

## Supporting Information

### High-performance organic electrochemical transistor based on foam-structured channel prepared with a template washing-off method

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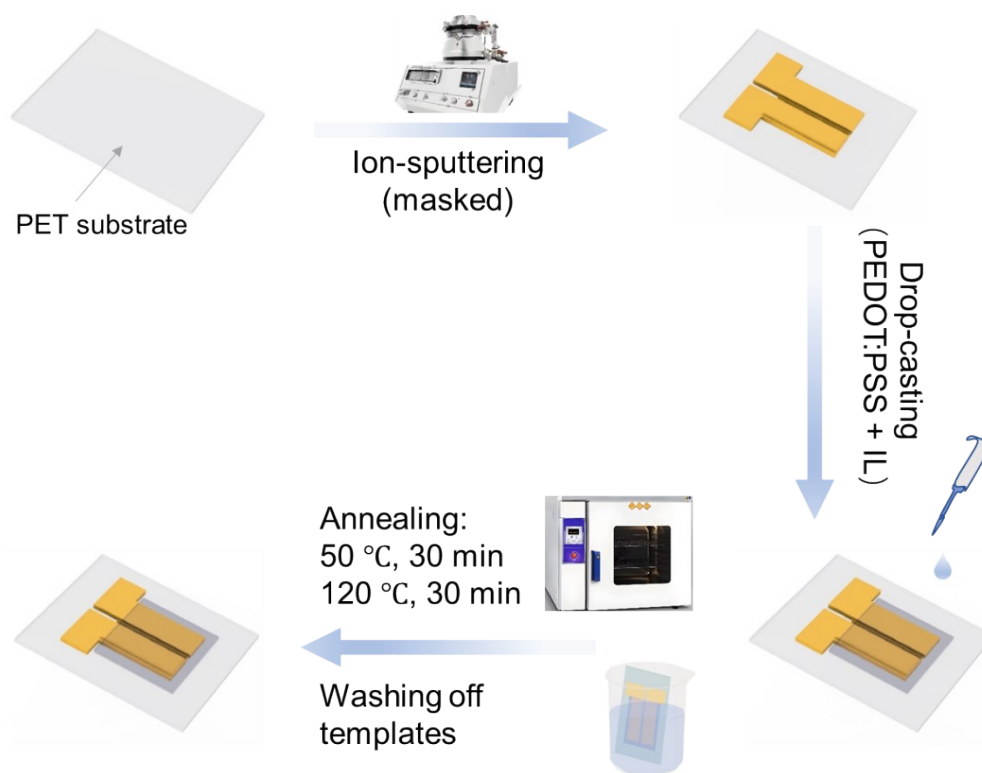
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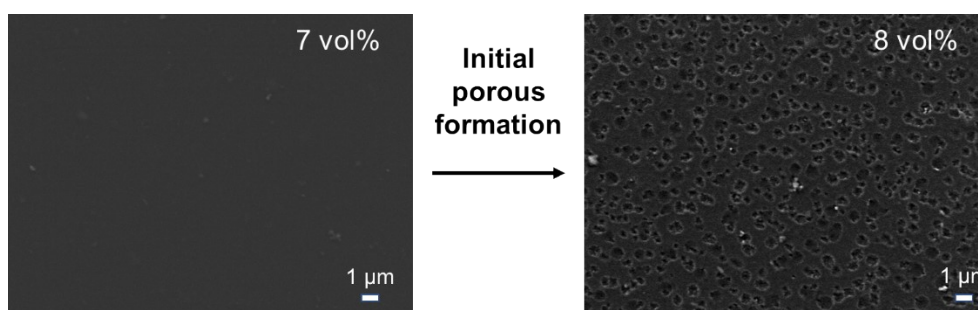
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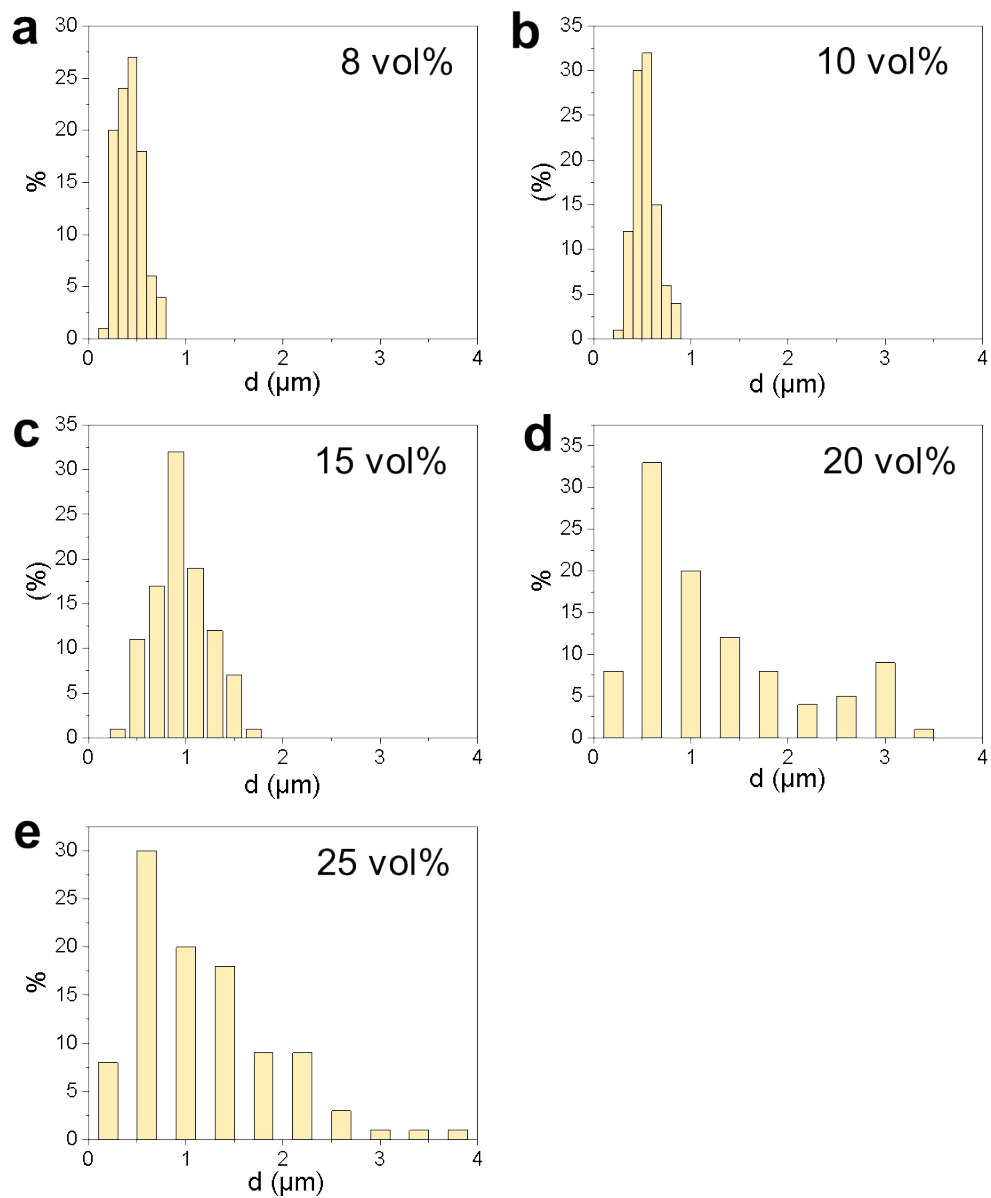
