Effects of iodine doping on carrier behavior at the interface of perovskite crystals: efficiency and stability

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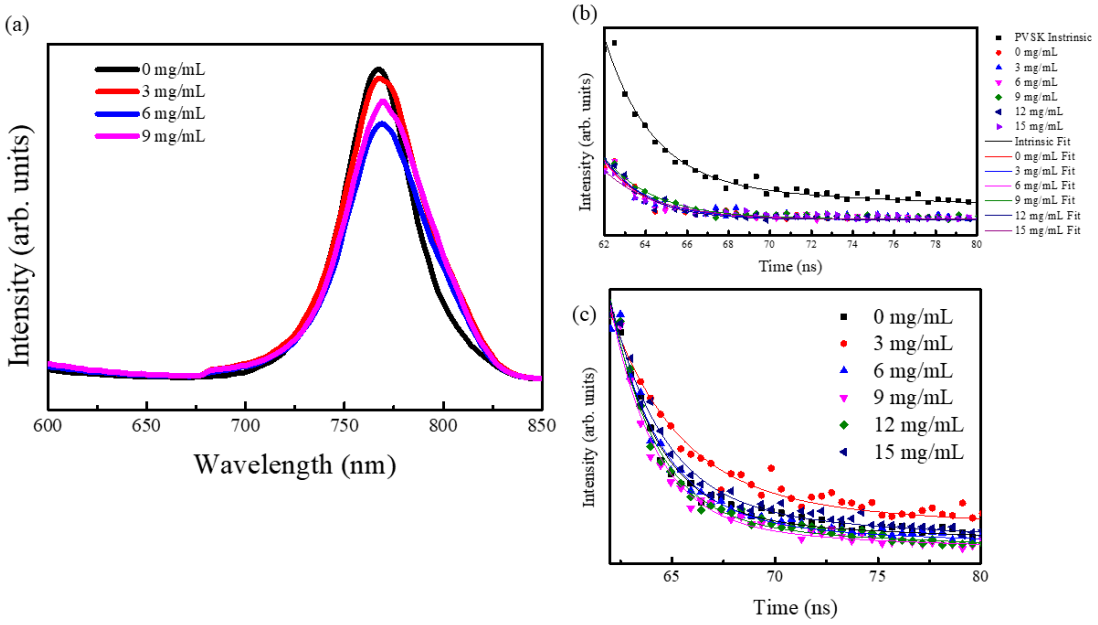

Figure S1. The fluorescence spectrum (a) and time-resolve photoluminescence spectra (b)

Table S1. Lifetime extracted from Figure S1, where the t_1 was the lifetime of radiative de-excitation and t_2 was the time of delayed fluorescence

Films	Lifetime t_1 (ns)	Lifetime t_2 (ns)	Diffusion Length L_D (nm)
PVSK	2.30	27.22	50.3
PVSK + HTL 0 mg/mL	2.04	2.04	47.4
PVSK + HTL 3 mg/mL	2.01	2.26	47.0
PVSK + HTL 6 mg/mL	2.05	2.05	47.5
PVSK + HTL 9 mg/mL	2.52	2.52	52.6
PVSK + HTL 12 mg/mL	2.02	2.02	47.1
PVSK + HTL 15 mg/mL	2.82	2.09	55.7

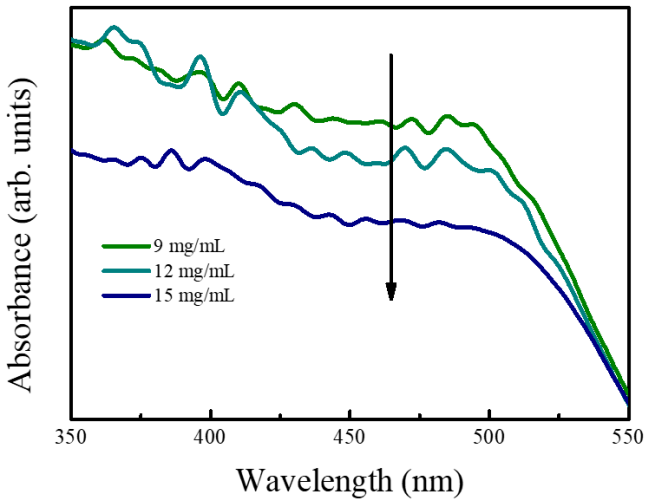

Figure S2 absorption spectra of perovskite films with oxidized spiro-OMeTAD layers when the dopant was over 9 mg/mL.

