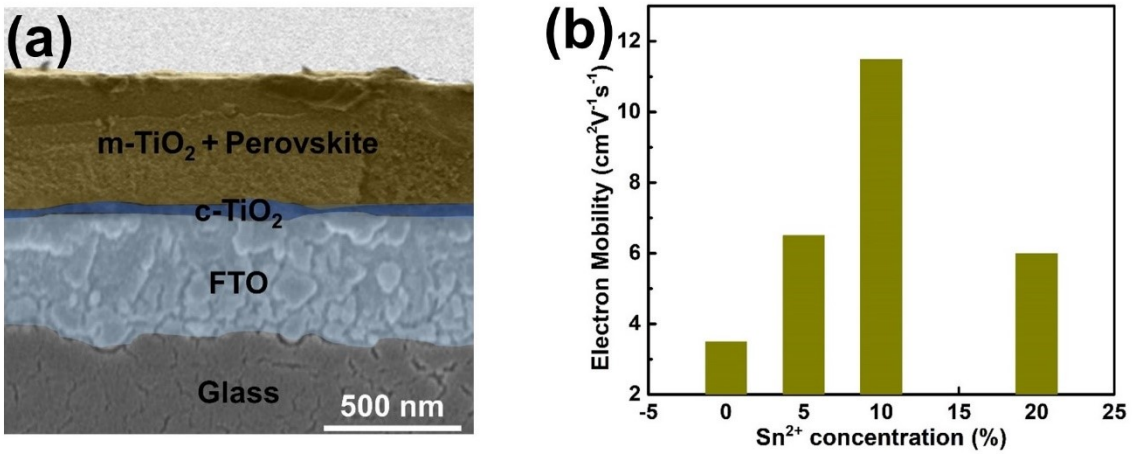

Figure S3. (a) Cross-sectional image of the FTO/c-TiO_2/mTiO_2+perovskite film, **(b)** electron mobility of the perovskite films with different Sn-concentration.

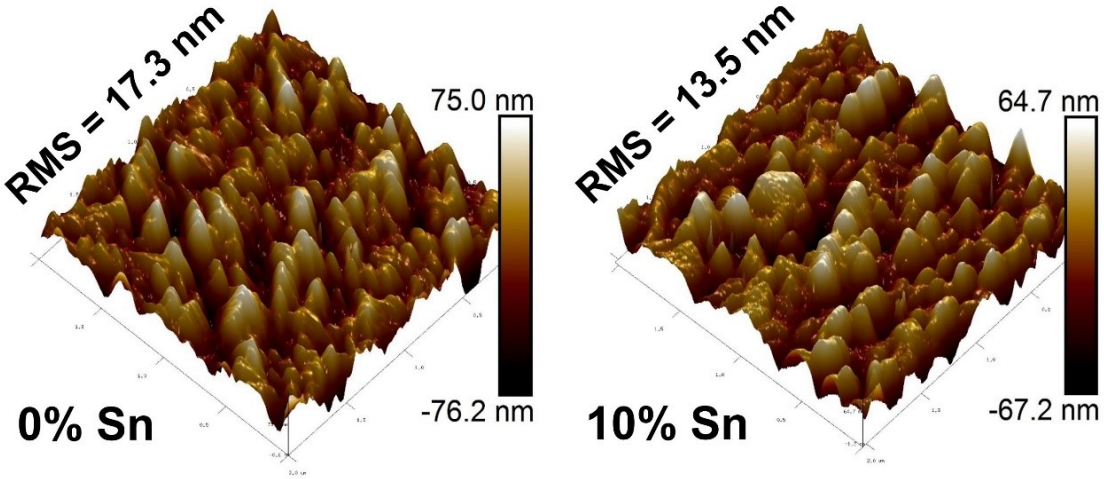

Figure S4. 3-D AFM images of the perovskite films with and without Sn.

