Supporting Information

Polyaspartic Acid Sodium Interfacial Layer Enhances Surface Trap Passivation in Perovskite Solar Cells

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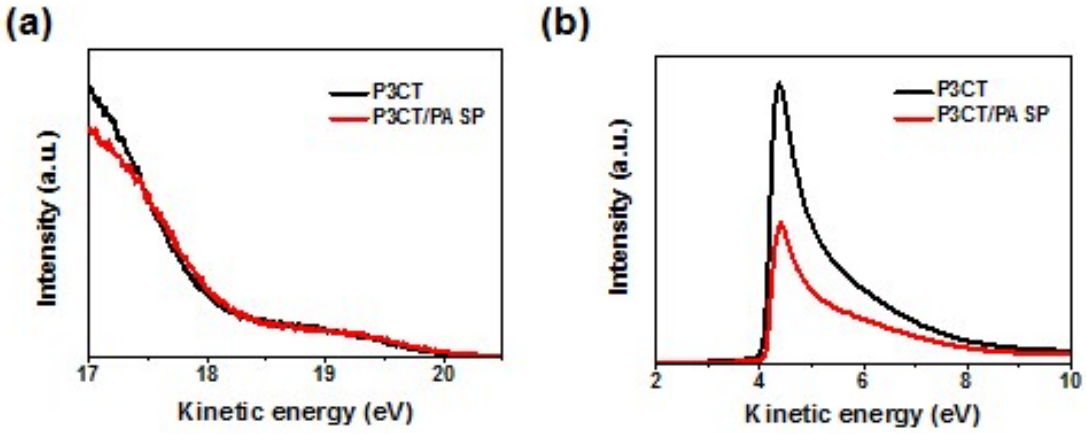

Fig. S1 UPS of P3CT and P3CT/PASP.

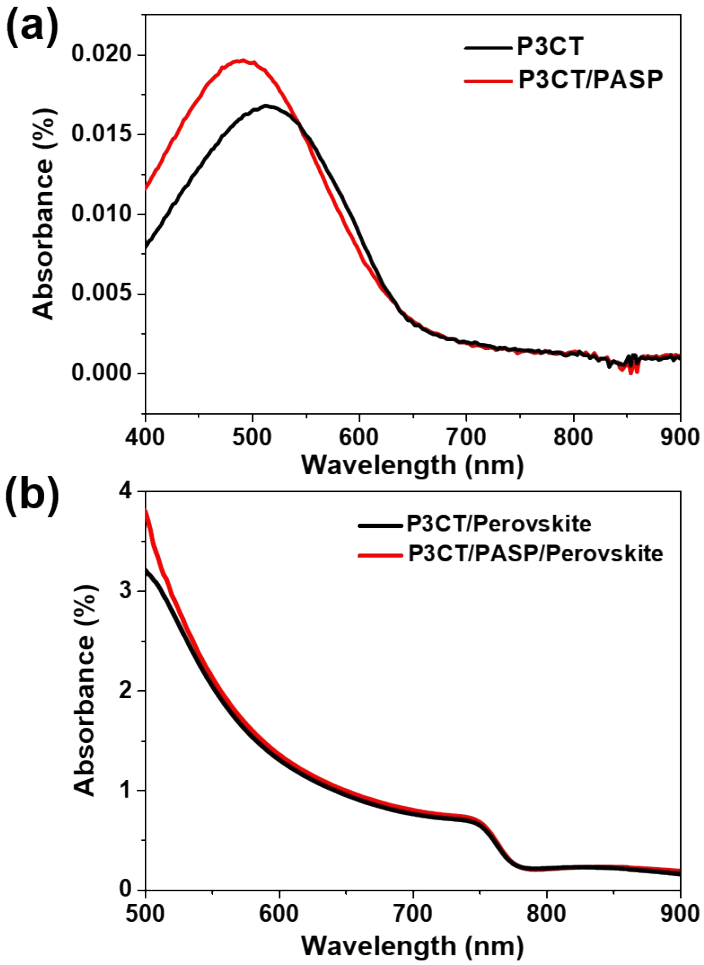

Fig. S2 UV-vis absorption spectra of (a) P3CT and P3CT/PASP

(b) perovskite films on P3CT and P3CT/PASP .