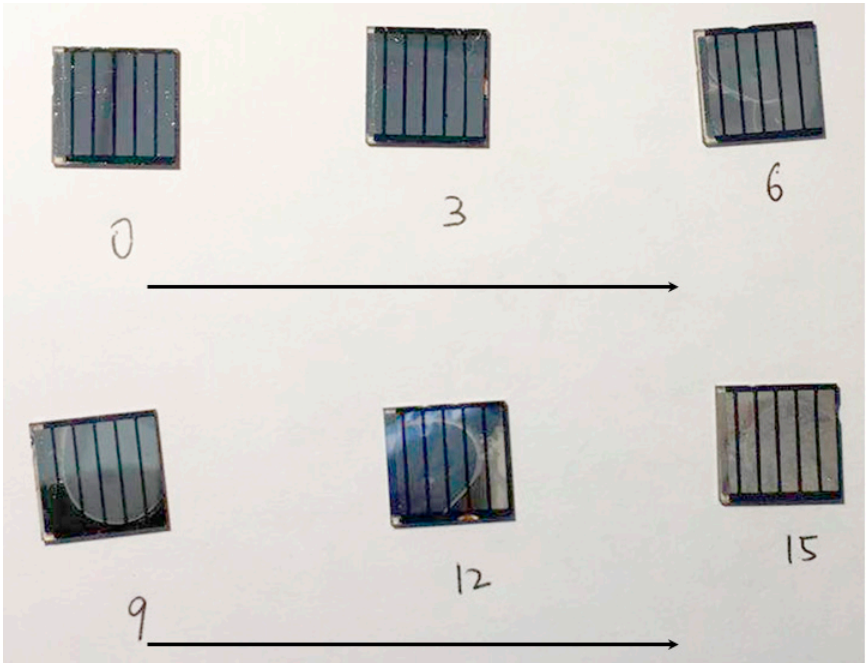

Figure S3. Rough morphology of sliver electrode with increasing iodine doping

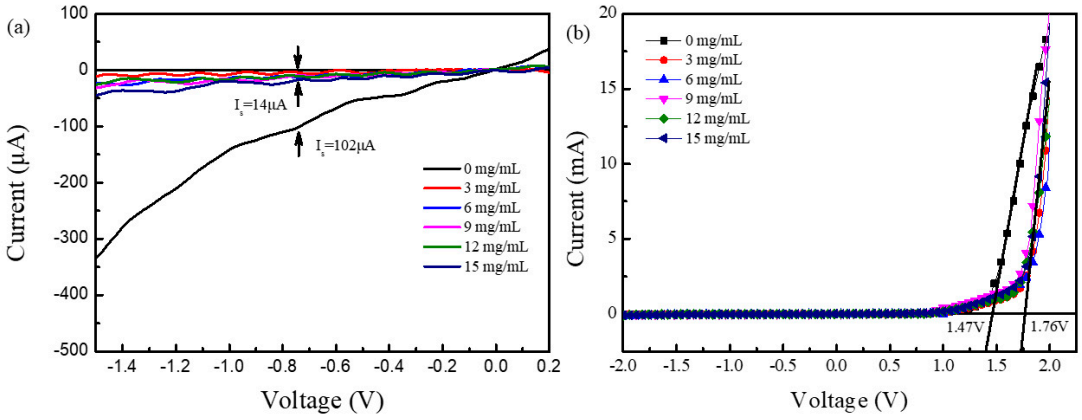

Figure S4. Dark current of perovskite solar cells after the electrode evaporation

