# Supporting information for

# Alcohol based vapor annealing of poly(3,4-ethylenedioxythiophene):poly(styrenesulfonate) layer for performance improvement of inverted perovskite solar cells

Guanchen Liu,‡[a] Xiaoyin Xie,‡[bc] Zhihai Liu,*[de] Guanjian Cheng[a] and Eun-Cheol Lee*[ef]

[a]*Department of Material Science and Technology, Jilin Institute of Chemical Technology, Jilin 132022, China*
[b]*Department of Chemical Technology, Jilin Institute of Chemical Technology, Jilin 132022, China*
[c]*International Joint Research Laboratory of Nano-Micro Architecture Chemistry, Institute of Theoretical Chemistry, Jilin University, Changchun 130023, China*
[d]*Department of Bio-Nano Technology, Gachon University, Gyeonggi 461-701, Republic of Korea. E-mail: zhliu@gachon.ac.kr*
[e]*Gachon Bio-Nano Research Institute, Gyeonggi 461-701, Republic of Korea*
[f]*Department of Nano-Physics, Gachon University, Gyeonggi 461-701, Republic of Korea. E-mail: eclee@gachon.ac.kr*

**Table S1.** Summary of photovoltaic parameters of the best sample among PSCs with PEDOT:PSS treated by methanol-based SVA.

| Scan | $J_{sc}$ (mA cm$^{-2}$) | $V_{oc}$ (V) | FF (%) | PCE (%) |
|---|---|---|---|---|
| Forward | 21.9 | 1.04 | 77.7 | 17.7 |
| Reverse | 21.9 | 1.05 | 78.1 | 18.0 |