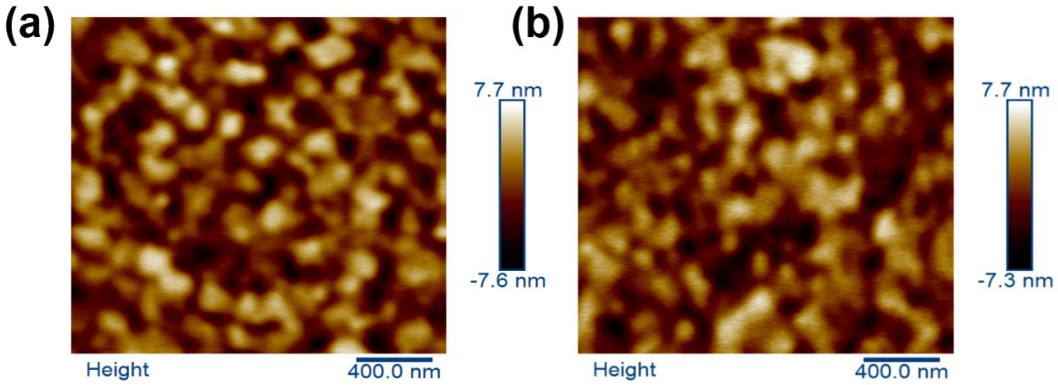

Fig. S3 Surface topographic AFM images (a) P3CT and (b) P3CT/PASP.

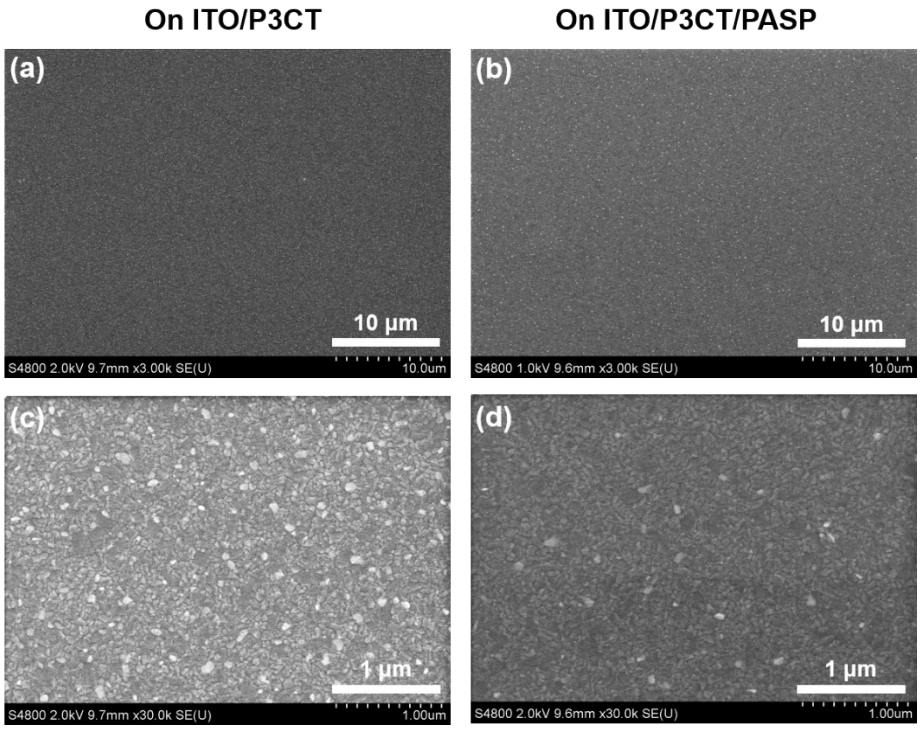

Fig. S4 SEM images of 50 nm perovskite coated on (a) (c) ITO/P3CT and (b) (d) ITO/P3CT/PASP.

