Electronic Supplementary Material (ESI) for Journal of Materials Chemistry A.

Supporting Information for

Post-Healing of Defects: Alternative Way for Passivation of Carbon-Based Mesoscopic Perovskite Solar Cells via Hydrophobic Ligand Coordination

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Fig. S1 Adsorption position of ligands in different device structures.

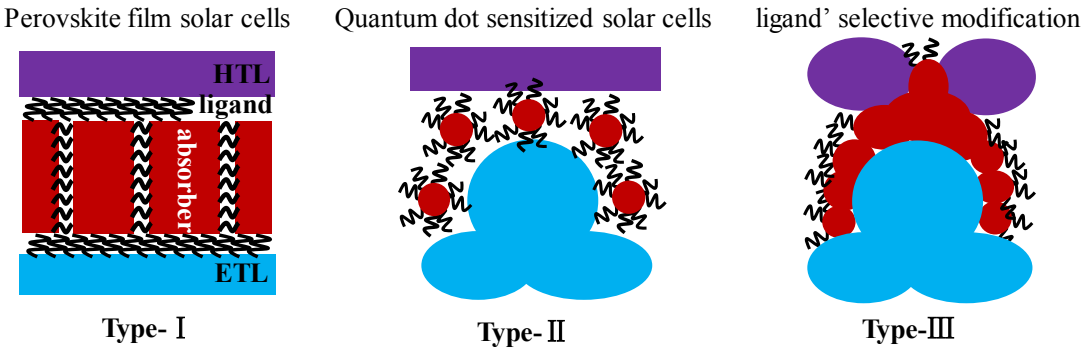

Fig. S2 Digital images of the triple-layer scaffold at different stages.

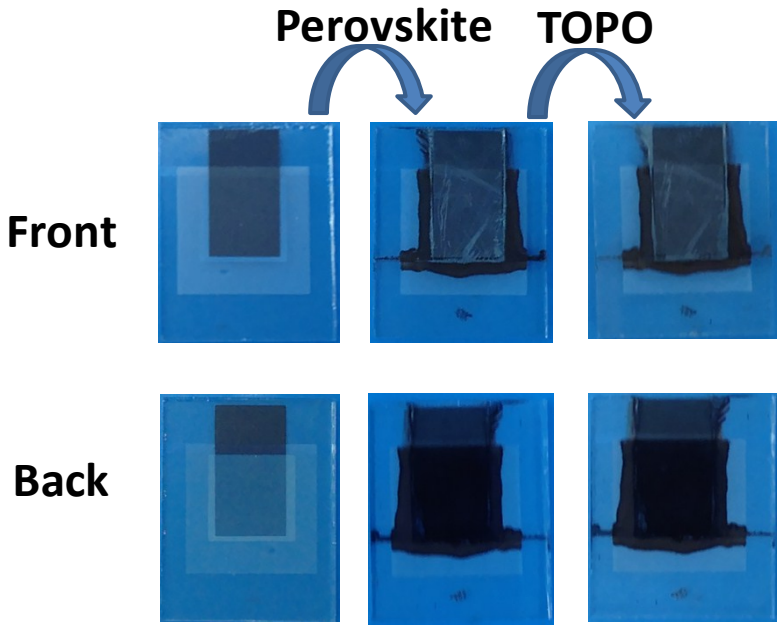

Fig. S3 The PCE changes of fully printable carbon-based MPSCs with varying TOPO precursor concentration. The average PCE is collected from 10 different test points. The mM represents 10^{-3} mmol/mL.

