Supporting Information

Optimized NiOx deposition for Industrial Compatible Perovskite Solar Modules on 15 × 15 cm^2: a Green Route Towards Stable Methylammonium-free Devices

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Table S1. The comparison of Perovskite Solar Cell and Modules Fabricated using NiOx as HTL in terms of active-area and PV characteristics.

Device Architecture	NiOx Deposition	Deposition Environment	Active Area (cm^2)	PCE (%)	Ref.
FTO/NiO_x/CsFAMA Perovskite/C_{60}/BCP/Cu	Spray coating	N_2	0.09	23.61	1
FTO/NiO_x/$FAPbI_3$/PCBM/PCB/Ag	Evaporation	N_2	0.09	23.4	2
ITO/NiO_x/CsMAFAPb$(IBr)_3$/C_{60}/BCP/Au	Evaporation	N_2	0.1	21.6	3
FTO/NiO_x/perovskite/C_{60}/ BCP/Cu	Spray Coating	Air	0.1	20.7	4
FTO/NiO_x/$CsFAPbI_3$/C_{60}/BCP/Cu	Spray Coating	Air	0.1	19.5	5
FTO/NiO_x/MAPI/C_{60}/BCP/Ag	Blade coating	Air	0.12	19.01	6
FTO/NiO_x/$CsFAPbI_3$/PCBM/BCP/Ag	Spin Coating	N_2	0.1	18.9	7
ITO/NiO/$CsFAPbBrI_3$/C60/BCP/Ag	Spray Coating	N_2	0.2	17.7	8
FTO/NiO_x/$CsFAPbI_3$/PCBM/BCP/Cu	Slot-die	Air	0.14	17.33	9
FTO/NiOx/$CsFAPbI_3$/PCBM/BCP/Ag	Spin Coating	N_2	1	16.2	7
ITO/NiOx/CsMAFAPb$(IBr)_3$/C_{60}/BCP/Au	Evaporation	N_2	0.1	15.6	10
ITO/NiO/$CsFAPbI_3$/C_{60}/BCP/Ag	Flexography	N_2	0.134	15.3	11
FTO/NiO_x/$CsFAPbI_3$/PCBM/BCP/Cu	Slot-die	Air	2.1	14.9	9
FTO/NiO_x/$MAPbI_3$/$PC_{61}BM$/TBAOH/Ag	Slot-die	Air	0.09	13.86	12
FTO/NiO_x/$MAPbI_3$/$PC_{61}BM$/TBAOH/Ag	Slot-die	Air	0.75	13.54	12
ITO/NiO_x/CsMAFAPb$(IBr)_3$/C_{60}/BCP/Au	Evaporation	N_2	2.3	12.4	10
FTO/NiO_x/MAPI/C_{60}/BCP/Ag	Blade coating	Air	25	11.07	6
FTO/NiO_x/MAPI/PCBM/PEI/Ag	Slot-die	Air	0.09	10.96	13
FTO/NiO_x/MAPI/PCBM/PEI/Ag	Slot-die	Air	3.78	10.34	13
FTO/NiO_x/CsFAMA Perovskite/C_{60}/BCP/Au	Chemical Bath Deposition	N_2	28.0	19.29	14
FTO/NiO_x/SAM/Perovskite/PTAA/Ag	Spin coating	N_2	60.84	17.04	15
ITO/NiO_x/CsFA Perovskite/LiF/C_{60}/BCP/Cu	Evaporation	N_2	100	15.5	16
FTO/NiO_x/$FAPbI_3$/PCBM/PCB/Ag	Evaporation	N_2	156	18.6	2
FTO/NiO_x/CSFAMA Perovskite/C_{60}/BCP/Cu	Spray Coating	N_2	178.4	17.18	1
FTO/NiO_x/SAM/$CsFAPbBrI_3$/C_{60}/BCP/Cu	**Blade coating**	**Air**	**110**	**12.6**	**This Work**

Table S2. The average thickness of doctor bladed NiOx based on the concentration of precursor ink based on the ellipsometry data.

Concentration	Avg. Thickness ± Std.
0.15 M (Ref)	39.40 ± 2.42
0.075 M (1:1)	42.18 ± 1.32
0.050 M (1:2)	40.05 ± 2.37
0.037 M (1:3)	36.20 ± 1.11

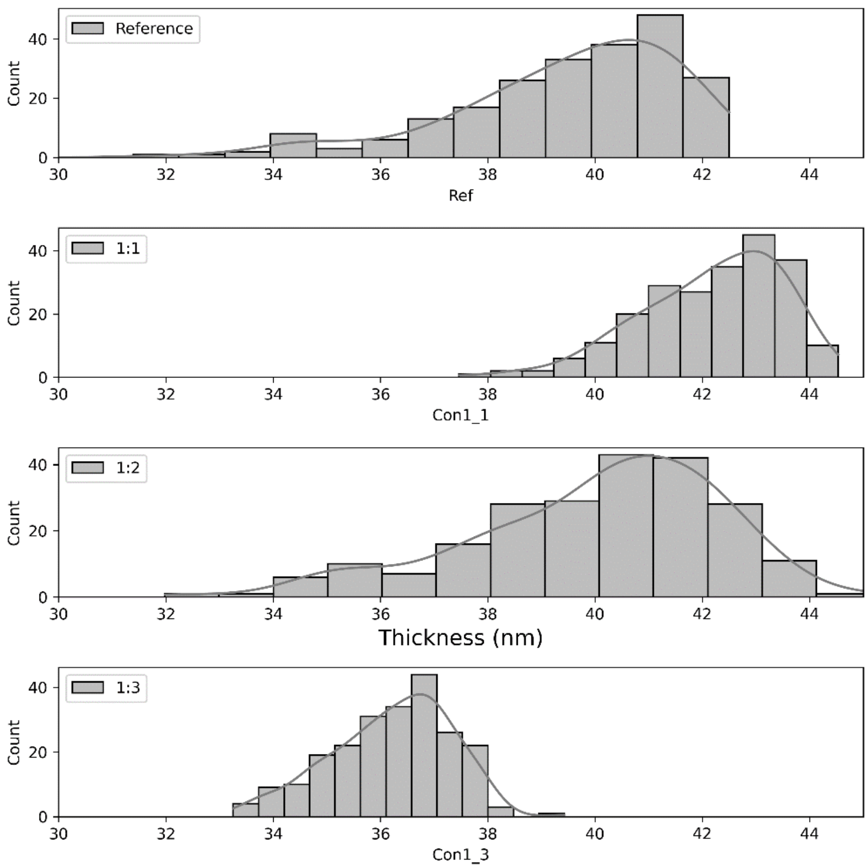

Figure S1. The thickness distribution of doctor bladed NiOx films by variation of precursor ink based on the ellipsometry data.

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