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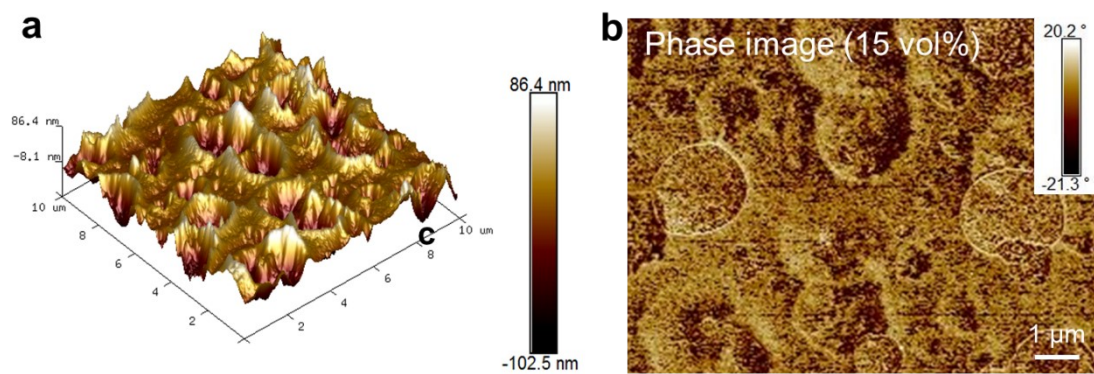
**Figure S1.** Preparation process of the OECT based on foam-structured PEDOT:PSS film. The source and drain gold electrodes were prepared by ion sputtering (masked). A mixture of PEDOT:PSS and IL in water:ethanol mixture was drop-casted and then annealed at 50°C for 30 min and followed by annealing at 120°C for 30 min. The IL in substrates was then washed away with a mixture of water and ethanol (volume ratio 1:3).



