

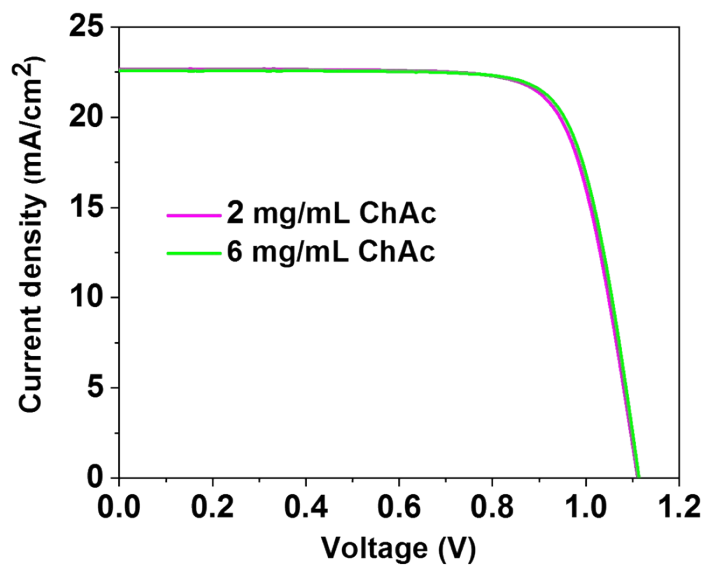
## Supporting information

### **Interface passivation using choline acetate for efficient and stable planar perovskite solar cells**

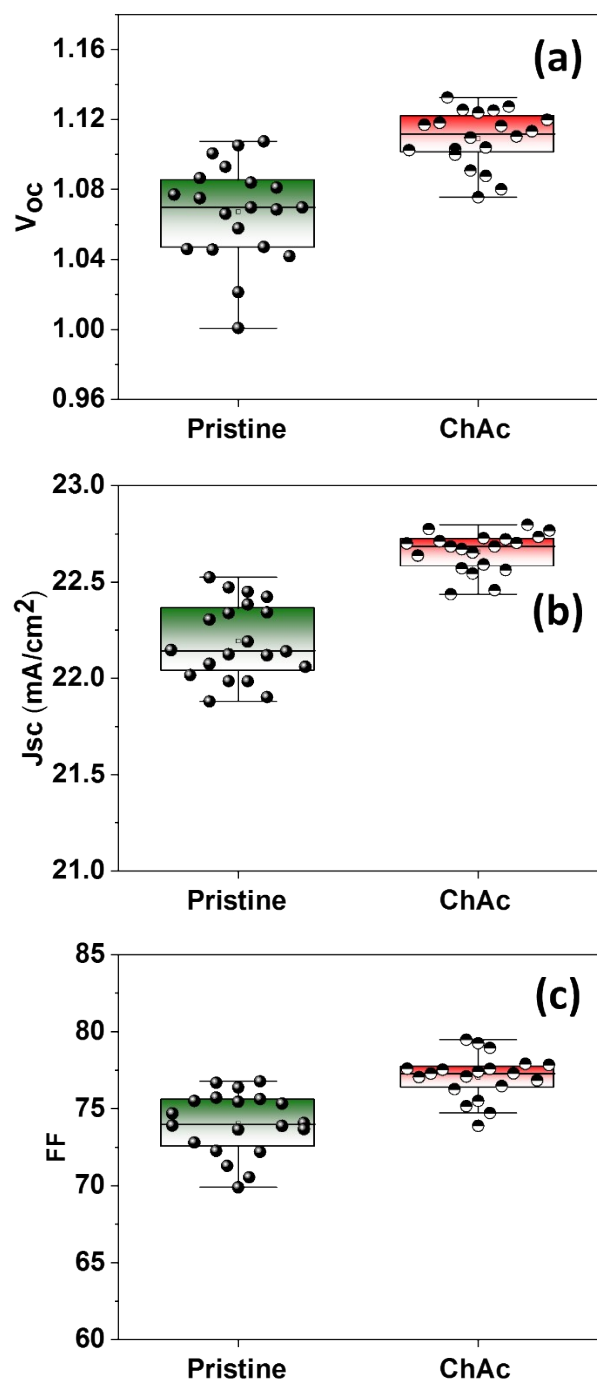
*M. Thambidurai<sup>1, 2, 3</sup>, Herlina Arianita Dewi<sup>2</sup>, Wang Xizu<sup>3</sup>, Nripan Mathews<sup>2,4</sup>, Cuong Dang<sup>\*1,2</sup>, and Hung D. Nguyen<sup>\*1,2</sup>*

