

SUPPLEMENTARY INFORMATION

Strain-Dependent Charge Trapping and Its Impact on the Operational Stability of Polymer Field-Effect Transistors

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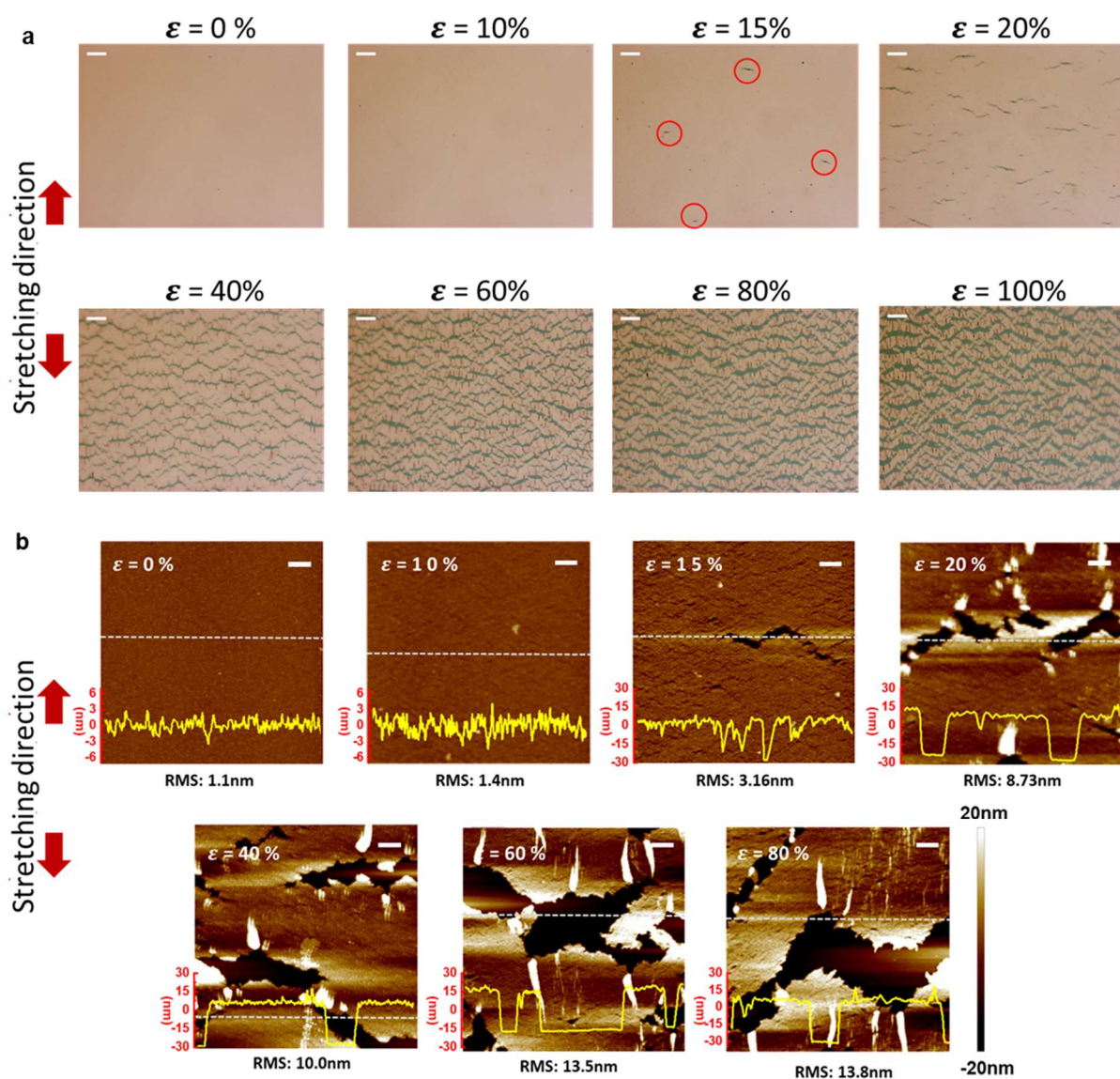
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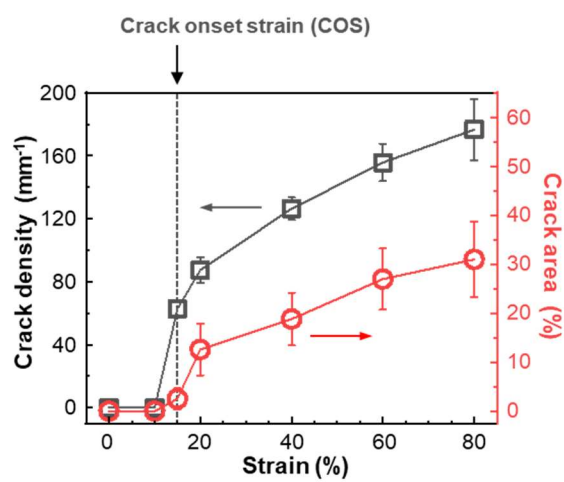
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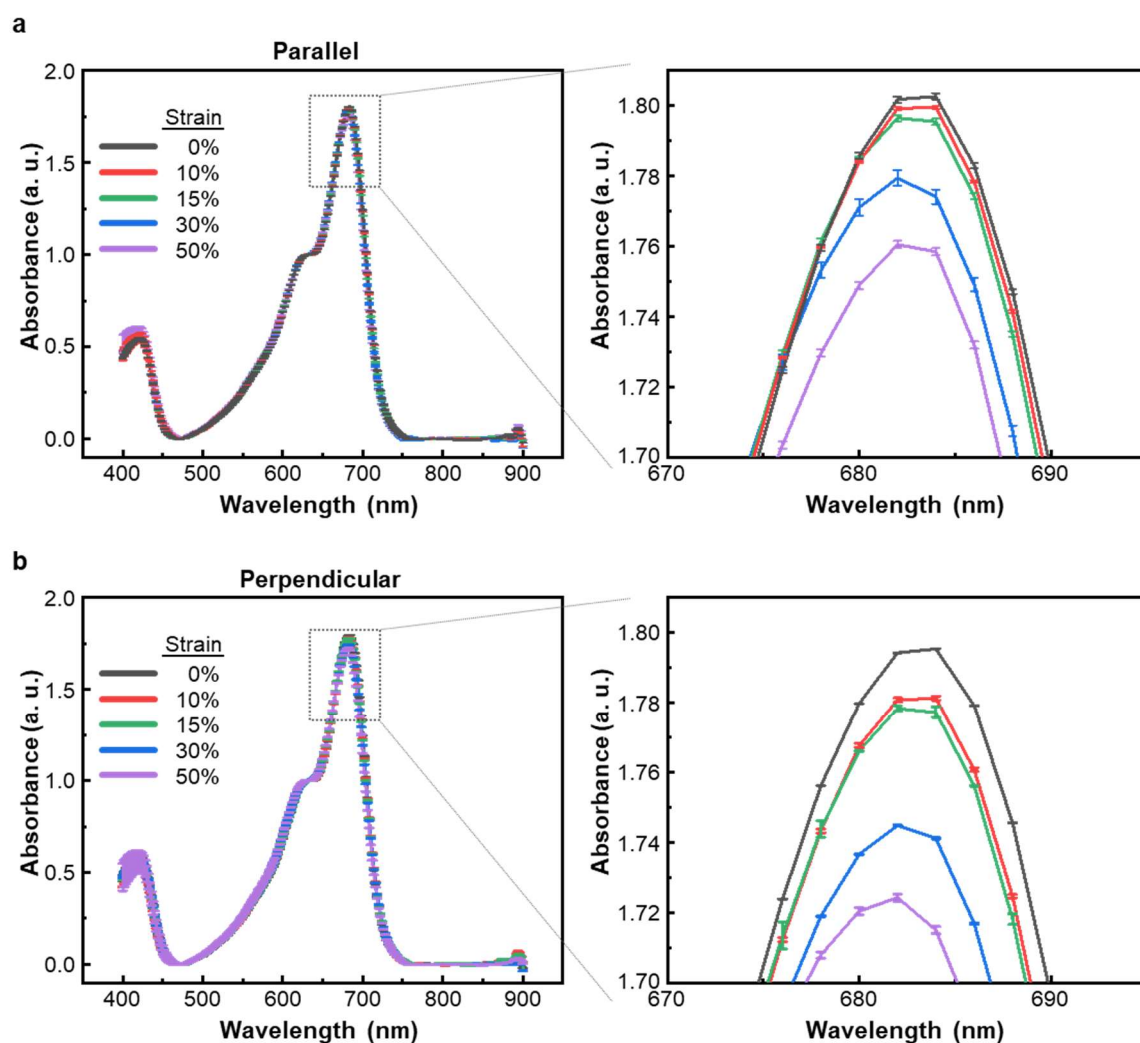
Keywords: charge trapping, operational stability, organic field-effect transistors, polymer semiconductor, stretchable electronics