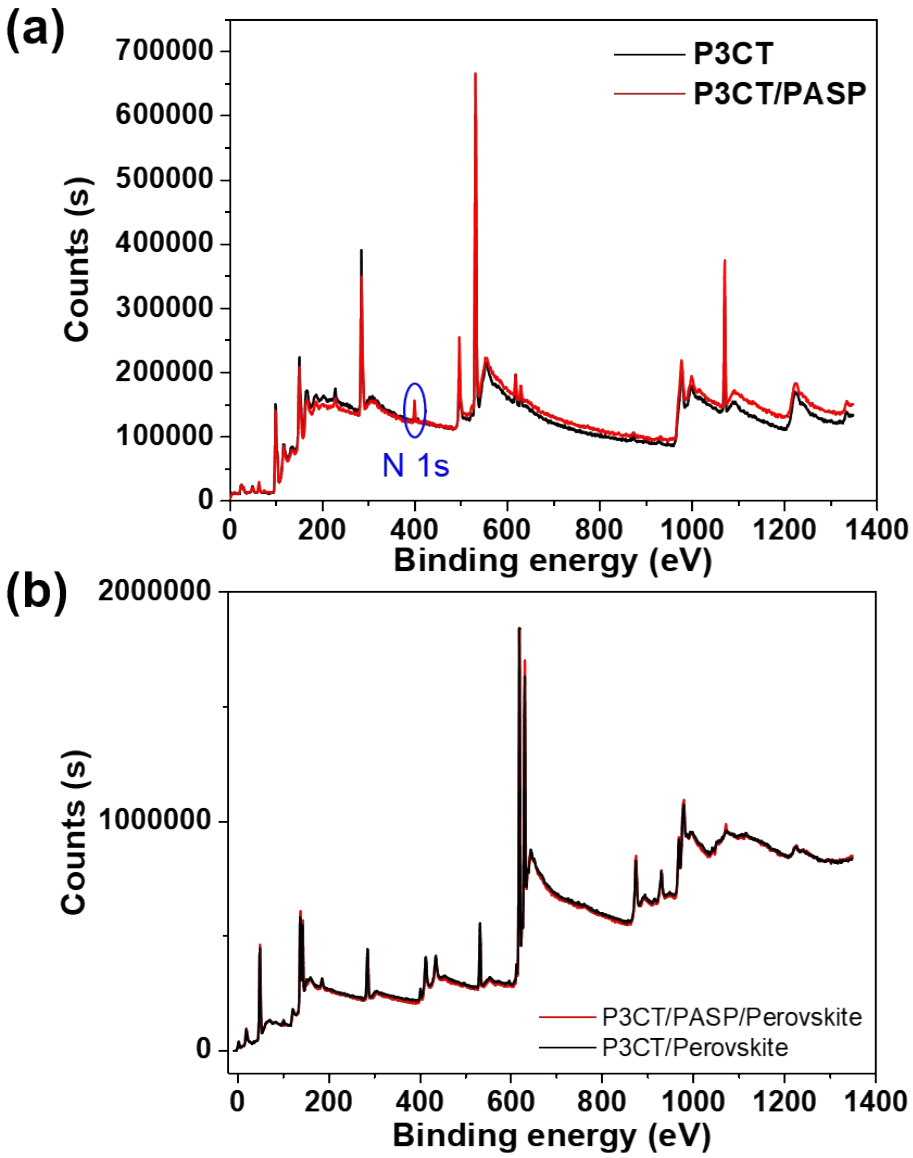

Fig. S5 Survey X-ray photoelectron spectroscopy (XPS) of (a) P3CT and P3CT/PASP films and (b) perovskite on the P3CT and P3CT/PASP films.