1. School of Electrical and Electronic Engineering, Nanyang Technological University, 50 Nanyang Avenue, 639798, Singapore.
2. Energy Research Institute @NTU (ERI@N), Research Techno Plaza, X-Frontier Block, Level 5, 50 Nanyang Drive, 637553, Singapore.
3. Institute of Materials Research and Engineering (IMRE), Agency for Science, Technology and Research, 138634, Singapore.
4. School of Materials Science and Engineering, Nanyang Technological University, 50 Nanyang Avenue, 639798, Singapore.

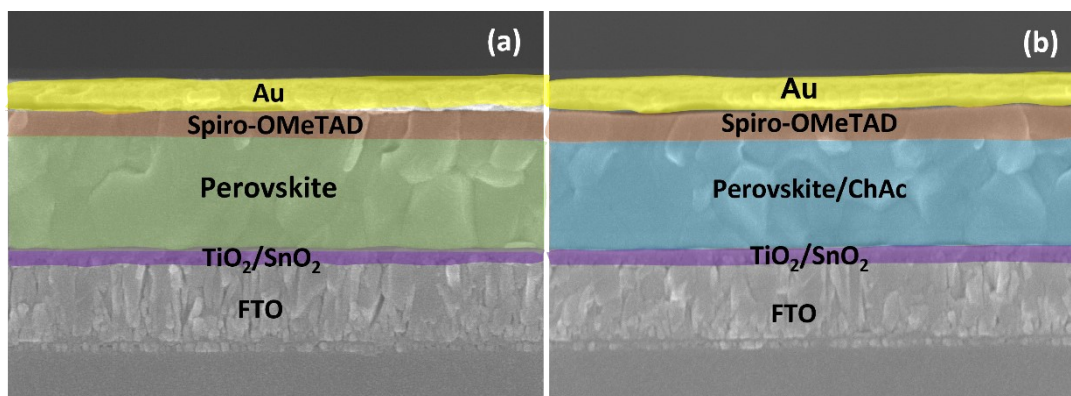
\*Email: hcdang@ntu.edu.sg; hunghtd@ntu.edu.sg



**Figure S1.** J-V curves of the ChAc passivated planar PSCs.



**Figure S2.** Statistical distribution of (a)  $V_{oc}$ , (b)  $J_{sc}$  and (c) FF of pristine and ChAc passivated planar PSCs.



**Figure S3.** Cross-sectional FESEM images of (a) pristine and (b) 4 mg/mL ChAc PSCs.

The cross-sectional images of the perovskite solar cell without and with ChAc passivation are shown in Figure S3. The relative thickness of the perovskite layer for pristine and 4 mg/mL ChAc passivated perovskite layer was found to be similar at approximately 600 nm. Despite the additional ChAc layer added to the pristine device, the change in film thickness is unobservable using the FESEM images. This can be explained by the low ChAc concentration applied, making it difficult to distinguish the few nano-meters thin ChAc layer.