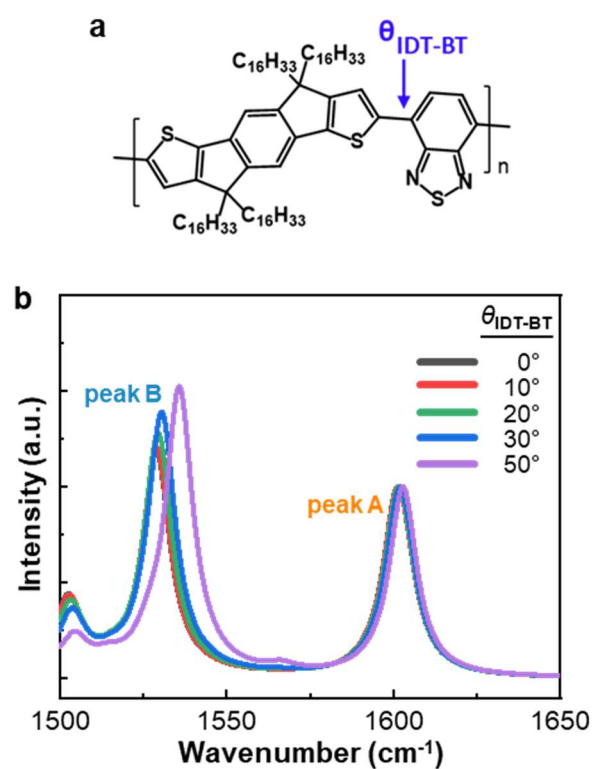
Supplementary Fig. 1. (a) Optical microscope images of IDTBT films under various tensile strains up to 100% (scale bar: 10 μm). (b) AFM height images of IDTBT films under various tensile strains (scale bar: 1 μm). Yellow solid line within the AFM images is the one-dimensional height profile along the grey dashed line.



