

## Supplementary Information

### **Crown-ether functionalized fullerene as solution-processable cathode buffer layer for high performance perovskite and polymer solar cells**

Xiaodong Liu,<sup>‡*a*</sup> Weixiang Jiao,<sup>‡*b*</sup> Ming Lei,<sup>\**b*</sup> Yi Zhou,<sup>\**a*</sup> Bo Song<sup>\**a*</sup> and

Yongfang Li<sup>\**a,c*</sup>

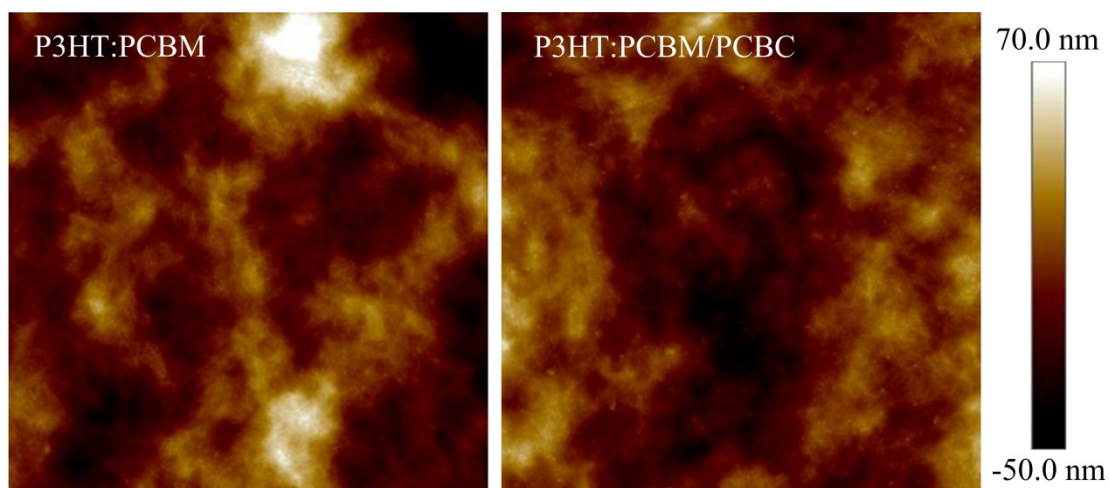
<sup>a</sup>Laboratory of Advanced Optoelectronic Materials, College of Chemistry, Chemical Engineering and Materials Science, Soochow University, Suzhou, Jiangsu 215123, China.

<sup>b</sup>Department of Chemistry, Zhejiang University, Hangzhou, 310027, China.

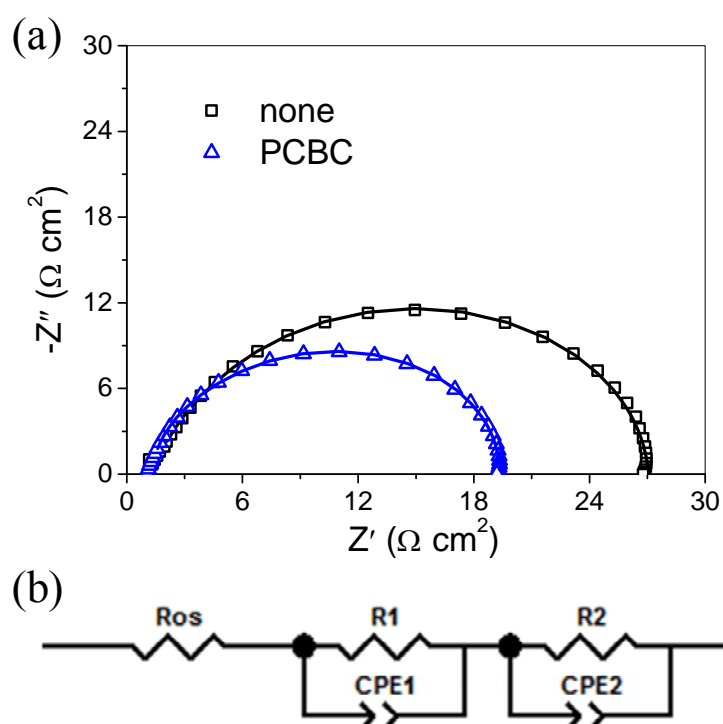
<sup>c</sup>Institute of Chemistry, Chinese Academy of Sciences, Beijing 100190, China.

<sup>‡</sup>Dr. Xiaodong Liu and Mr. Weixiang Jiao contributed equally to this work.

\*Corresponding authors, E-mail: [yizhou@suda.edu.cn](mailto:yizhou@suda.edu.cn),  
[songbo@suda.edu.cn](mailto:songbo@suda.edu.cn), [leiming@zju.edu.cn](mailto:leiming@zju.edu.cn), [liyf@iccas.ac.cn](mailto:liyf@iccas.ac.cn)



**Fig. S1** AFM height images of the pristine P3HT:PC<sub>60</sub>BM and P3HT:PC<sub>60</sub>BM/PCBC films prepared on ITO/PEDOT:PSS substrates for a 5 μm×5 μm surface area. The root-mean-square (RMS) roughnesses of the P3HT:PC<sub>60</sub>BM films with and without a PCBC layer on top are 15.9 and 19.9 nm, respectively.



**Fig. S2** (a) The Nyquist plots (symbols) and fitted curves (solid curves) for the pero-SCs based on CH<sub>3</sub>NH<sub>3</sub>PbI<sub>3-x</sub>Cl<sub>x</sub> without and with PCBC CBL, measured in the dark and with applied voltage near the V<sub>oc</sub> (0.97 V). (b) The equivalent circuit used for fitting the impedance data.

**Table S1** The fitted ACIS parameters of planar pero-SCs based on  $\text{CH}_3\text{NH}_3\text{PbI}_{3-x}\text{Cl}_x$ .

CBL	$R_{\text{os}}$ ( $\Omega \text{ cm}^2$ )	$R_1$ ( $\Omega \text{ cm}^2$ )	$\text{CPE}_{1\text{-T}}$ ( $\mu\text{F cm}^{-2}$ )	$\text{CPE}_{1\text{-P}}$	$R_2$ ( $\Omega \text{ cm}^2$ )	$\text{CPE}_{2\text{-T}}$ ( $\mu\text{F cm}^{-2}$ )	$\text{CPE}_{2\text{-P}}$
None	1.42	3.49	2.48	0.83	22.14	0.18	0.98
PCBC	1.32	4.04	0.52	0.94	13.96	0.14	1.03