Electronic Supplementary Material (ESI) for Journal of Materials Chemistry C.

Supplementary Material

"Supercooled Water Induced Hysteretic Transition in H_2SO_4-treated PEDOT:PSS"

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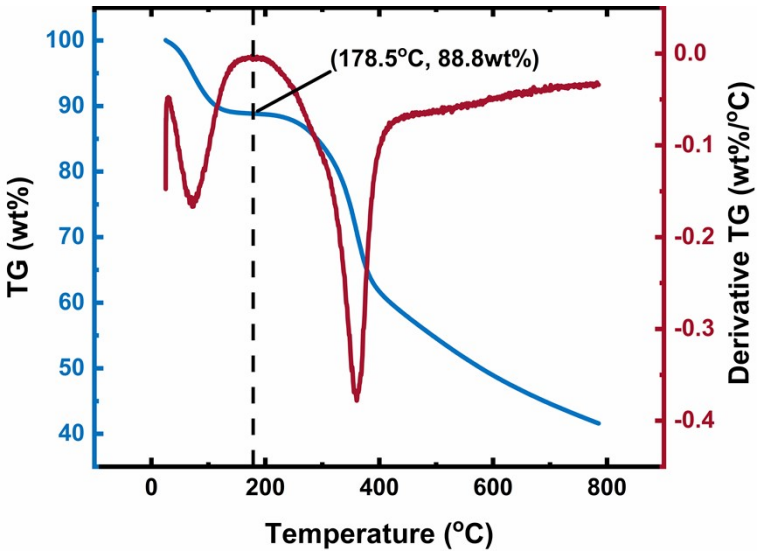


Fig. S1 Thermogravimetric (TG) and corresponding derivative thermogravimetric curves of the PEDOT:PSS film post treated by H_2SO_4. The TG platform at 178.5 $^{\circ}C$ indicates the removal of water molecules from the film with a water content of approximately 11.2 $wt\%$.

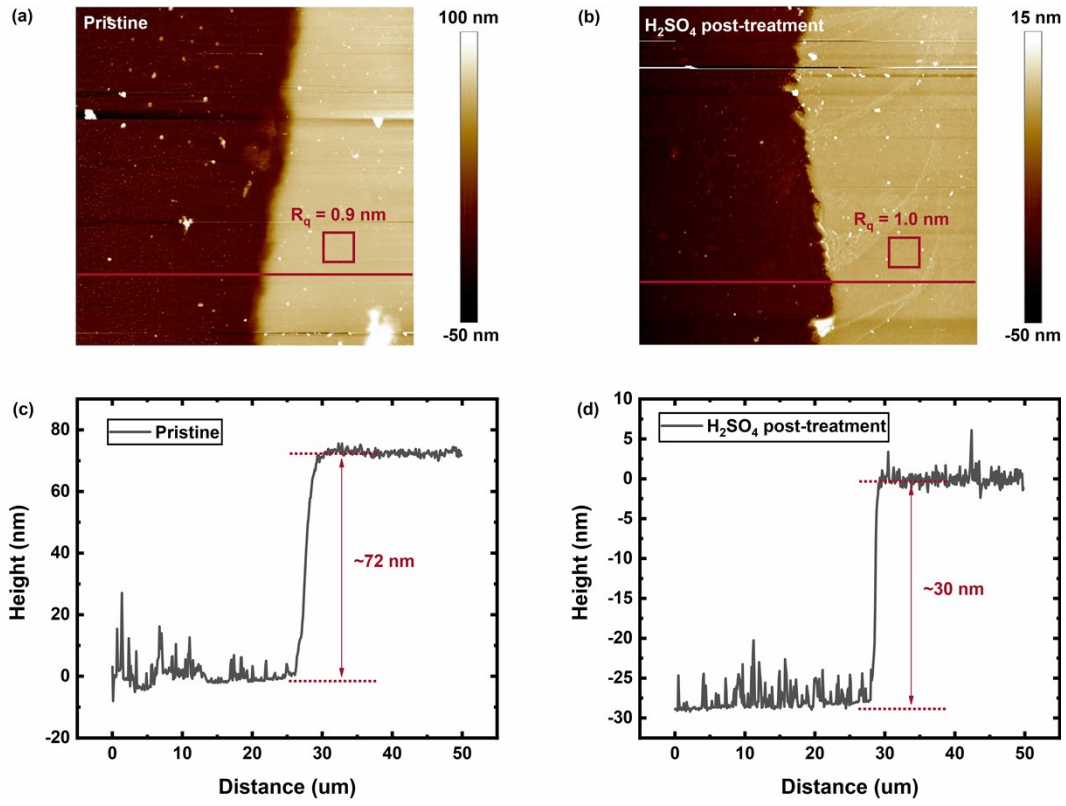


Fig. S2 The atomic force microscope (AFM) topographic images of the PEDOT:PSS thin film (a)