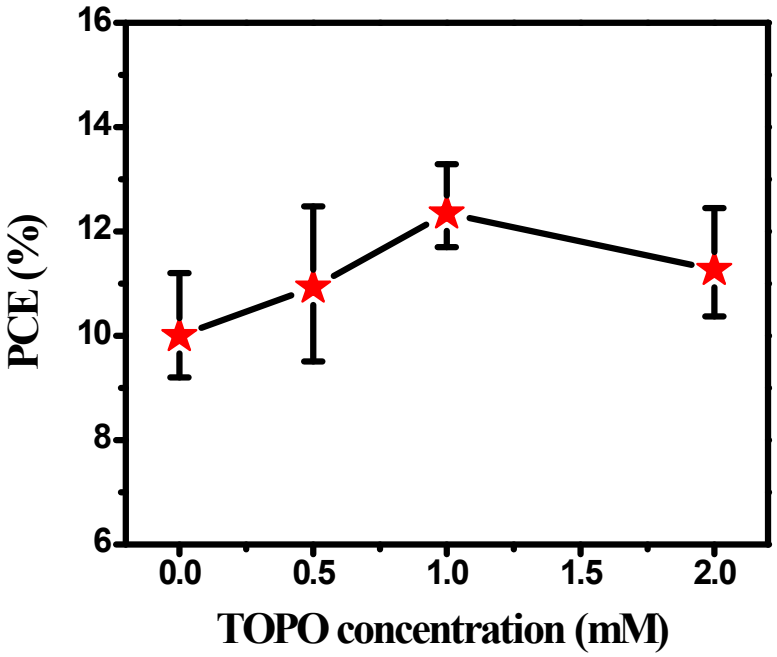

Fig. S4 XPS of pristine and TOPO post-treated $MAPbI_3$ film.

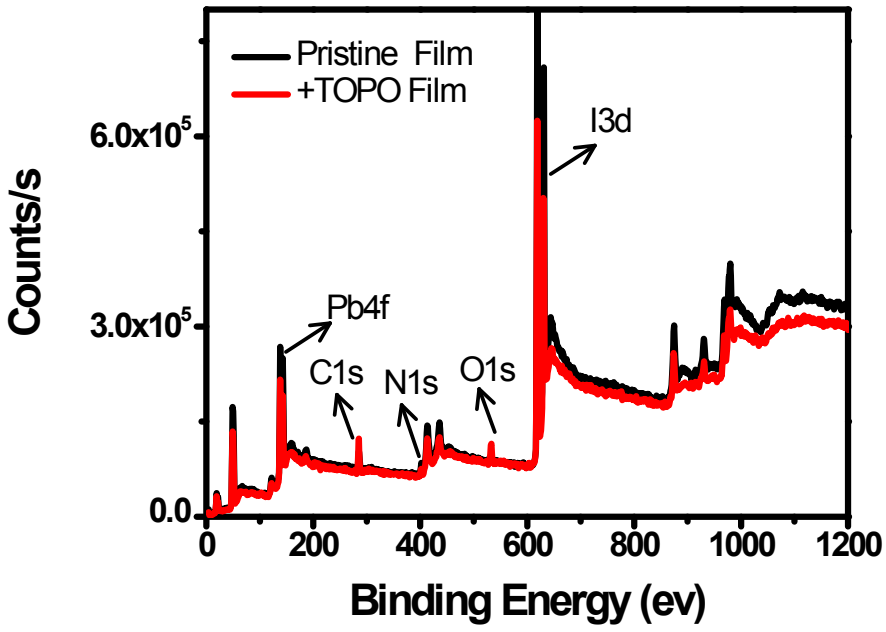

Fig. S5 XPS results of C 1s (a), N 1s (b), I 3d (c), Pb 4f (d), O 1s (e) and P 2p (f) for pristine and TOPO post-treated $MAPbI_3$ film.