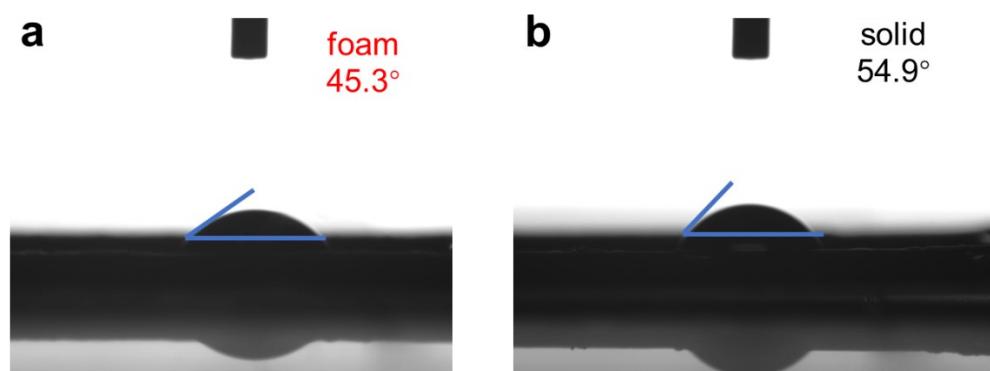
**Figure S2.** The porous structure foamed when the template ratio increased to 8 vol%.



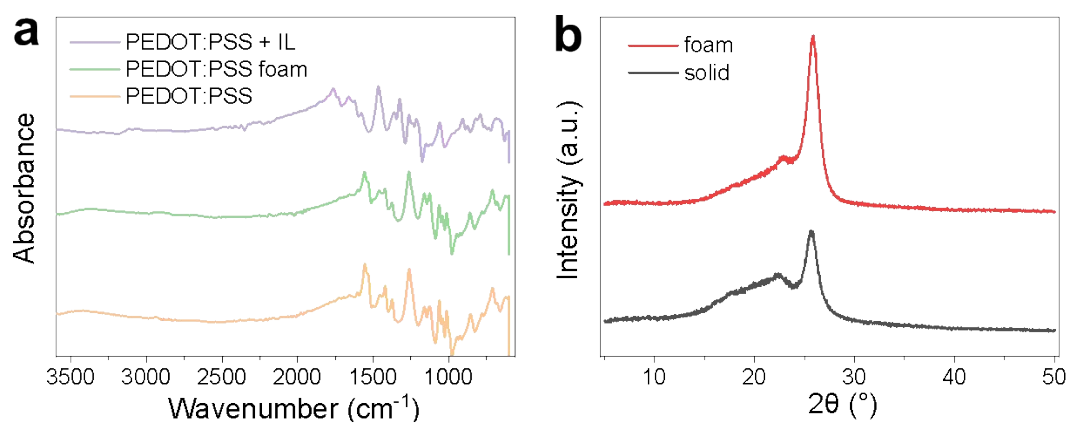
**Figure S3.** The distribution of pore diameters in the film samples with different pore contents. Roughly 100 pores were used for statistical analysis.