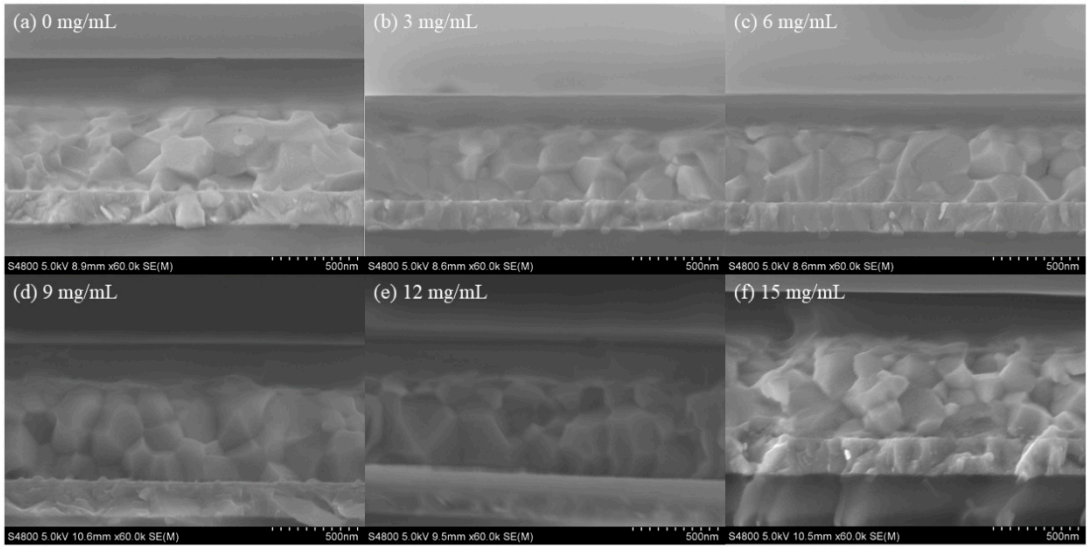

Figure S5. cross-section images of perovskite samples with doped HTL, the HTLs were doped with various concentration of iodine.