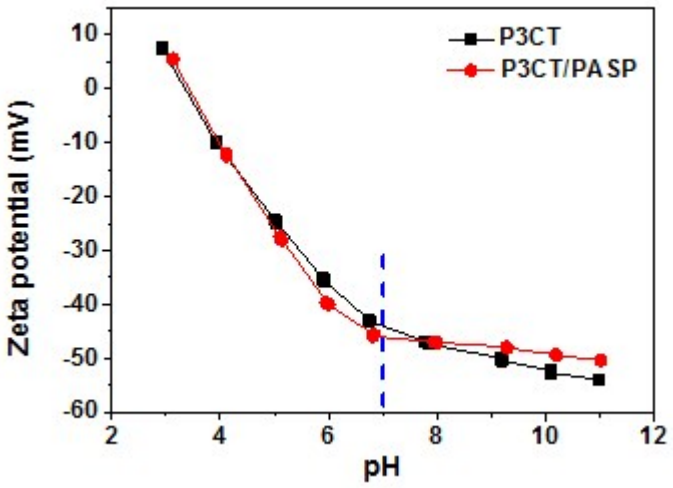

Fig. S6 The comparison of zeta potential of P3CT/PASP and P3CT thin films at different pH values.

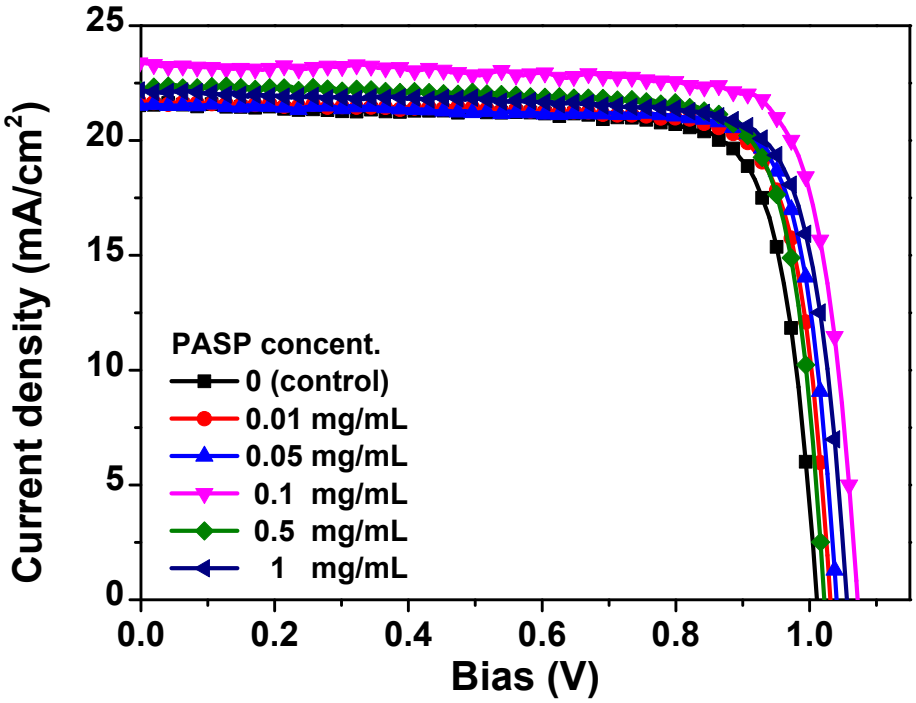

Fig. S7 J-V curve of $MAPbI_3$ solar cells with PASP interlayers deposited from various solution concentrations (in H_2O) measured under standard 1 sun irradiation (reverse scan).

