SUPPORTING INFORMATION

A simple way to engineer metal-semiconductor interface for enhanced performance of perovskite organic lead iodide solar cells

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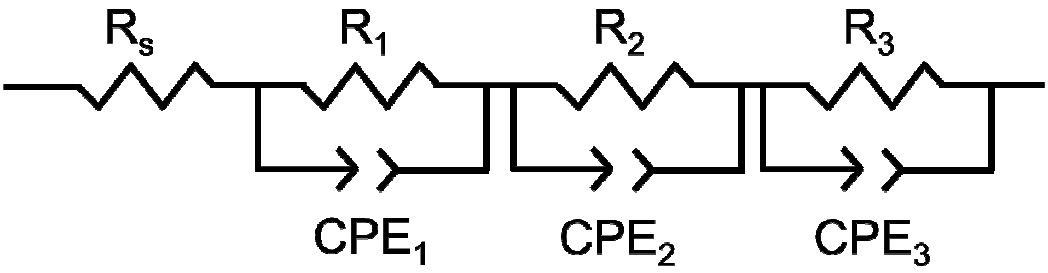

Figure S1. Equivalent circuit employed to fit the Nyquist plots of the device with thick TPB layer at the bias voltages from 500 mV to 800 mV. R_S is the series resistance of the device. R_1 and C_1 of CPE_1 are the interface resistance and capacitance of the $TiO_2/CH_3NH_3PbI_3$ interface which cause the low frequency feature.R_2 and C_2 of CPE_2 are the interface

resistance and capacitance of one of the two back contact interfaces, the $CH_3NH_3PbI_3$/TPB interface or the TPB/Au interfaces, while R_3 and C_3 of CPE_3 are the interface resistance and capacitance of the other interface.

Table S1. The fitted charge transport resistance in the back contact of the device with thick TPB layer.

	500mV	600mV	*700mV*	800mV	900mV
R_2/Ω	31775	6021	3289	1188	1130
R_3/Ω	5676	4083	1317	968.7	-

The R_2 at the bias voltage of 900 mV was fitted without R_3-CPE_3 unit since the oblate arc reverts to one arc.

Note 1. Impedance Spectroscopy Model.

With a thick TPB layer added, the spectra pattern in Figure 4cis composed by one oblate arc and a low frequency feature in the whole measured frequency range. This oblate arc can be subdivided into two arcs with different eccentricities at the bias voltages from 500 to 800mV. Therefore, we think it can be due to two new interfaces derived from the introduction of the thick TPB layer, which are the $CH_3NH_3PbI_3$/TPB and the TPB/Au interfaces, respectively.

Therefore, a new equivalent circuit in Figure S1 will be applied to fit the EIS spectra of the device with thick TPB. The fitting results are shown in Table S1. However, more work need to be done to figure out the one-to-one correspondence between the two interface resistances and the two interfaces. It is worth noting that when the bias voltage is 900 mV, the oblate arc reverts to one arc, which means that the two interfaces were coupled into inseparable one in high bias voltage. This phenomenonis difficult to interpret at the present stage and further investigation is in need.