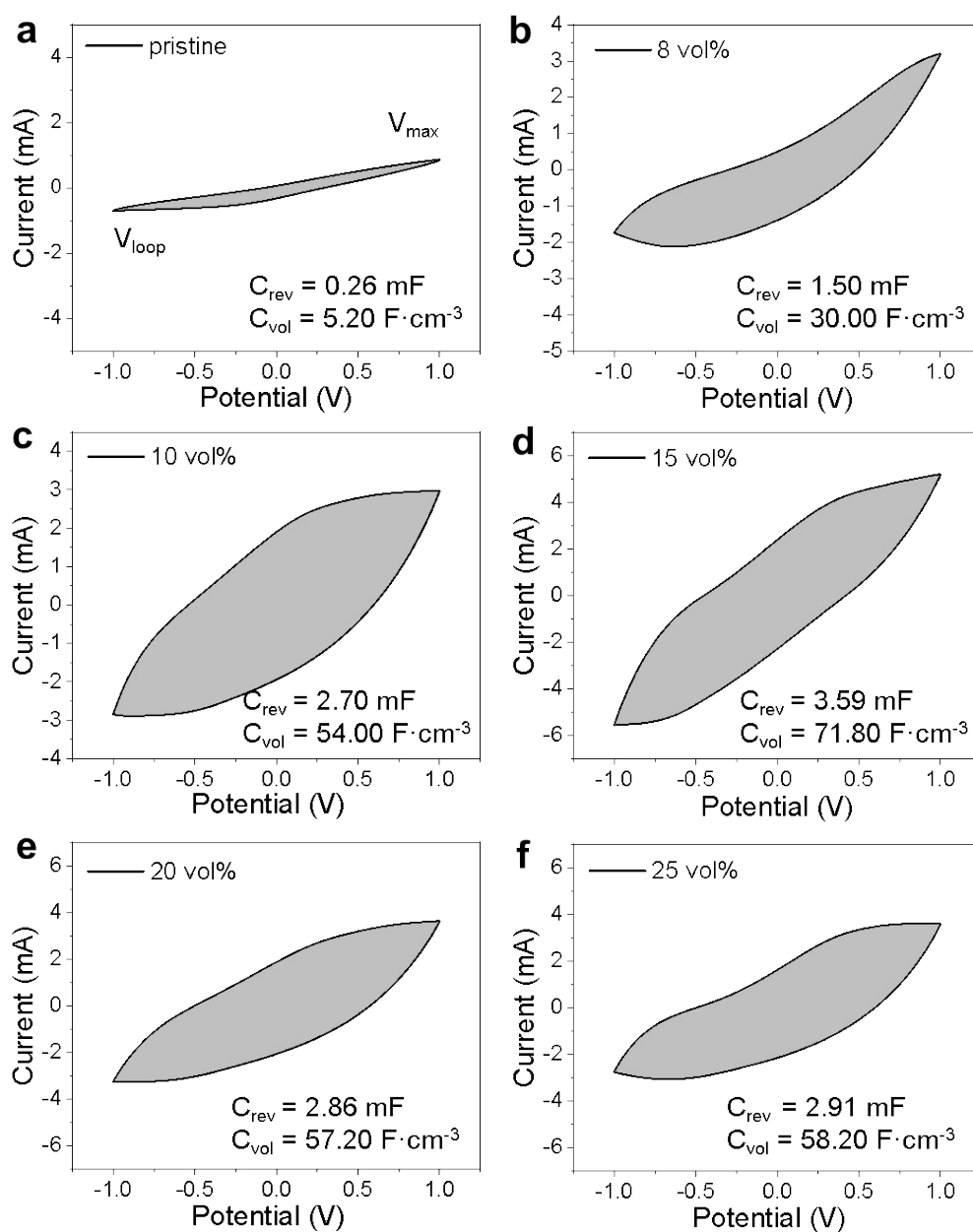
**Figure S4.** AFM (a) 3D topographical and (b) phase images of the foam-structured film with a pore content of 15 vol% foam films.



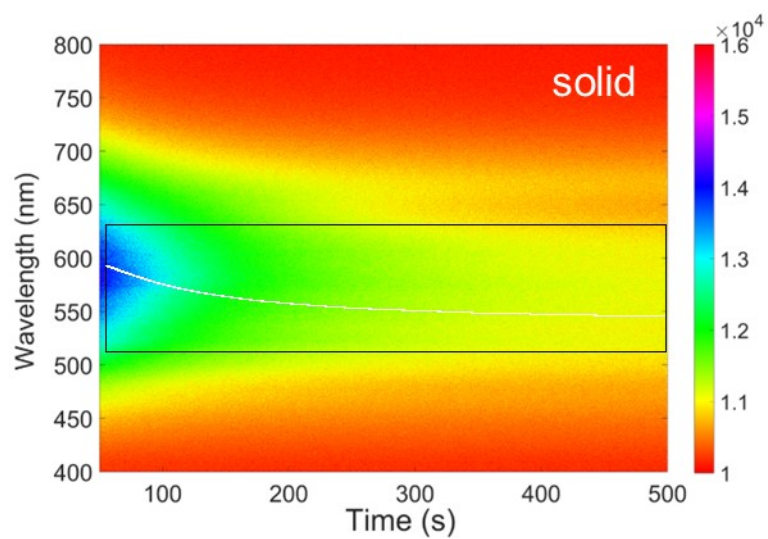
**Figure S5.** The water contact angles of the (a) foam-structured and (b) solid PEDOT:PSS films.