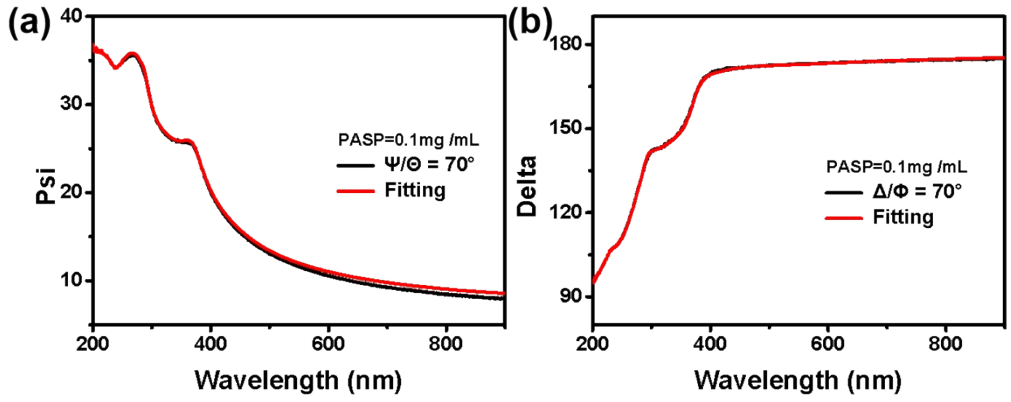

Fig. S8 Parameters of (a) Psi and (b) delta for the ellipsometry used to determine

the thickness of PASP layer. The PASP film was prepared identically to that in solar cells. Also shown by red lines are the fittings to the measured parameters, leading to determinations on the PASP film thickness (~0.51 nm).

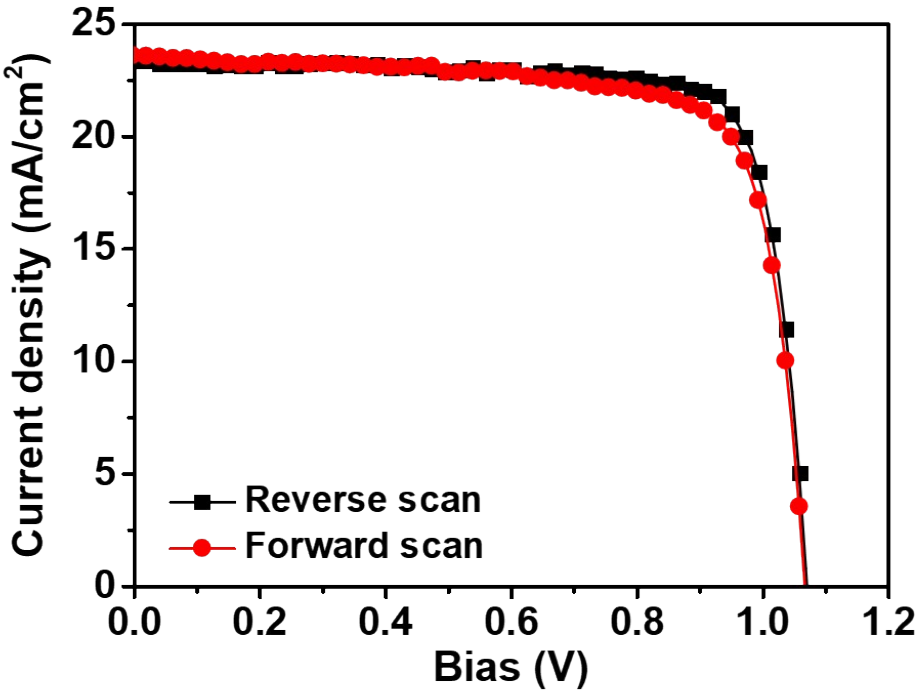

Fig. S9 J-V curve of $MAPbI_3$ solar cells with PASP interlayer in the optimal condition (0.1 mg/mL) scanned in reverse and forward directions under 1 sun irradiation.

