

Supporting Information

Numerical Investigation of High-Performance Bilayer Tin-Based Perovskite Solar Cells with SCAPS-1D

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Thickness (μm)	Voc (V)	Jsc (mA/cm ²)	FF (%)	PCE (%)
0.1	0.97	11.95	87.01	10.16
0.2	0.99	16.97	87.4	14.73
0.3	1	20.19	87.6	17.75
0.4	1.01	22.47	87.78	19.93
0.5	1.01	24.17	87.87	21.57
0.6	1.01	25.49	87.91	22.86
0.7	1.02	26.55	88.0	23.9
0.8	1.02	27.41	88.06	24.76
0.9	1.02	28.13	88.11	25.47
1.0	1.02	28.73	88.14	26.08
1.1	1.03	29.25	88.17	26.6
1.2	1.03	29.69	88.19	27.06
1.3	1.03	30.08	88.2	27.45
1.4	1.03	30.43	88.21	27.8
1.5	1.03	30.73	88.22	28.12

Table S1. Thickness analysis of single-layer CsSnI₃.

Thickness (μm)	Voc (V)	Jsc (mA/cm^2)	FF (%)	PCE (%)
0.1	0.73	19.43	75	10.71
0.2	0.74	22.87	75.65	12.89
0.3	0.74	24.89	75.56	14.12
0.4	0.75	26.12	75.45	14.83
0.5	0.75	26.91	75.16	15.25
0.6	0.75	27.43	74.84	15.5
0.7	0.75	27.93	74.51	15.64
0.8	0.75	28.06	74.17	15.71
0.9	0.75	28.22	73.83	15.75
1.0	0.75	28.36	73.48	15.75
1.1	0.75	28.46	73.14	15.73
1.2	0.75	28.54	72.79	15.69
1.3	0.75	28.6	72.45	15.65
1.4	0.75	28.65	72.11	15.6
1.5	0.75	28.69	71.77	15.54

Table S2. Thickness analysis of single-layer CsSnCl_3 .

Table S3. Thickness analysis of Bilayer ($\text{CsSnCl}_3/\text{CsSnI}_3$).

Thickness (μm)	Voc (V)	Jsc (mA/cm^2)	FF (%)	PCE (%)
0.1	0.99	20.81	87.85	18.19
0.2	1	23.52	87.98	20.85
0.3	1.01	25.37	88.07	22.71
0.4	1.02	26.73	88.15	24.1
0.5	1.02	27.78	88.24	25.2
0.6	1.03	28.61	88.29	26.09
0.7	1.03	29.29	88.32	26.83
0.8	1.04	29.85	88.34	27.44
0.9	1.04	30.33	88.39	27.97
1.0	1.04	30.73	88.44	28.43
1.1	1.04	31.08	88.47	28.82
1.2	1.05	31.38	88.5	29.18
1.3	1.05	31.64	88.52	29.49
1.4	1.05	31.88	88.53	29.77
1.5	1.05	32.09	88.54	30.02