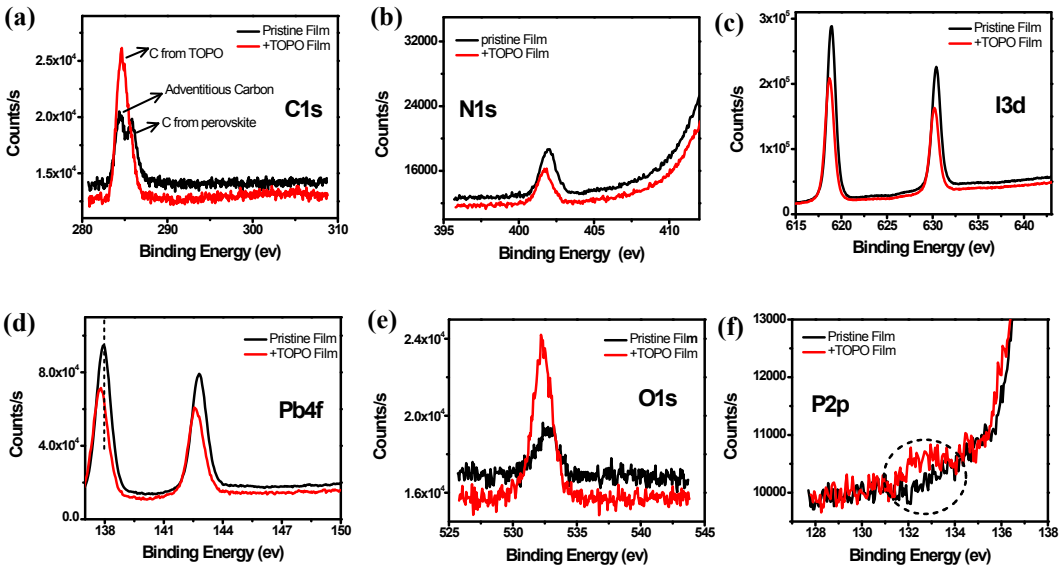

Fig. S6 Nyquist plots of devices with/without TOPO post-treatment and the equivalent circuit employed to fit the EIS spectra. The fitting results are showed in Table S1.

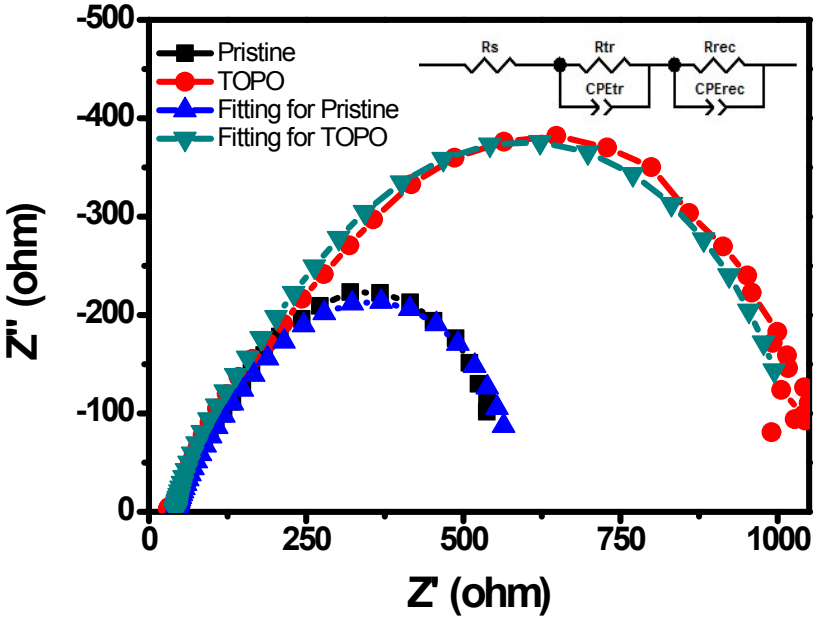

Fig. S7 V_{oc} of devices with/without TOPO post-treatment plotted against light intensity on a logarithmic scale.

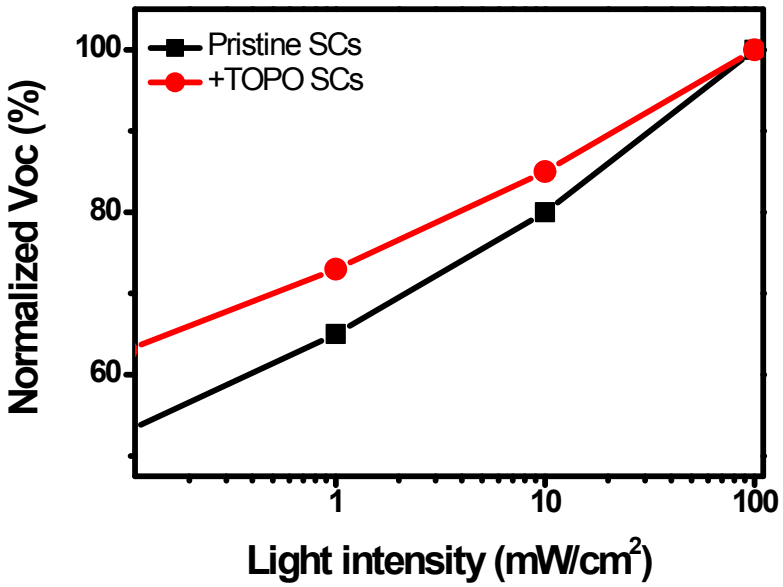

Fig. S8 X-Ray Diffraction (XRD) of pristine and post-treated TOPO perovskite film.