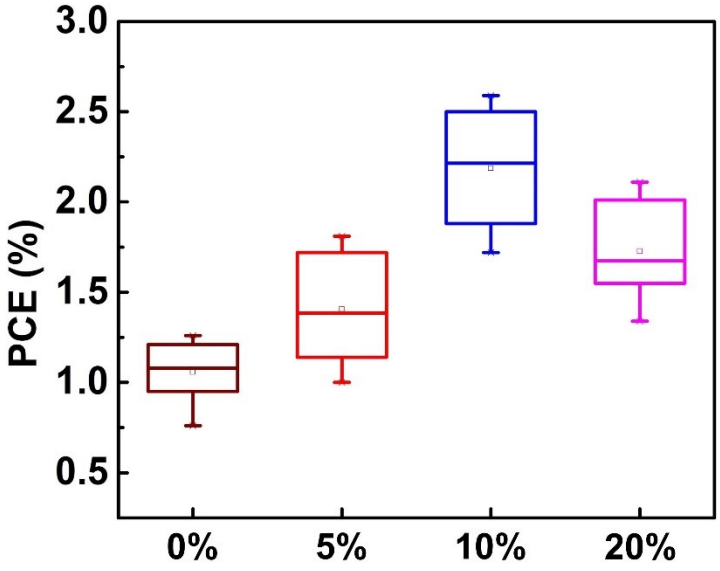

Figure S5. Statistical distribution of PCE.

Table S1. Photovoltaic parameters of the champion cell in different scan directions.

Device	**Scan Direction**	**V_{oc} (volt)**	**J_{sc} (mA/cm^2)**	**FF**	**PCE (%)**
Champion Cell	Forward	1.02	3.42	0.70	2.44
	Reverse	1.02	3.63	0.74	2.74

Table S2. Comparison of photovoltaic performance with reported DP-based solar cells.

Year	**Device**	**V_{oc} (volt)**	**J_{sc} (mA/cm^2)**	**FF**	**PCE (%)**	**Ref**
2017	FTO/c-TiO_2/m-TiO_2/$Cs_2AgBiBr_6$/Spiro/Au	0.98	3.93	0.63	2.43	[1]
2018	ITO/TiO2/$Cs_2AgBiBr_6$/Spiro/Au	1.06	1.55	0.74	1.22	[2]
2018	FTO/TiO_2/$Cs_2AgBiBr_6$/PTAA/Au	1.02	2.84	0.67	1.26	[3]
2018	ITO/Cu-NiO/$Cs_2AgBiBr_6$/C_{60}/BCP/Ag	1.01	3.19	0.69	2.23	[4]

2019	ITO/SnO_2/$Cs_2AgBiBr_6$/Spiro/Au	1.01	1.73	0.69	1.21	[5]
2019	ITO/TiO_2/$Cs_2AgBiBr_6$/Spiro/MoO_3/Ag	1.01	3.82	0.65	2.51	[6]
2020	FTO/TiO_2/$Cs_2AgBiBr_6$/P3HT/Cu	1.07	2.58	0.69	1.91	[7]
2020	ITO/SnO_2/$Cs_2AgBiBr_6$/Zn-Chl/Ag	0.99	3.83	0.73	2.79	[8]
2020	FTO/c-TiO_2/m-TiO_2/$Cs_2AgBiBr_6$/N719/Spiro/Ag	1.06	5.13	0.52	2.84	[9]
2020	FTO/c-TiO_2/m-TiO_2/$(Cs_{1-x}Li_x)_2AgBiBr_6$/Carbon	1.18	3.15	0.69	2.57	[10]
2021	FTO/c-TiO_2/m-TiO_2/$Cs_2AgBiBr_6$/PMMA/Carbon	1.18	2.82	0.67	2.25	[11]
2021	FTO/$Ti_3C_2T_X$-TiO_2/$Cs_2AgBiBr_6$/Spiro/MoO_3/Au	0.96	4.14	0.70	2.81	[12]
2021	ITO/TiO_2-D149/$Cs_2AgBiBr_6$/Spiro/Ag	0.73	8.24	0.70	4.23	[13]
2022	FTO/TiO_2/$Cs_2AgBiBr_6$/SnS/Carbon	1.02	3.74	0.51	1.95	[14]
2022	FTO/TiO_2/BMPyr-$Cs_2AgBiBr_6$/Carbon	1.20	2.61	0.71	2.22	[15]
2022	FTO/TiO_2/$Cs_2AgBiBr_6$/MoS_2/Carbon	1.10	6.12	0.62	4.17	[16]
2022	FTO/SnO_2/Hydrogenated-$Cs_2AgBiBr_6$/Spiro/Au	0.92	11.40	0.61	6.37	[17]
2023	**FTO/c-TiO_2/m-TiO_2/$Cs_2Ag_{1-x}Sn_xBiBr_6$/CuSCN/Au**	**1.02**	**3.63**	**0.74**	**2.74**	**This work**

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