MATERIALS ADVANCES 2023

Supplementary Information

Fabrication of low-cost and flexible Perovskite Solar Cells by slot-die coating for indoor applications

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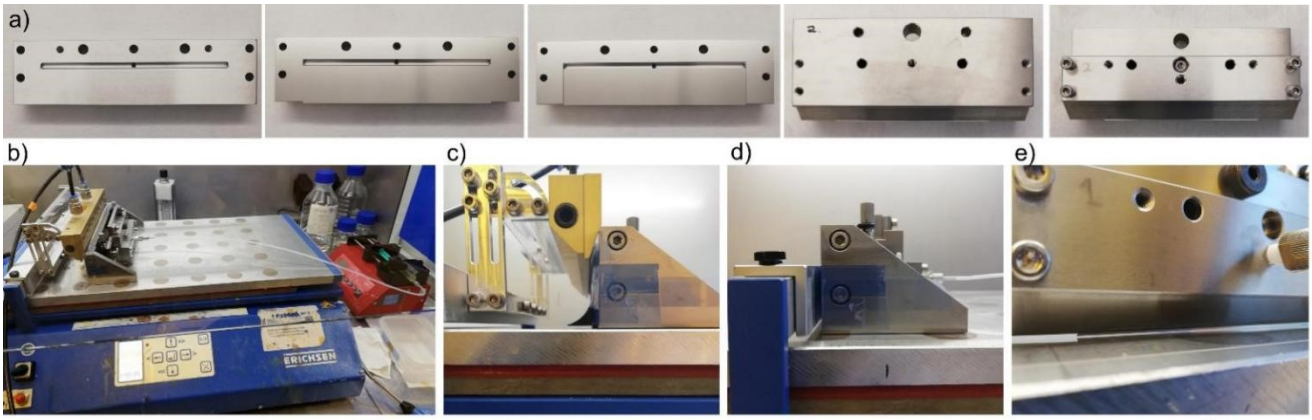

Figure S1. a,e) Shims assembly for the 3D perovskite layer; b) film applicator with air-knife and slot-die coater assembled; slot-die head and attachment part c) for the 3D perovskite and d) for the SnO_2 deposition.

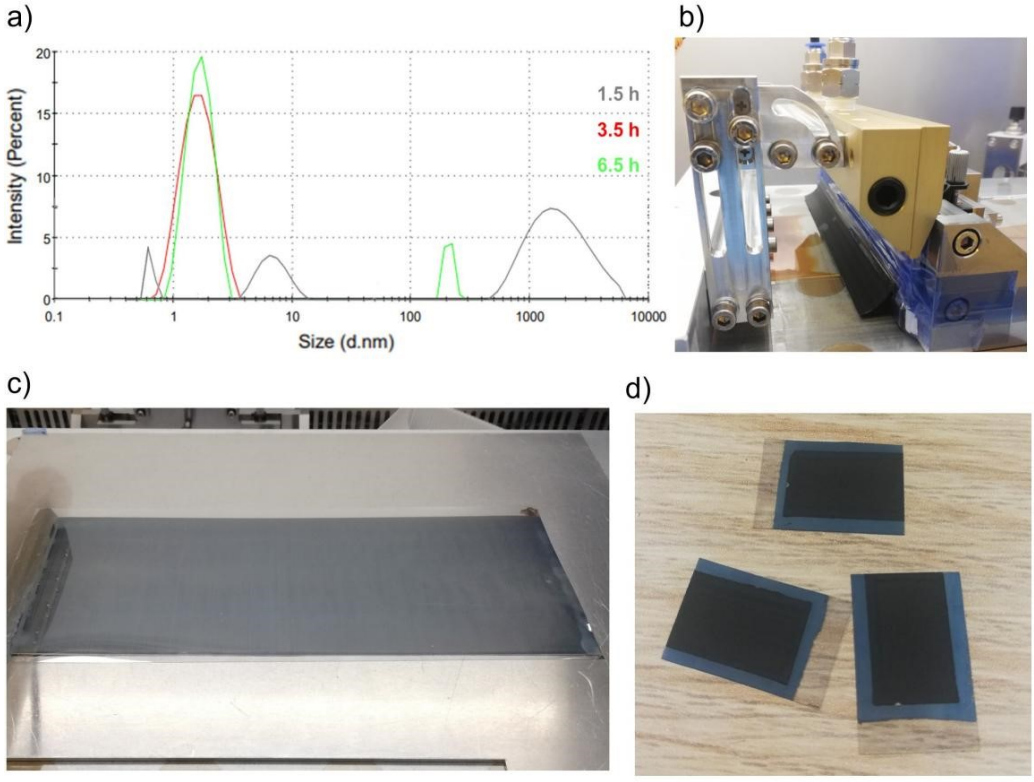

Figure S2. a) Particle size distribution of 3D perovskite solution for different stirring times; b) perovskite's intermediate phase after parallel N_2 flow exposure during slot-die coating; c) slot-die coated 3D perovskite film after annealing: 10 cm x 20 cm; d) complete perovskite solar cells of 1.8 cm x 1.2 cm.