before and (b) after the H_2SO_4 post-treatment. The root mean square roughness (R_q) of the PEDOT:PSS films with and without the H_2SO_4 treatment were 0.9 nm and 1.0 nm, respectively. From the height profiles illustrated in (c, d), thickness of the film is decreased from 72 nm to 30 nm after H_2SO_4 treatment.

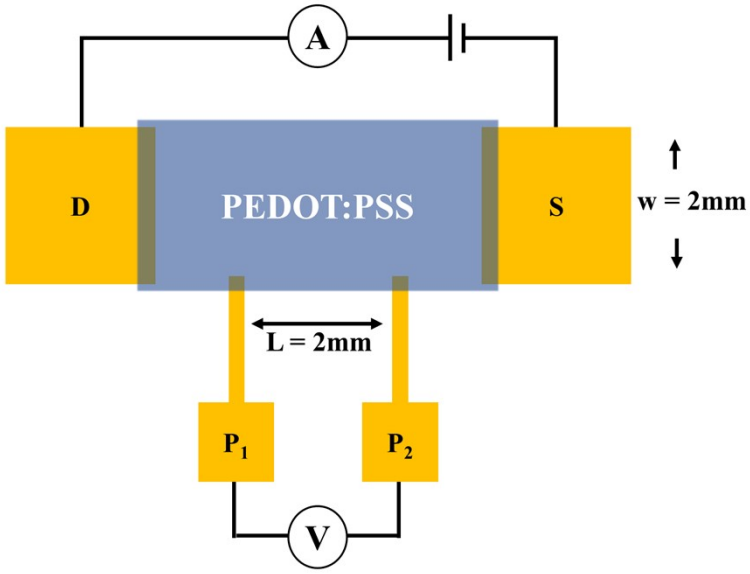


Fig. S3 Schematic diagram of the standard four-terminal resistance measurement method for measuring the conductivity of film. A source-drain current $\boldsymbol{I_{SD}}$ goes through the outer electrodes while the voltage $\boldsymbol{V_{P_1P_2}}$ probes between the inner probes is measured. The electrical conductivity of PEDOT:PSS film was given by $\sigma = \frac{I_{SD}}{V_{P_1P_2}} \frac{L}{t * w}$, where $\boldsymbol{L}$ is the channel length (the distance between two inner terminals P_1 and P_2); $\boldsymbol{t}$ is the film thickness; $\boldsymbol{w}$ is the channel width. To facilitate good adhesion of Au layer, a pure Ti layer was first deposited onto wafer, and the thickness of Ti layer and Au layer was 5 and 30 nm, respectively.