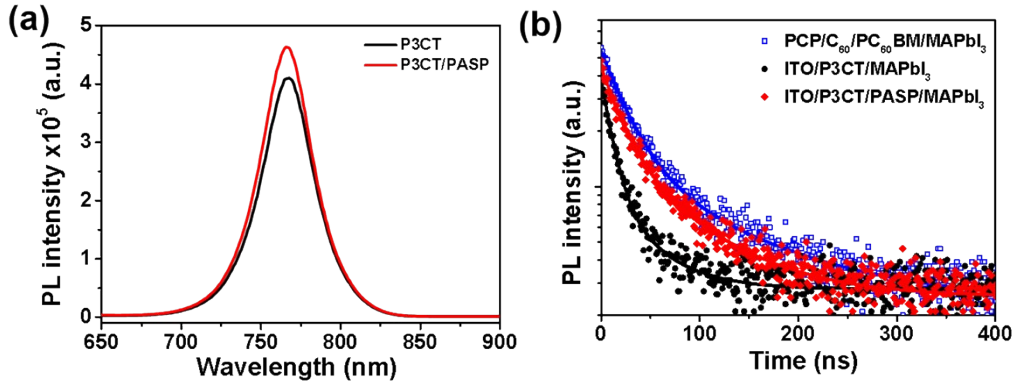

Fig. S10 (a) Photoluminescence (PL) spectroscopy of $MAPbI_3$ films prepared on P3CT-Na and P3CT-Na/PASP. (b) Time-resolved PL decay measurements on $MAPbI_3$ samples deposited with different charge transporting layers.