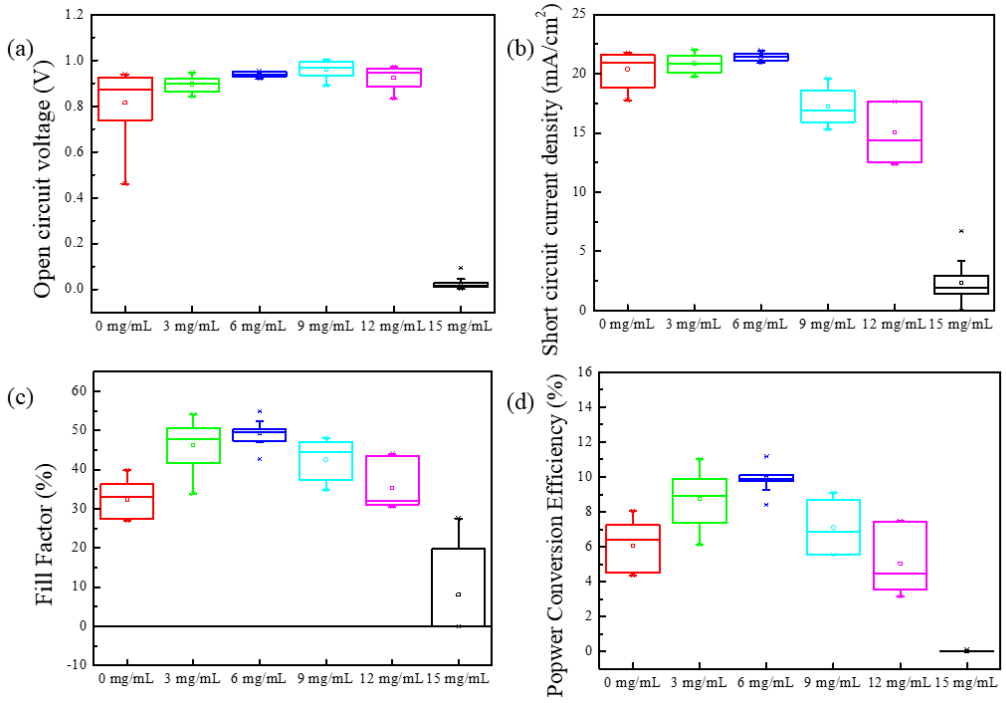

Figure S6. photovoltaic parameters of PSCs evaporated with sliver electrode

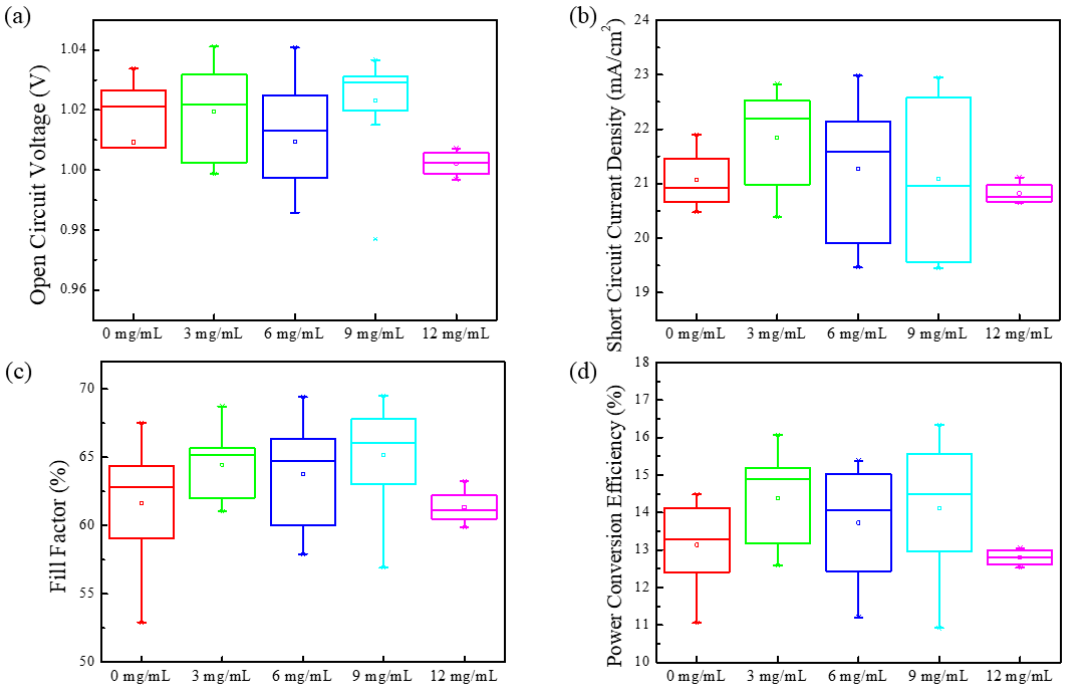

Figure S7. Photovoltaic parameters of PSCs evaporated with gold electrodes. All samples were characterized after 48-hour oxygen aging in sealed cabin.

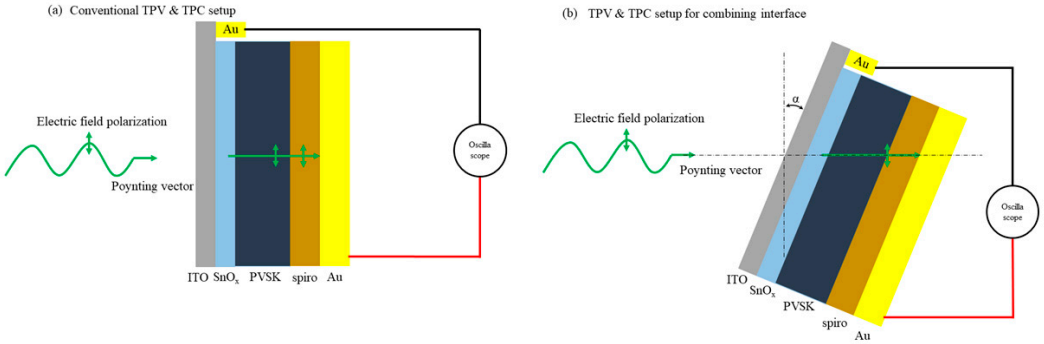

Figure S8. Schematic figure of TPV/TPC setups