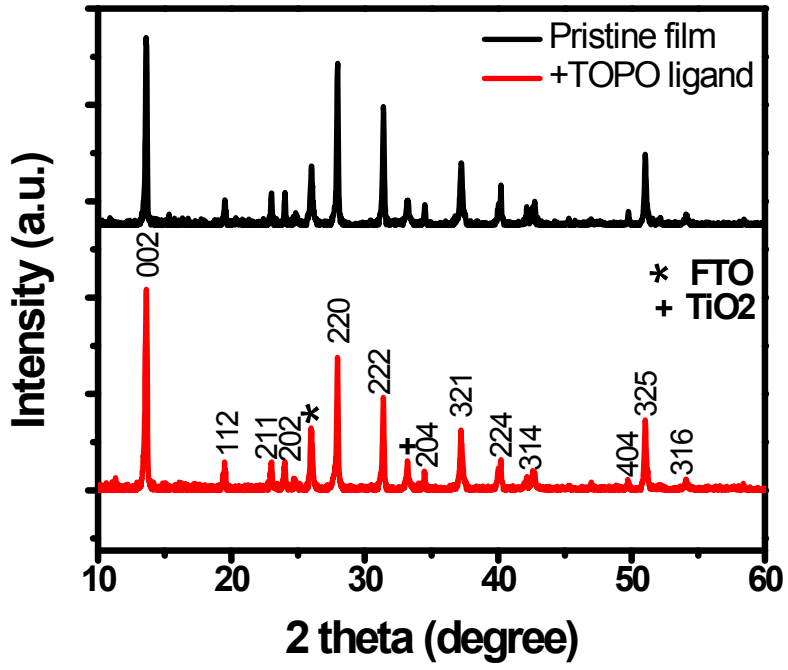

Fig. S9 Time-resolved photoluminescence (TRPL) of pristine and TOPO post-treated $MAPbI_3$ film deposited on TiO_2.

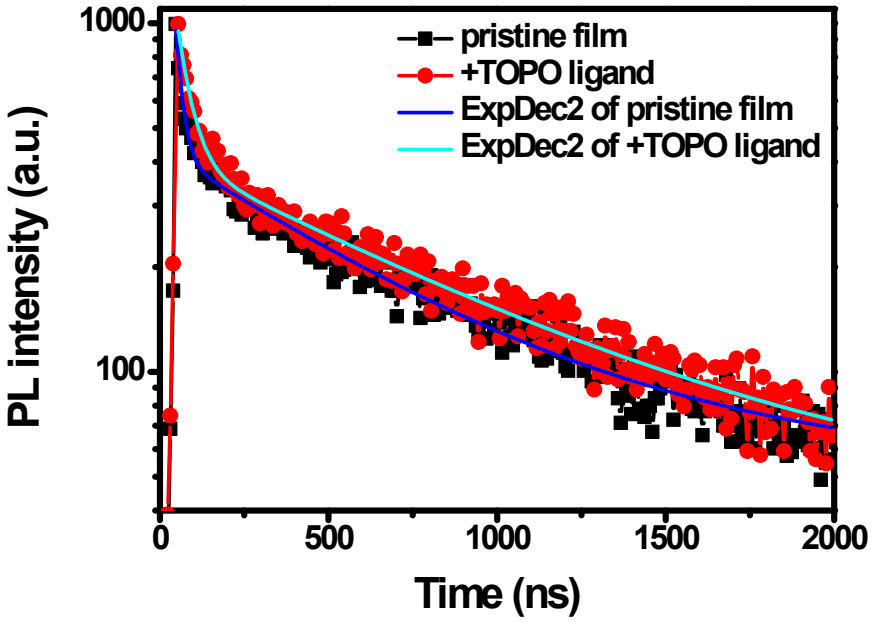

Fig. S10 Atomic force microscope (AFM) images of pristine and TOPO post-treated perovskite film.

