

## Supporting Information for

### Solution-processed and Thickness-insensitive Hole Transport Layer for High Efficiency Organic Solar Cells

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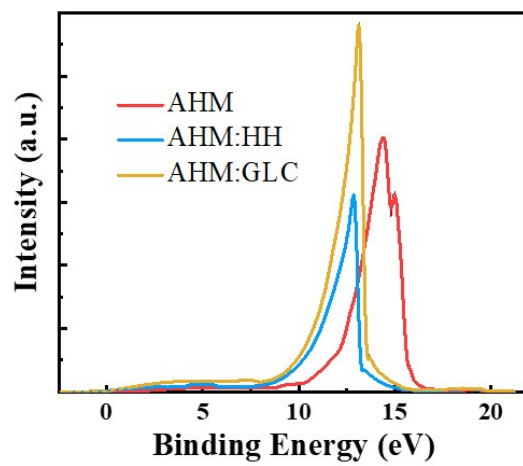
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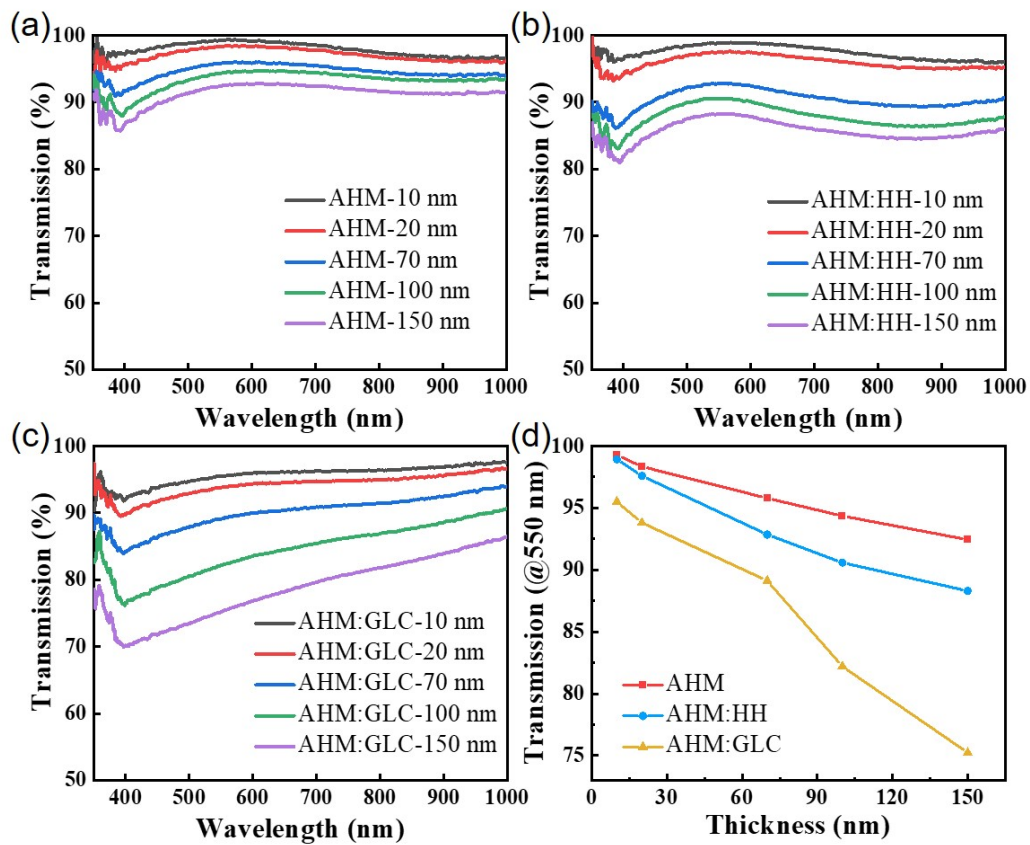
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**Figure S1.** UPS spectra of the MoO<sub>x</sub> films prepared from the AHM, AHM:HH (4:1) and AHM:GLC (8:1) precursor solutions.



**Figure S2.** Transmission spectra of the thickness-different MoO<sub>x</sub> films prepared from (a) pure AHM, (b) AHM:HH (4:1, w/w) and (c) AHM:GLC (8:1, w/w) precursor solutions. (d) thickness dependence of transmittance at 550 nm for the films prepared from pure AHM, AHM:HH (4:1, w/w) and AHM:GLC (8:1, w/w) precursor solutions, respectively.

**Table S1.** Photovoltaic parameters of the OSCs based on different thickness HTL prepared from pure AHM precursor solution.

HTL	Thickness (nm)	$V_{OC}$ (V)	$J_{SC}$ (mA cm <sup>-2</sup> )	$J_{cal}$ (mA cm <sup>-2</sup> )	FF (%)	PCE (%)
AHM	10	0.82	25.62	24.50	69.03	14.53 (14.49±0.40)
	20	0.81	25.25	24.26	63.47	12.98 (12.96±0.38)
	40	0.80	23.93	22.83	58.60	11.16 (11.12±0.45)
	70	0.80	23.77	22.64	55.98	10.66 (10.30±0.35)
	100	0.81	22.06	22.25	56.30	10.06 (9.93±0.24)
	150	0.81	22.63	21.70	45.25	8.29 (8.25±0.41)

<sup>a</sup> $J_{cal}$  was obtained from the EQE data, the average PCE was calculated from 10 devices.

**Table S2.** Photovoltaic parameters of the OSCs based on different thickness HTL prepared from AHM:HH (4:1) precursor solution.

HTL	Thickness (nm)	$V_{OC}$ (V)	$J_{SC}$ (mA cm <sup>-2</sup> )	$J_{cal}$ (mA cm <sup>-2</sup> )	FF (%)	PCE (%)
AHM:HH	10	0.84	25.99	24.62	72.95	15.92 (15.99±0.12)
	20	0.84	25.90	24.04	72.97	15.77 (15.77±0.11)
	40	0.83	25.75	23.65	72.49	15.51 (15.43±0.37)
	70	0.83	24.76	23.47	70.49	14.53 (14.44±0.29)
	100	0.83	24.34	23.10	72.69	14.72 (14.46±0.28)
	150	0.84	24.21	23.08	70.88	14.35 (14.29±0.19)

<sup>a</sup> $J_{cal}$  was obtained from the EQE data, the average PCE was calculated from 10 devices.

**Table S3.** Photovoltaic parameters of the OSCs based on different thickness HTL prepared from AHM:GLC (8:1) precursor solution.

HTL	Thickness (nm)	$V_{oc}$ (V)	$J_{sc}$ (mA cm <sup>-2</sup> )	$J_{cal}$ (mA cm <sup>-2</sup> )	FF (%)	PCE (%)
AHM:GLC	10	0.83	25.89	24.40	73.91	15.94 (15.75±0.32)
	20	0.84	25.52	24.28	72.91	15.59 (15.41±0.41)
	40	0.83	24.45	23.09	72.10	14.66 (14.55±0.26)
	70	0.82	23.74	22.73	72.33	14.17 (14.03±0.47)
	100	0.83	22.84	21.73	71.63	13.65 (13.29±0.39)
	150	0.82	21.42	20.18	71.31	12.60 (12.55±0.37)

<sup>a</sup> $J_{cal}$  was obtained from the EQE data, the average PCE was calculated from 10 devices.