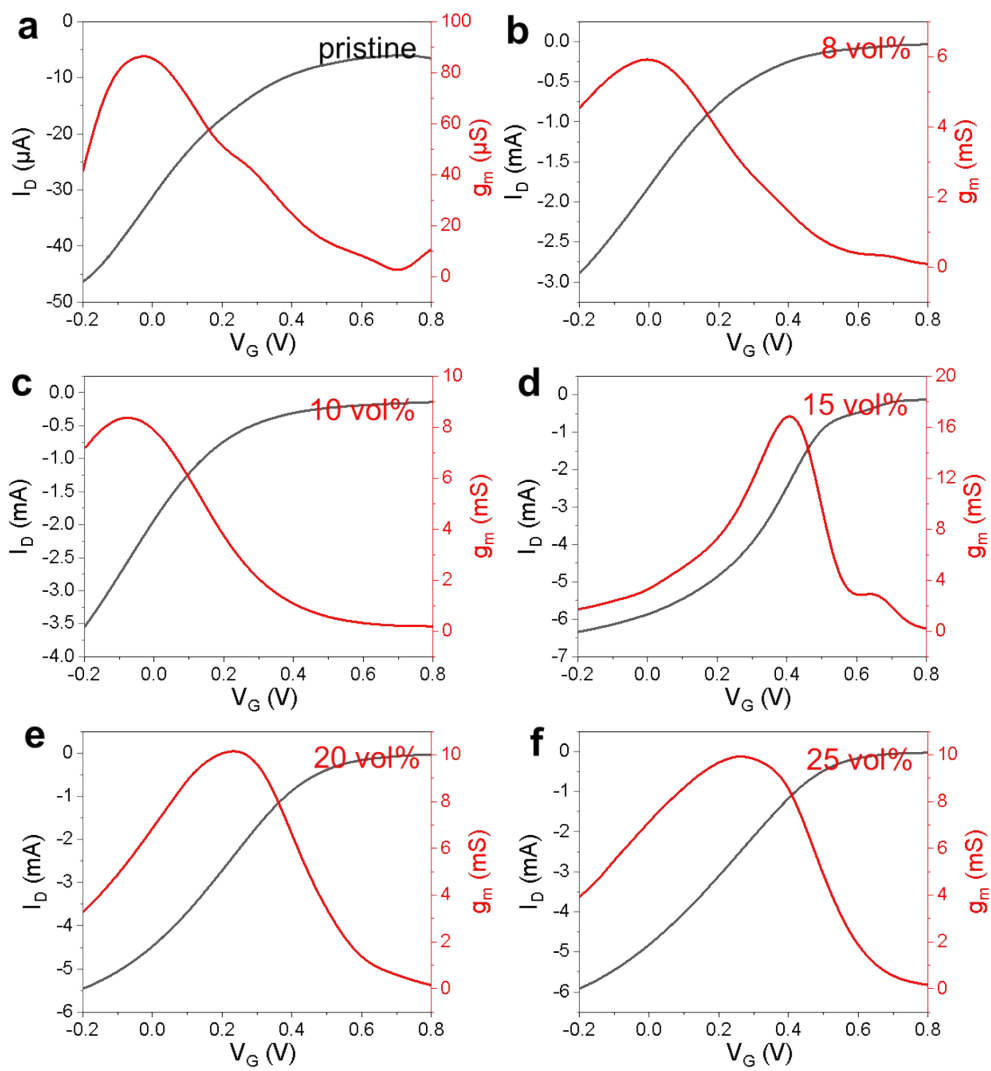
**Figure S6.** The (a) FTIR spectra and (b) XRD patterns of the foam-structured and solid PEDOT:PSS films. The peak of 1700~2000  $\text{cm}^{-1}$  indicates that IL was completely washed away.



**Figure S7.** CV curves at different pore contents and their reversible charge storage capacities. PBS buffer (0.01 M) was used as the electrolyte during measurements.



**Figure S8.** Kinetic absorption mapping of solid PEDOT:PSS film. A bias of 1.0 V was applied after 50 s.



**Figure S9.** Transfer curves of the OECTs based on (a) pristine and (b-f) foam-structured PEDOT:PSS films. The pore content varied from 8 to 25 vol%. The drain voltage was set as 300 mV.