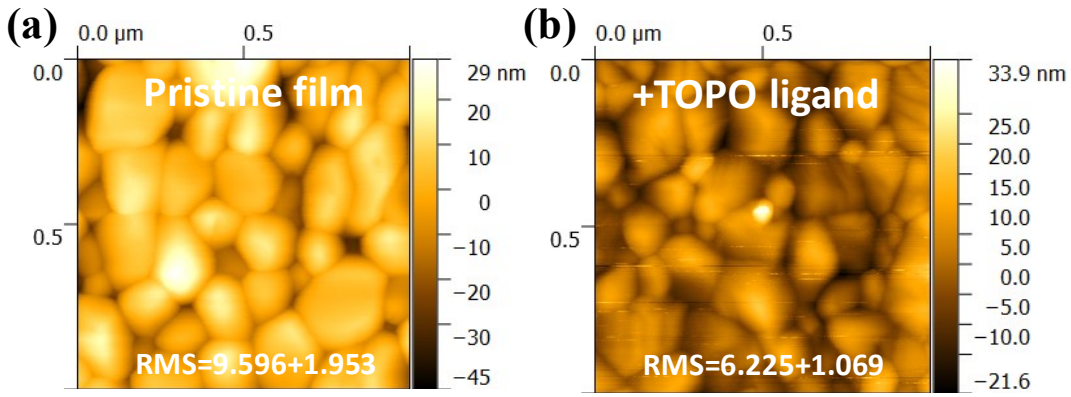

Fig. S11 The solubility of chlorobenzene to perovskite film at different TOPO amount. The TOPO concentration used for the MPSCs is 0.001mmol/ml. The area of perovskite film in bottle is equal to the MPSCs (0.64 cm^2).

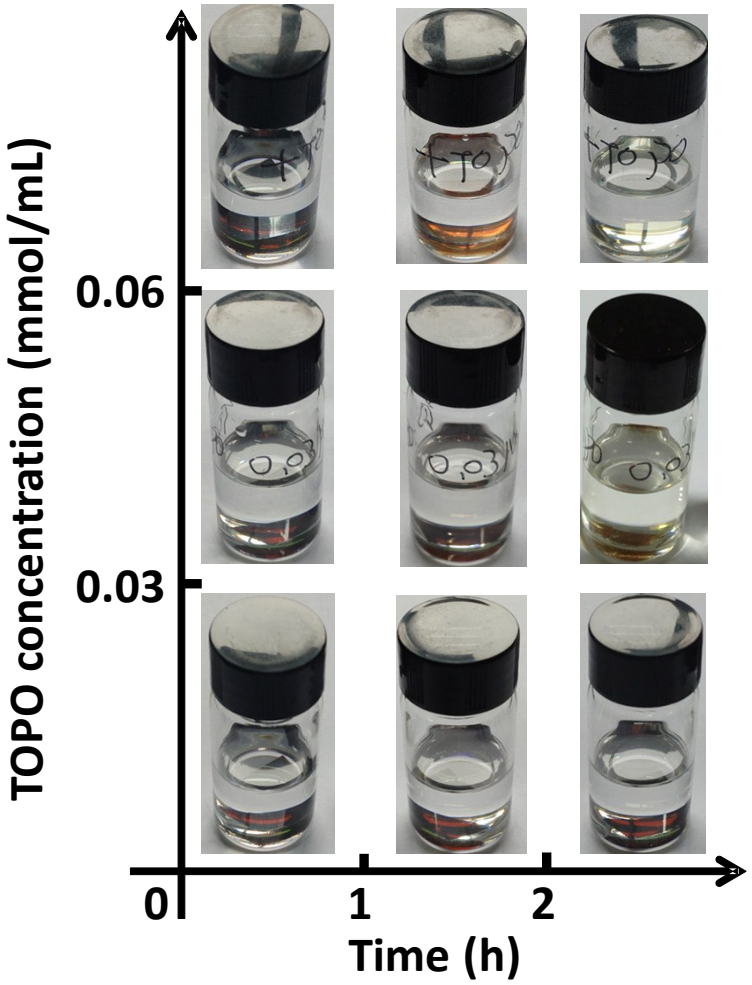

Table. S1 The fitting results of EIS in Fig S6.

	Rs (Ω)	Rtr (Ω)	CPEtr-T	CPEtr-P	Rrec(Ω)	CPErec-T	CPErec-P
Pristine	41.97	187.2	1.178E-4	0.687	363.6	5.809E-5	0.973
+TOPO	42.23	175.4	5.548E-5	0.788	826.8	5.070E-5	0.900

Table. S2 The fitting results of TRPL in Fig S9.

Function: y=a1*exp(-x/t1) + a2*exp(-x/t2)					
	t1(ns)	a1	t2(ns)	a2	tavg(ns)
Pristine	19.8	5812	627	383	57.3
+TOPO	40.4	2143	818	381	158.8