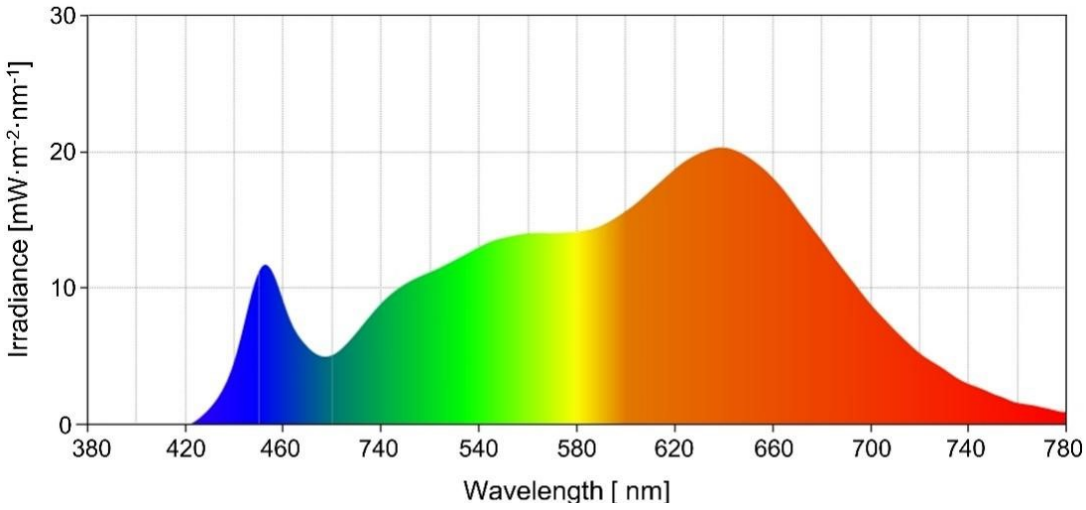

Figure S3. Spectrum of the warm white ~3270 K LED used at 1000 lux (372 μW·cm^{-2}).

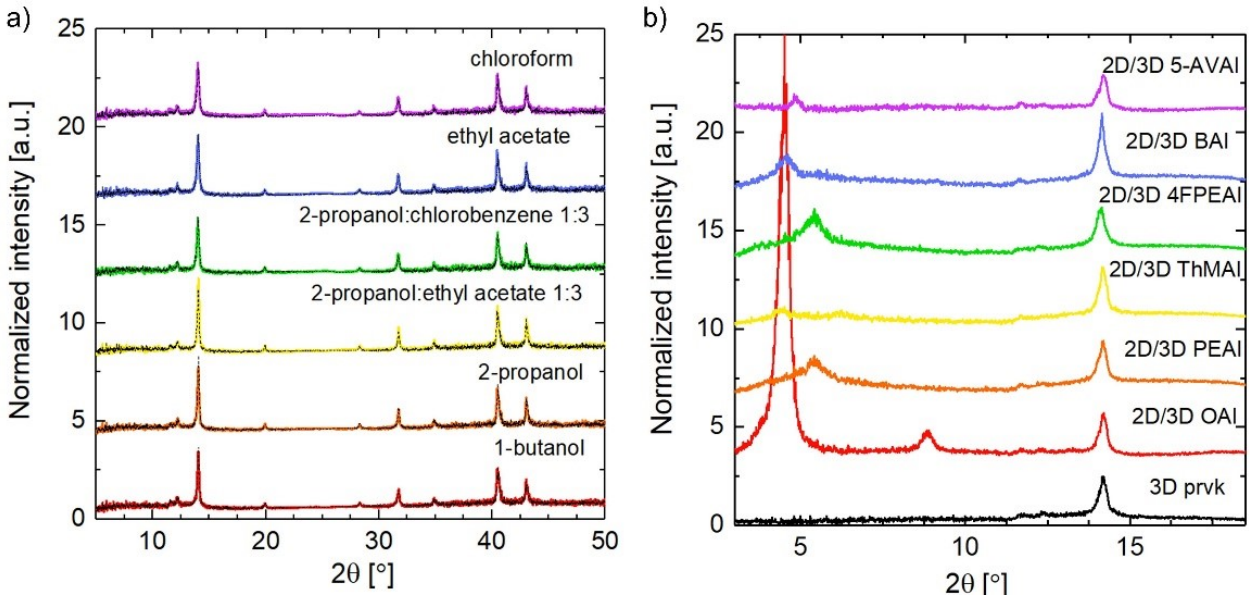

Figure S4. XRD data of a) 3D perovskite before and after blade coating different solvents, and b) after blade coating 10 mM of 6 different spacer cations on 3D perovskite, followed by annealing at 85 °C for 5 min.