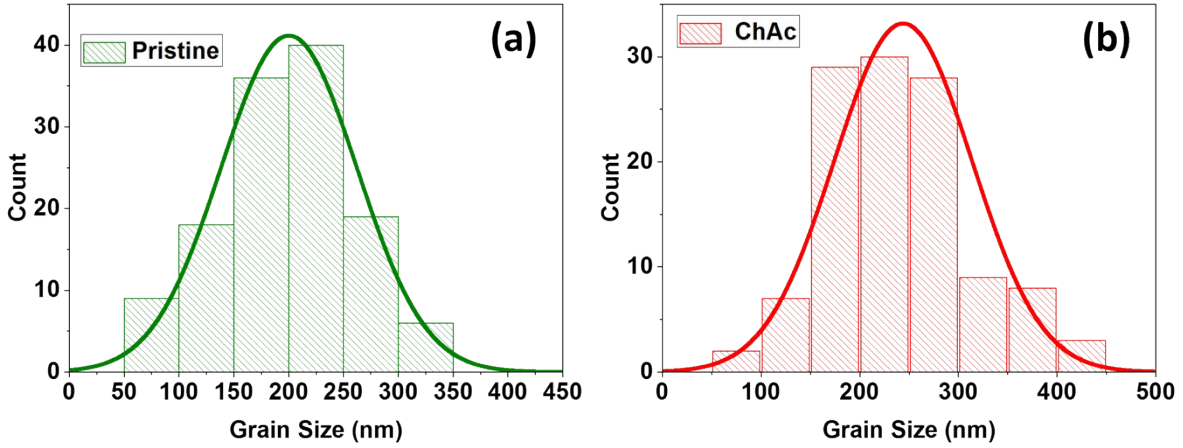
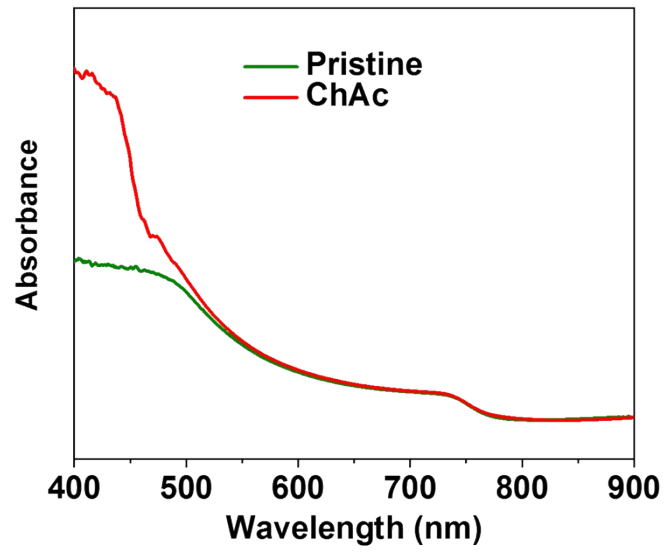
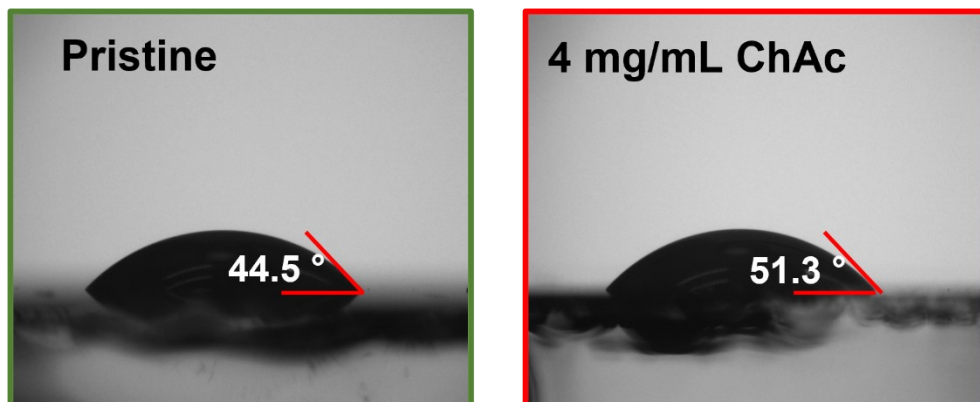


Figure S4. Grain size distribution of (a) pristine and ChAc passivated films.

The grain size distribution of pristine perovskite films with and without ChAc is illustrated in Figure S1. The average grain size of the pristine is estimated to be around 200 nm, however the passivated film with ChAc is found to be 245 nm.



**Figure S5.** UV absorption spectra of pristine and ChAc passivated perovskite films.



**Figure S6.** Water contact angles of the pristine and ChAc passivated perovskite films.

**Table 1.** Photovoltaic parameters of perovskite solar cells with and without ChAc passivation.

Devices	$V_{oc}$ [V]	$J_{sc}$ [mA cm <sup>-2</sup> ]	FF [%]	PCE [%]
Pristine	1.09	22.30	74.69	18.20
2 mg/mL ChAc	1.11	22.66	76.51	19.24
4 mg/mL ChAc	1.12	22.70	77.63	19.80
6 mg/mL ChAc	1.11	22.60	77.41	19.45