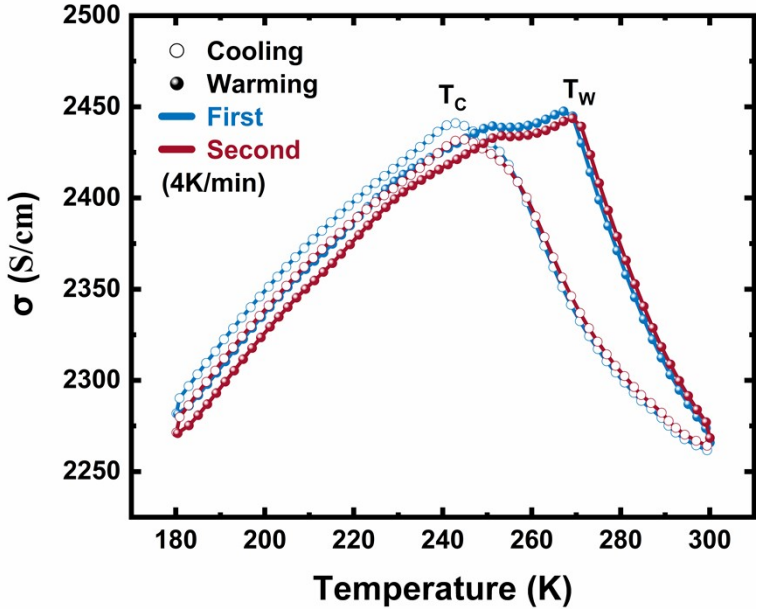
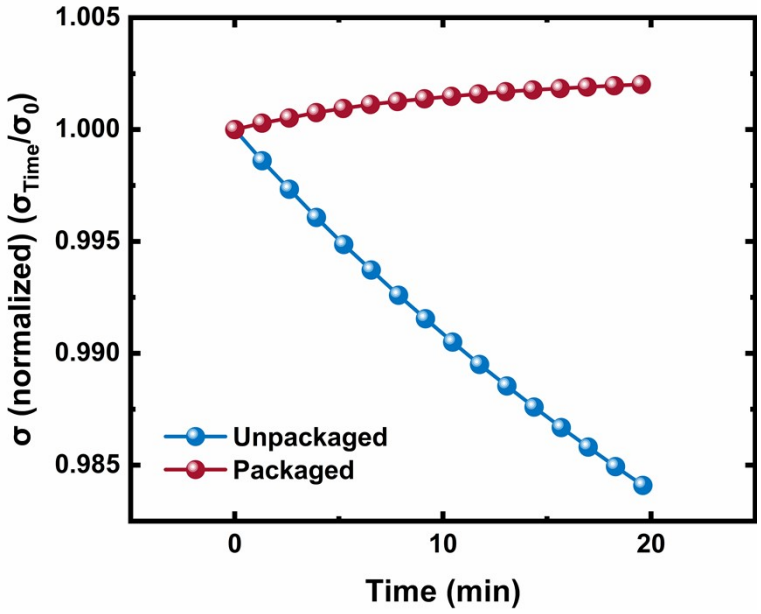
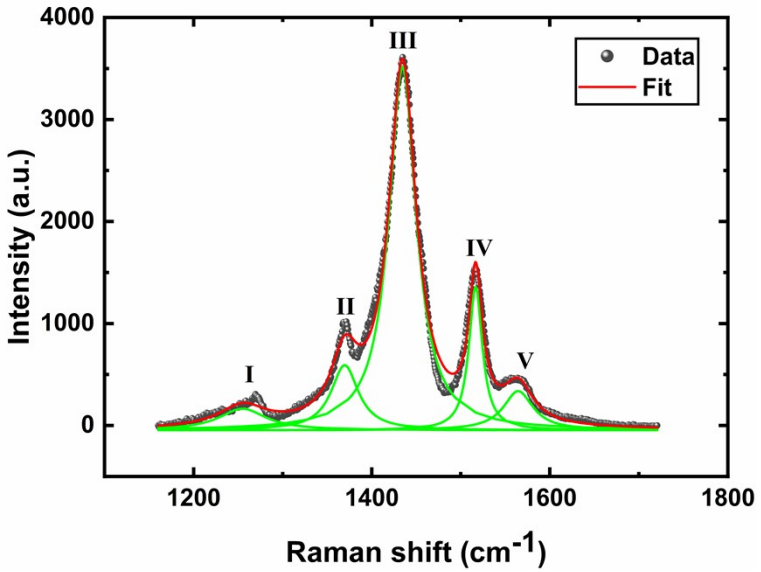


Fig. S4 Conductivity versus temperature (σ - T) curves between 180-300 K in cooling and warming of the H_2SO_4-treated PEDOT:PSS film. The transition temperature difference obtained from two



consecutive cycles of testing is basically the same.

Fig. S5 Evolution of the normalized conductivity as a function of time after the sample was placed into chamber and the chamber pressure was reduced to 10 Torr. The conductivity of the unpackaged and packaged samples is monitored at 300 K for 20 minutes upon they are transferred from



atmosphere to the PPMS chamber. The chamber is at a pressure of 10 Torr after purging helium three times, a same condition with that for obtaining the σ - T curves in Fig. 1.

Fig. S6 Multi-peak fitting with Gaussian function for Raman spectrum of the H_2SO_4-treated PEDOT:PSS film.