Table S1. Most relevant properties of the solvents used in the slot-die coating depositions.[1]

Solvents	Abr.	Boiling point at 1 atm [°C]	Viscosity at 20-25°C [cP]	Dielectric Constant	Toxicity
acetonitrile	ACN	81	0.38	38.8	Problematic
2-methoxyethanol	2-ME	124	1.72	16.9	Hazardous
dimethyl sulfoxide	DMSO	189	1.99	47.2	Problematic
water	H_2O	100	1.00	80.1	Recommended
chloroform	CF	61	0.57	4.81	Highly hazardous
ethyl Acetate	EA	77	0.43	6.4	Recommended
chlorobenzene	CBZ	132	0.80	5.6	Hazardous
1-butanol	BuOH	118	2.98	7.8	Recommended
2-propanol	IPA	83	2.40	19.9	Recommended

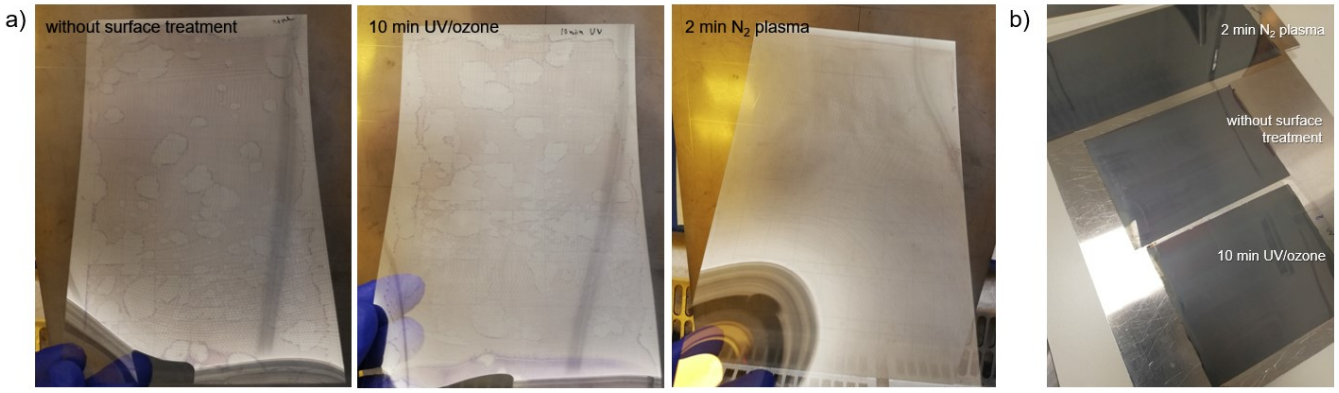

Figure S5. Pictures of the a) SnO_2 and b) perovskite films coated on PET/ ITO and SnO_2 (respectively), after different surface treatments.

Table S2. Contact angle at different times of water, diiodomethane, SnO_2 solvents and perovskite solvents on PET/ITO and SnO_2 films with different surface treatments.

Contact angle [°]					
solvent	surface	pre-treatment	after 0.5s	after 2s	after 4s
water	PET	none	**62**	missing data	
		UV/ozone	**50.9**	50.6	49.8
		plasma	**31.1**	29.8	28.7
diiodomethane	PET	none	**51.4**	50.9	50.1
		UV/ozone	**50.6**	50.3	50.1
		plasma	**32.2**	31.7	31.2
SnO_2 solvents	PET	none	33.7	32.9	**32.5**
		UV/ozone	30.8	29.6	**28.4**
		plasma	17.4	15.1	**14**
water	SnO_2	none	**37.3**	36.7	36.1
		UV/ozone	**15.5**	13	10
		plasma	**7.8**	3.7	-
diiodomethane	SnO_2	none	**37.4**	36.7	36.5
		UV/ozone	**38.1**	37.6	37.7
		plasma	**31.5**	31.2	31.4
perovskite solvents	SnO_2	none	**10.8**	5	-
		UV/ozone	**12.9**	11.0	10.3
		plasma	**6.7**	3.7	-
OAI solution	3D prvk	none	6.9	<3	-