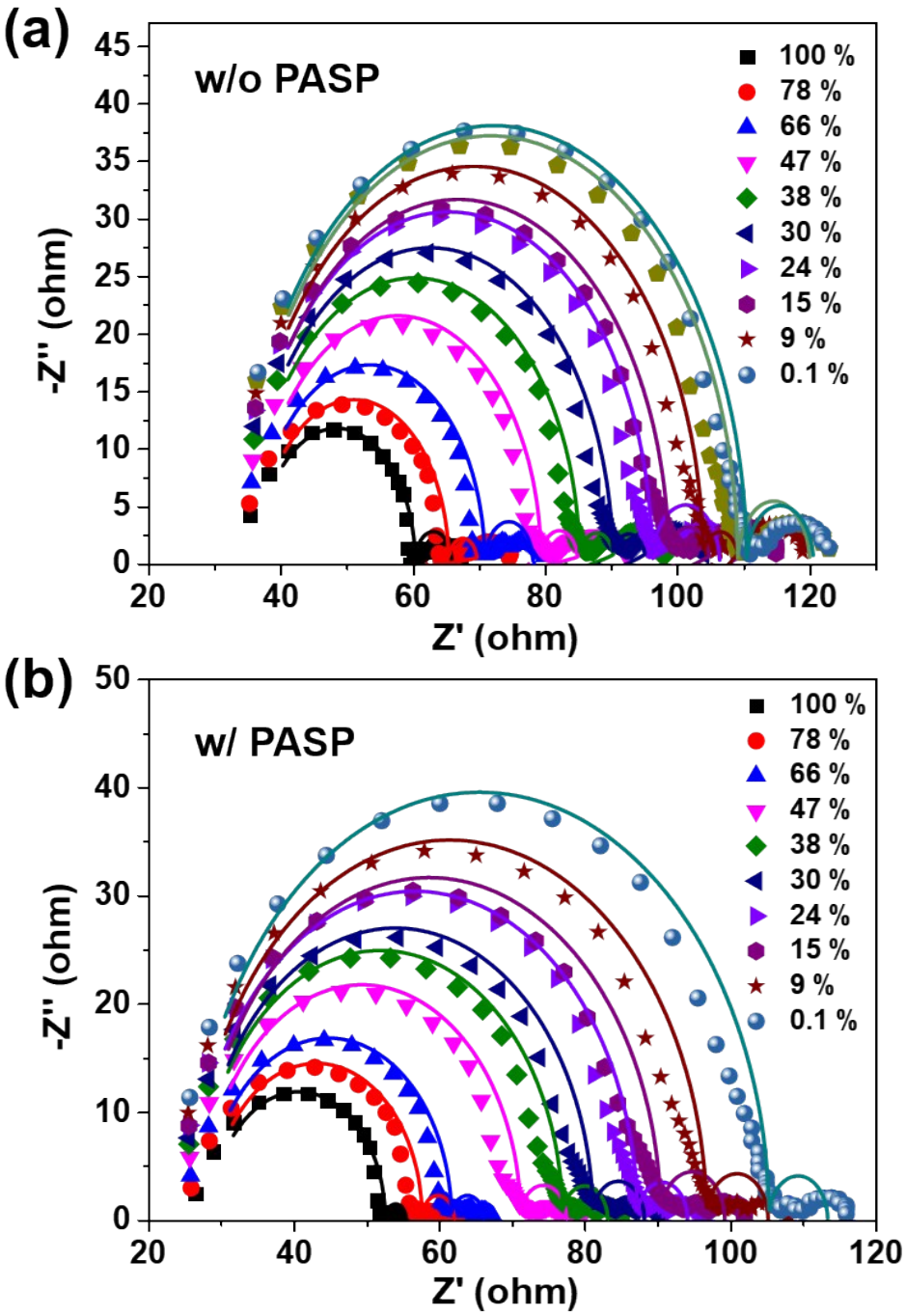

Fig. S11 Impedance spectra of solar cells with and without PASP as a function of light intensity (P_{light}).

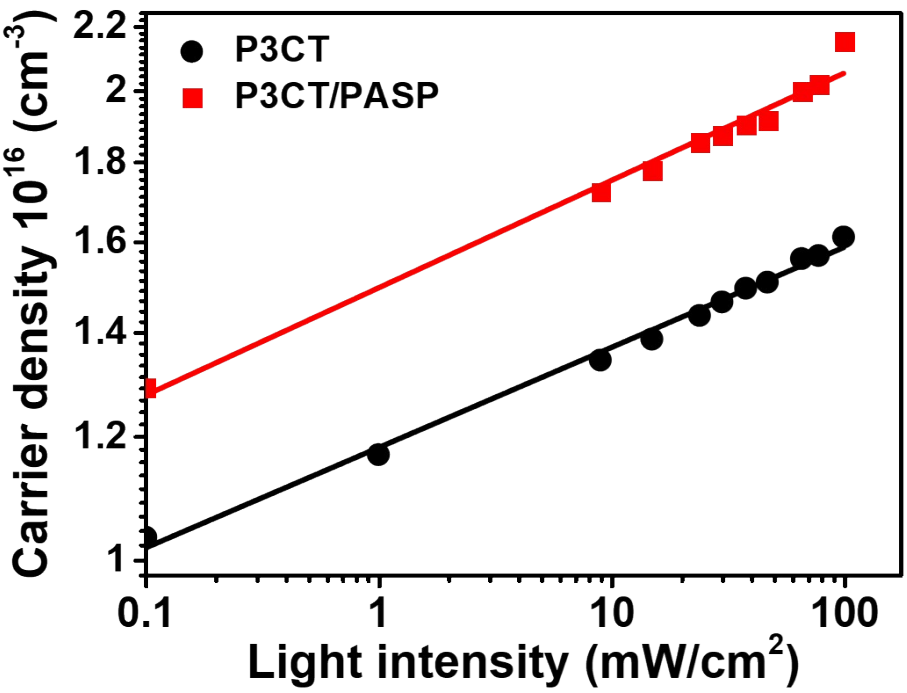

Fig. S12 Carrier density of solar cells with and without PASP as a function of light intensity (P_{light}).

Table S1. Time constants in PL decay kinetics determined by bi-exponential fittings measured on $MAPbI_3$ films spun-coat on P3CT and P3CT/PASP substrates.

	τ_1（ns）	Fraction 1	τ_2（ns）	Fraction 2	τ（ns）
BCP/C60/Perovskite	27.29	56.97%	6.12	43.03%	18.18
P3CT/Perovskite	10.68	47.94%	2.73	50.06%	6.49
P3CT/PASP/Perovskite	18.24	65.20%	4.91	34.80%	13.60

Table S2. Device parameters of TPC measurement on single-carrier devices.

	decay（ns）
w/o PASP	54.119
w/ PASP	38.233

Table S3. Device parameters of impedance spectroscopy of $MAPbI_3$ solar cells measured under 1 sun at V_{oc} together.

	R_1（Ω）	R_2（Ω）	R_3（Ω）	C_1(C)	C_2(C)
w/o PASP	36.74	23.63	1.81	$1.93*10^{-8}$	$4.0*10^{-4}$
w/ PASP	28.8	23.79	1.53	$2.18*10^{-8}$	$1.56*10^{-4}$