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Supplementary Information

Stable solvent for solution-based electrical doping of semiconducting polymer films and its application to organic solar cells

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Table S1. Solvents used to dissolve PMA and their properties.

	Hansen Space (as in HsPiP 5.0.04)				NFPA 704		
Solvent	***δD***	***δP***	***δH***	**Distance to NM**	**Health**	**Flammability**	**Instability**
Nitromethane (NM)	15.8	18.8	6.1	-	2	3	4
Acetonitrile	15.3	18	6.1	1.28	2	3	0
Dimethyl sulfoxide	18.4	16.4	10.2	7.04	2	2	0
Dimethylformamide	17.4	13.7	11.3	7.96	2	2	0
2-methoxyethanol	16	8.2	15	13.85	3	2	2
2-propanol	15.8	6.1	16.4	16.35	1	2	1
Ethanol	15.8	8.8	19.4	16.64	2	3	0

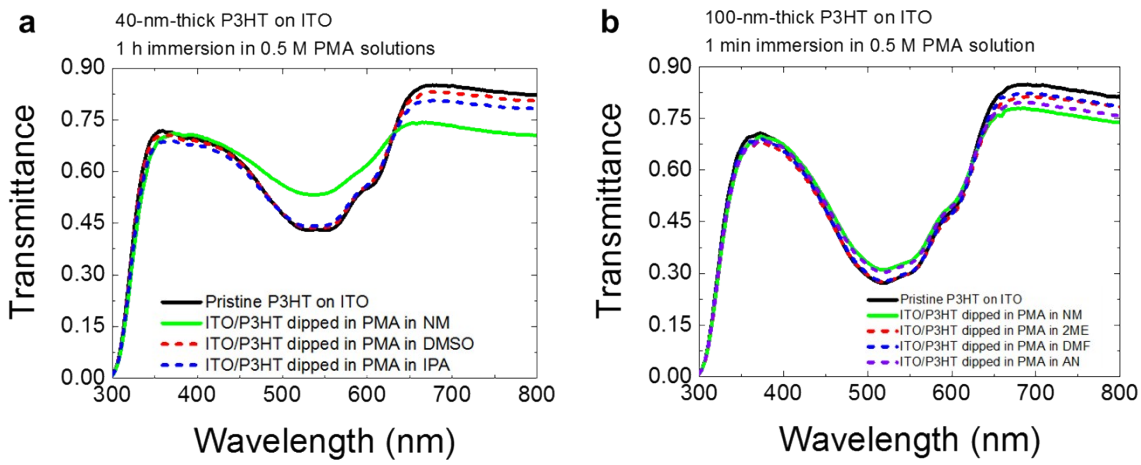

Figure S1. **Transmittance spectra of pristine P3HT and PMA-im-P3HT, when using various solvents to dissolve PMA. a,** Transmittance spectra of 40-nm-thick P3HT on ITO, pristine or immersed in several 0.5 M PMA solutions for 1 h. In the legend, 'NM' stands for nitromethane, 'DMSO' is dimethyl sulfoxide and 'IPA' is isopropyl alcohol. **b,** Transmittance spectra of 100-nm-thick P3HT on ITO, pristine or immersed in several 0.5 M PMA solutions for 1 min. In the legend, '2ME' stands for 2-methoxyethanol, 'DMF' is dimethylformamide and 'AN' is acetonitrile. All measurements were conducted in air, although the immersion step was conducted inside a N_2-filled glovebox.