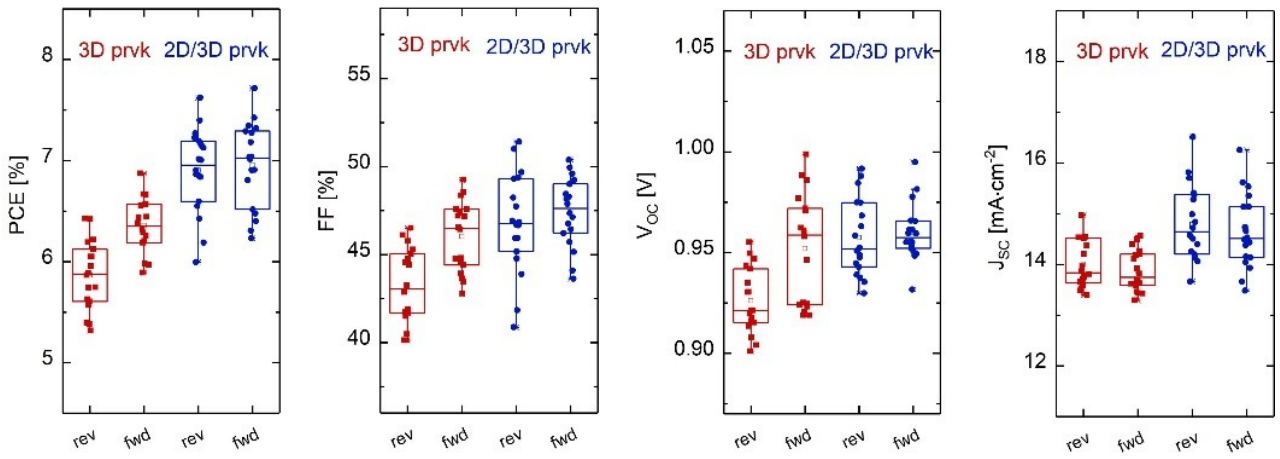

Figure S6. Box charts of the photovoltaic parameters of samples with and without 2D perovskite layer (18 samples each) under 1 sun.

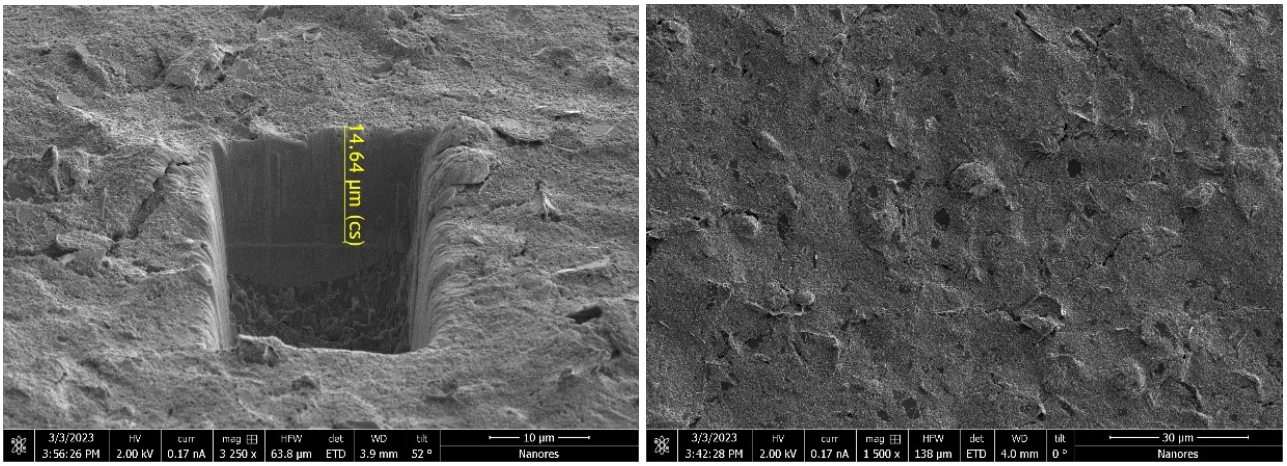

Figure S7. SEM cross section and top view images of a PSC with carbon electrode.

References

[1] D. Di Girolamo, J. Pascual, M. H. Aldamasy, Z. Iqbal, G. Li, E. Radicchi, M. Li, S.-H. Turren-Cruz, G. Nasti, A. Dallmann, F. De Angelis, A. Abate, ACS Energy Letters 2021, 6, 959.