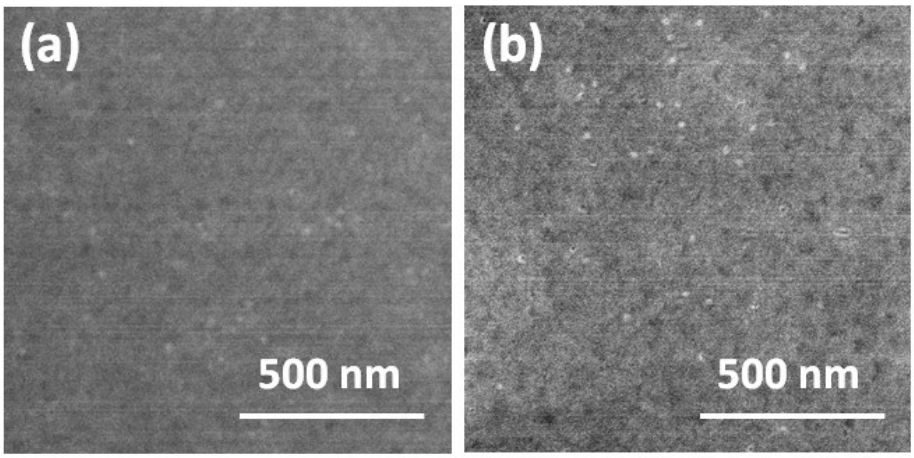


**Fig. S1.** SEM images of PEDOT:PSS without (a) and with (b) methanol-based SVA treatment.

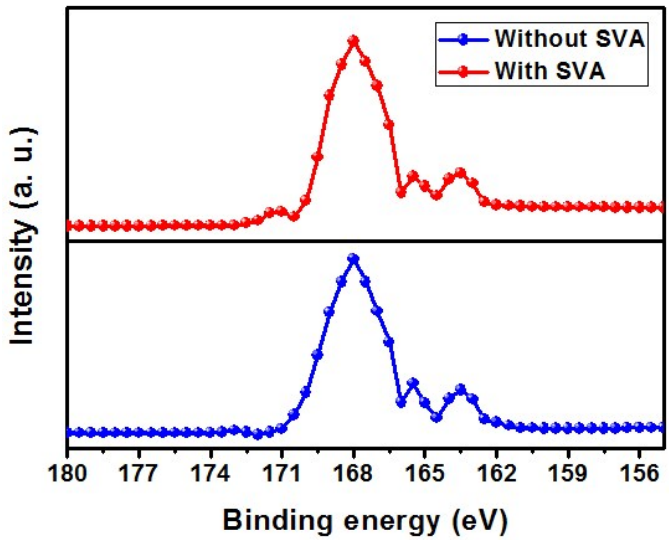


**Fig. S2.** XPS spectra of PEDOT:PSS without (a) and with (b) methanol-based SVA treatment.

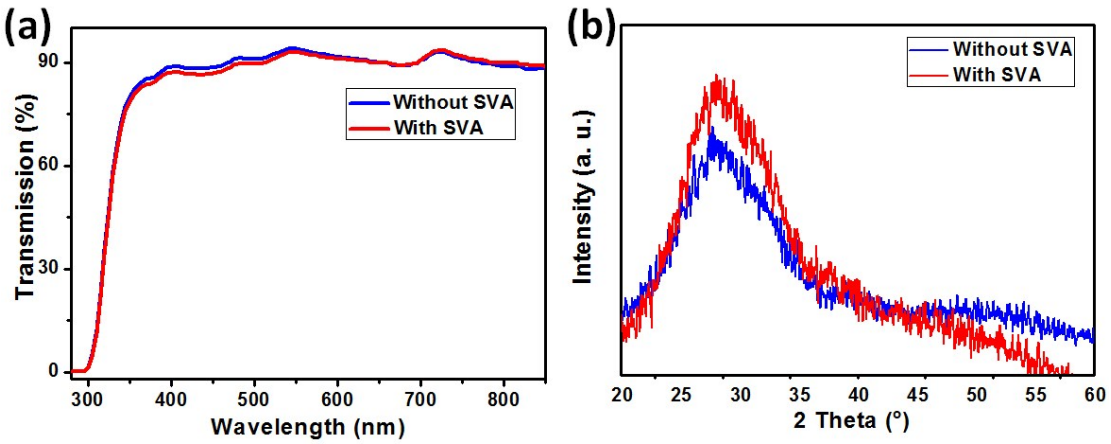


**Fig. S3.** (a) Transmission spectra and (b) XRD patterns of PEDOT:PSS on glass without and with methanol-based SVA treatment.