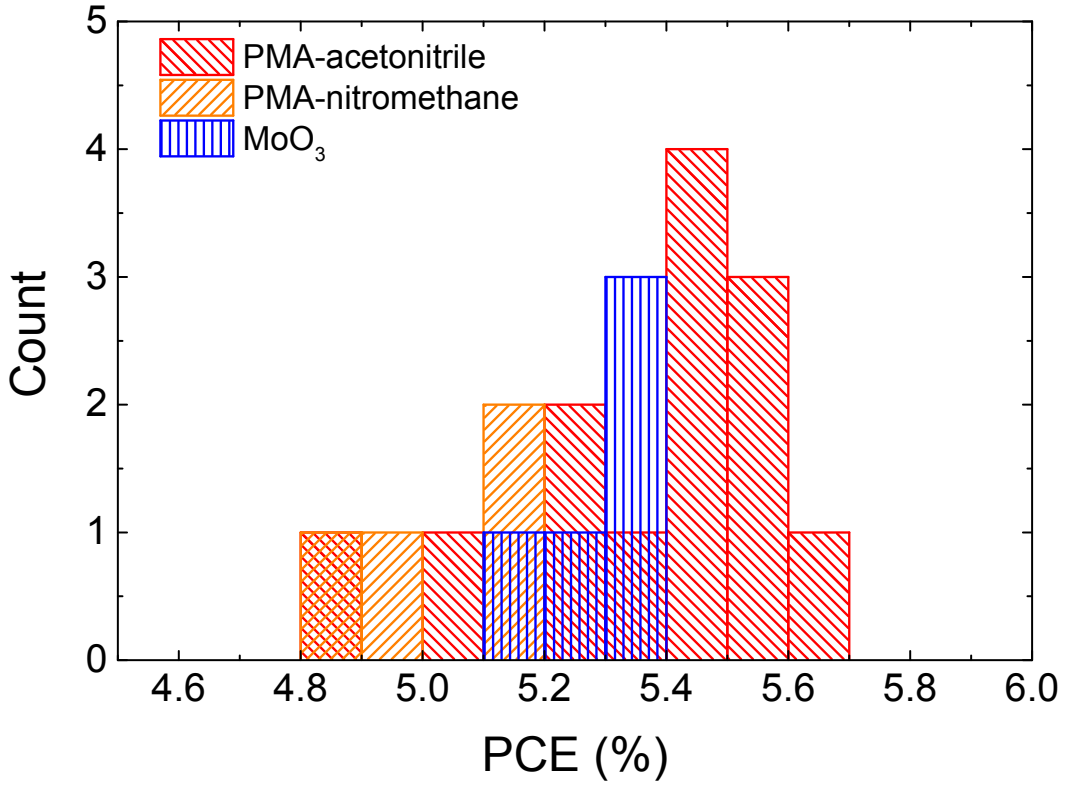

Figure S2. **Histogram of PCEs measured under AM 1.5G solar simulation, including populations of organic solar cells doped with PMA-acetonitrile, PMA-nitromethane or with an evaporated MoO_3 hole-collecting layer.** All measurements were conducted in inert atmosphere and before exposing these devices to air.

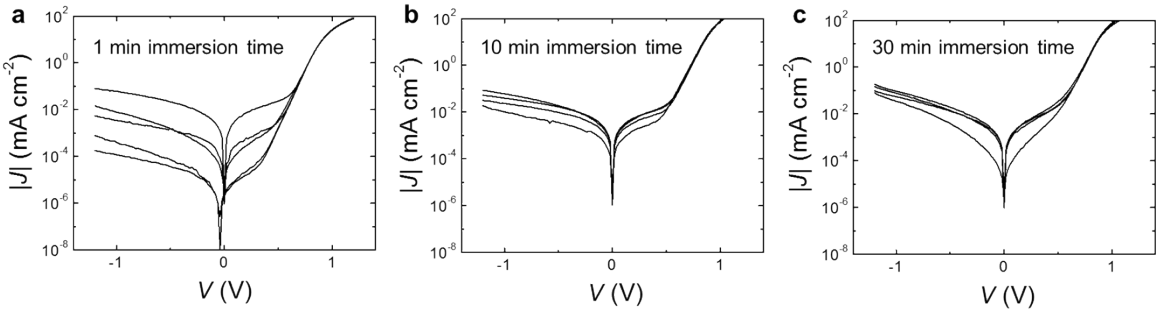

Figure S3. ***J-V* characteristic of solar cells in the dark, doped for various times. a,** *J-V* characteristic of 200 nm-thick PMA-im-P3HT:ICBA OPVs, doped using PMA in acetonitrile for 1 min. **b,** *J-V* characteristic of 200 nm-thick PMA-im-P3HT:ICBA OPVs, doped using PMA in acetonitrile for 10 min. **c**, *J-V* characteristic of 200 nm-thick PMA-im-P3HT:ICBA OPVs, doped using PMA in acetonitrile for 30 min. All measurements were conducted after 10 min soaking under 1-sun illumination in a N_2-filled glovebox.