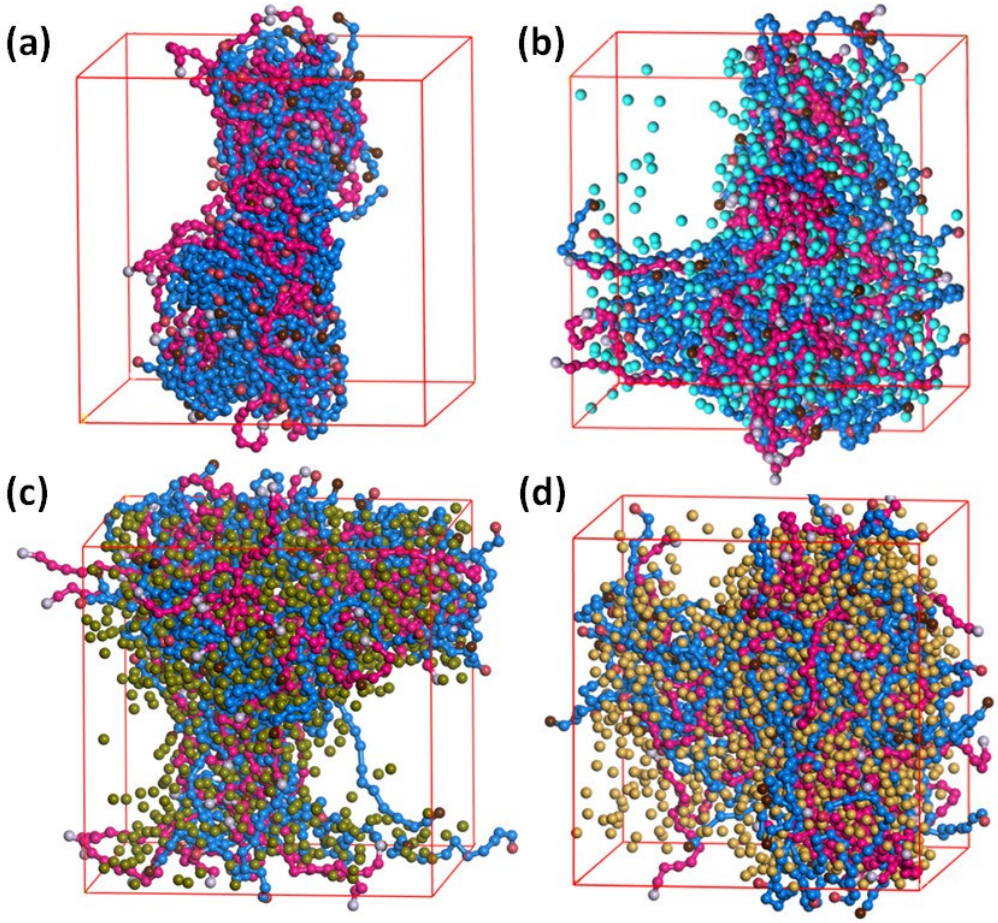


**Fig. S4.** Atomic simulation results of (a) pure PEDOT:PSS and PEDOT:PSS in (b) methanol, (c) ethanol, and (d) isopropanol. Blue and red clusters correspond to PEDOT and PSS, respectively, and the other colored dots stand for the solvent.

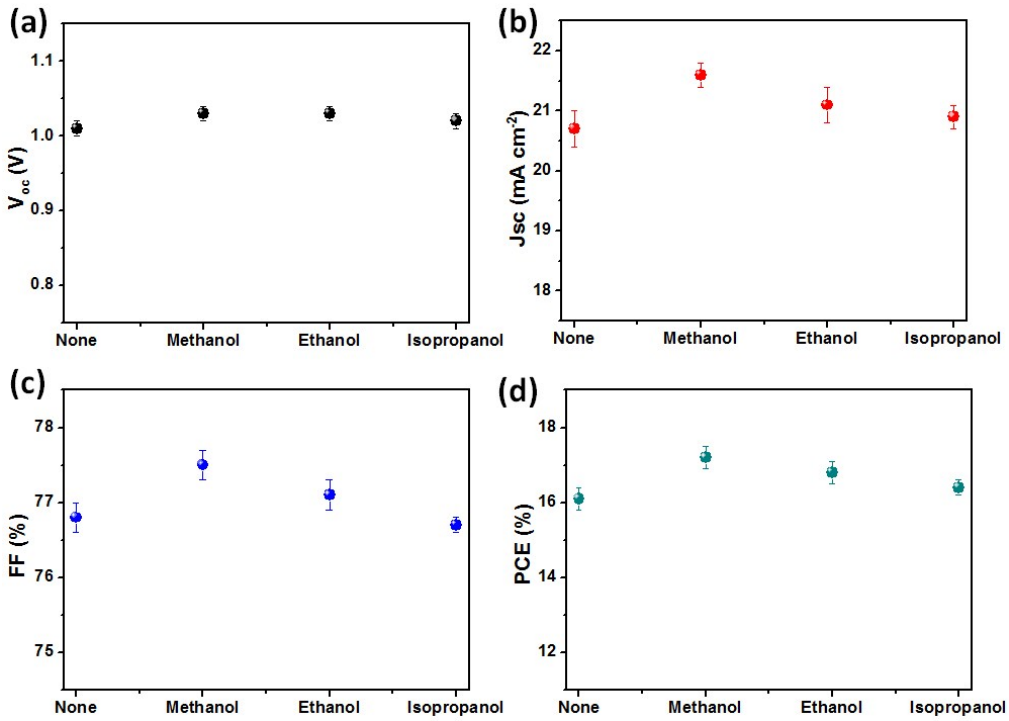


**Fig. S5.** Average values and standard deviations of (a) $V_{oc}$, (b) $J_{sc}$, (c) FF, and (d) PCE for 20 PSCs.