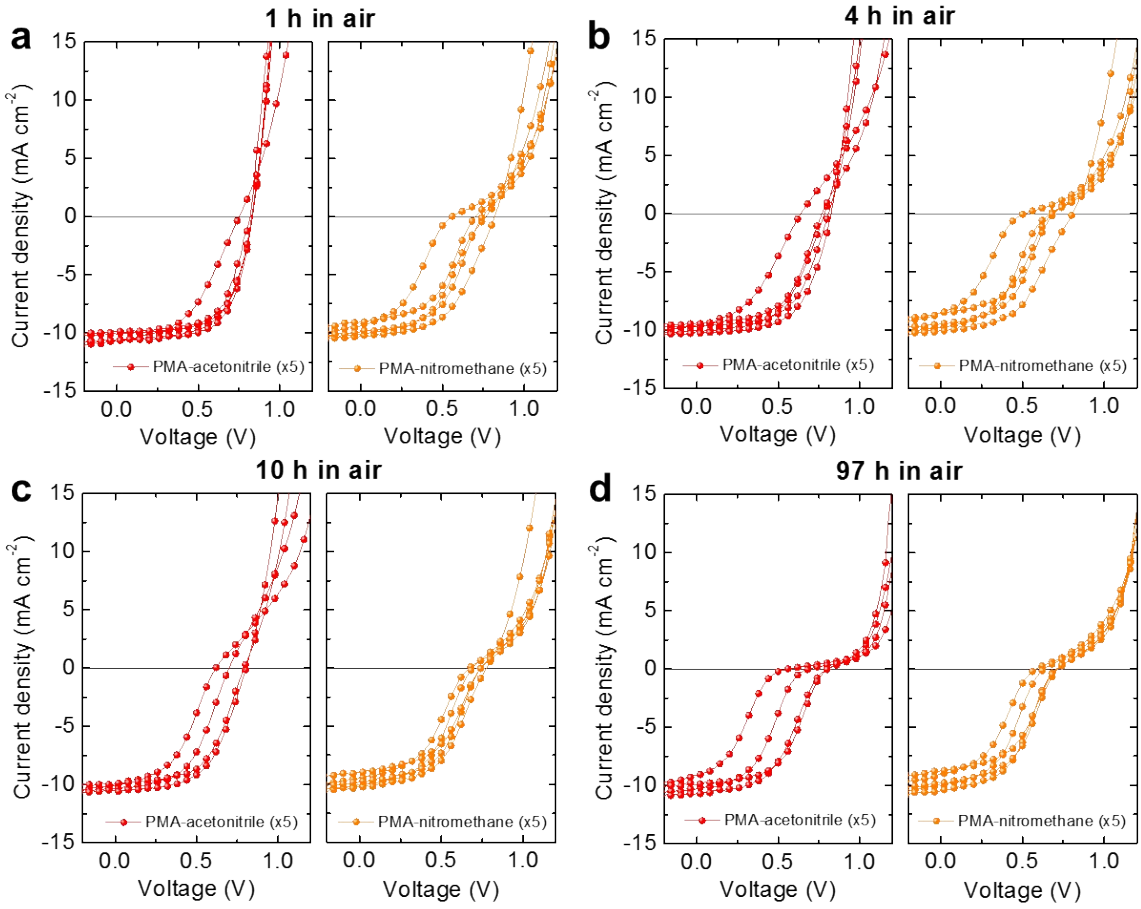

Figure S4. ***J-V*** **characteristic of solar cells doped with PMA after air exposure. a,** *J-V* characteristic of 200 nm-thick PMA-im-P3HT:ICBA OPVs, doped using PMA in acetonitrile for 1 min or PMA in nitromethane for 1 min, after 1 h exposure to air. **b,** *J-V* characteristic of 200 nm-thick PMA-im-P3HT:ICBA OPVs, doped using PMA in acetonitrile for 1 min or PMA in nitromethane for 1 min, after 4 h exposure to air. **c,** *J-V* characteristic of 200 nm-thick PMA-im-P3HT:ICBA OPVs, doped using PMA in acetonitrile for 1 min or PMA in nitromethane for 1 min, after 10 h exposure to air. **d,** *J-V* characteristic of 200 nm-thick PMA-im-P3HT:ICBA OPVs, doped using PMA in acetonitrile for 1 min or PMA in nitromethane for 1 min, after 97 h exposure to air. All measurements were conducted after 10 min soaking under 1-sun illumination in a N_2-filled glovebox.

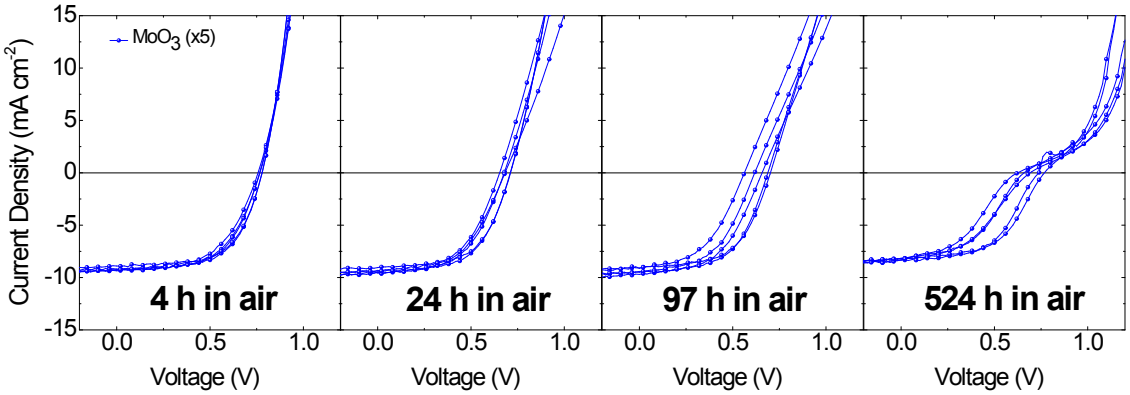

Figure S5. ***J-V*** **characteristic of reference solar cells after air exposure. a,** *J-V* characteristic of 200 nm-thick P3HT:ICBA OPVs, with a 10 nm MoO_3 layer for hole collection, after 4 h exposure to air. **b,** *J-V* characteristic of 200 nm-thick P3HT:ICBA OPVs, with a 10 nm MoO_3 layer for hole collection, after 24 h exposure to air. **c,** *J-V* characteristic of 200 nm-thick P3HT:ICBA OPVs, with a 10 nm MoO_3 layer for hole collection, after 97 h exposure to air. **d,** *J-V* characteristic of 200 nm-thick P3HT:ICBA OPVs, with a 10 nm MoO_3 layer for hole collection, after 524 h exposure to air. All measurements were conducted after 10 min soaking under 1-sun illumination in a N_2-filled glovebox.