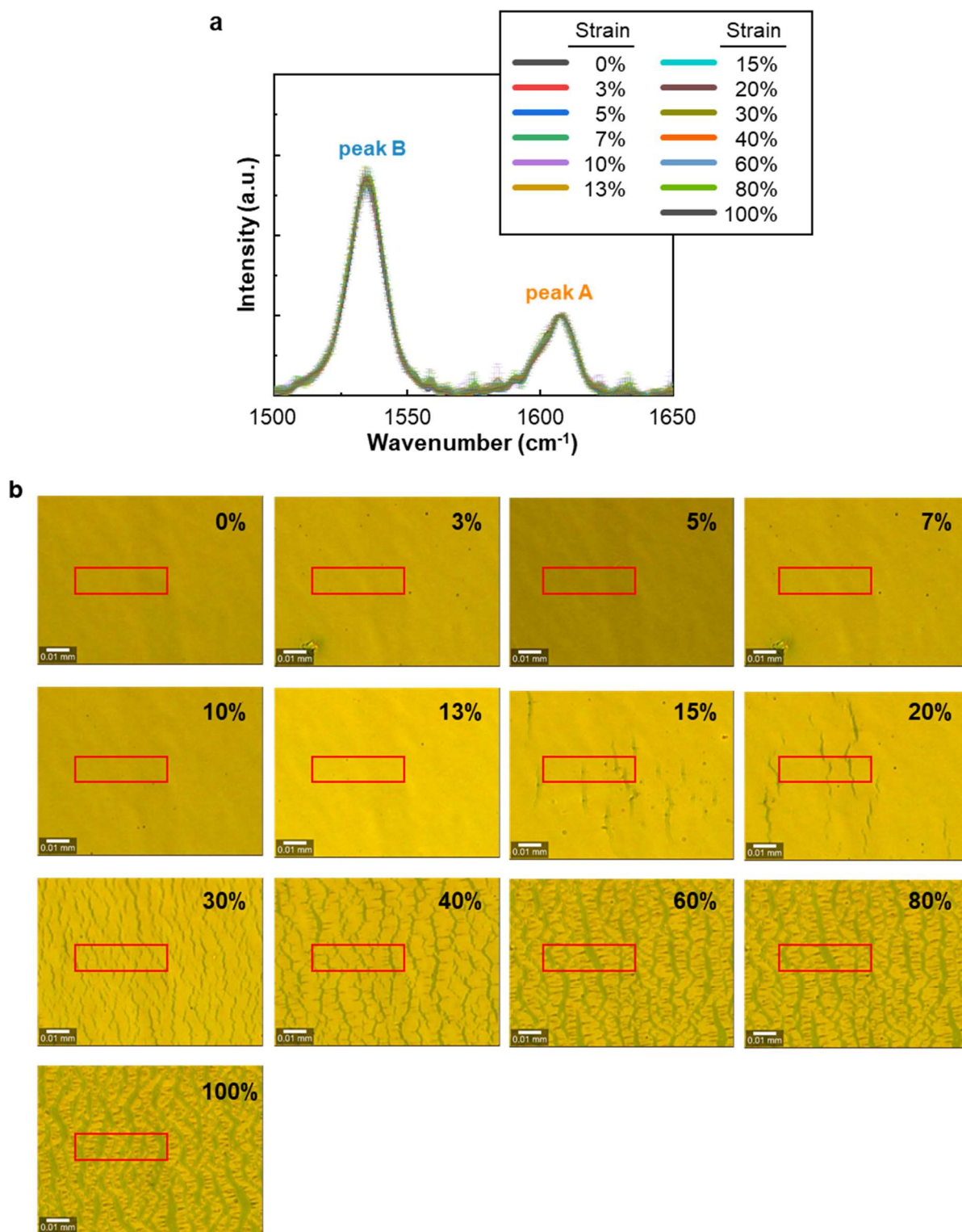
Supplementary Fig. 2. Crack density and area of the IDTBT film as a function of applied tensile strain. The black dashed line indicates crack onset strain (COS).



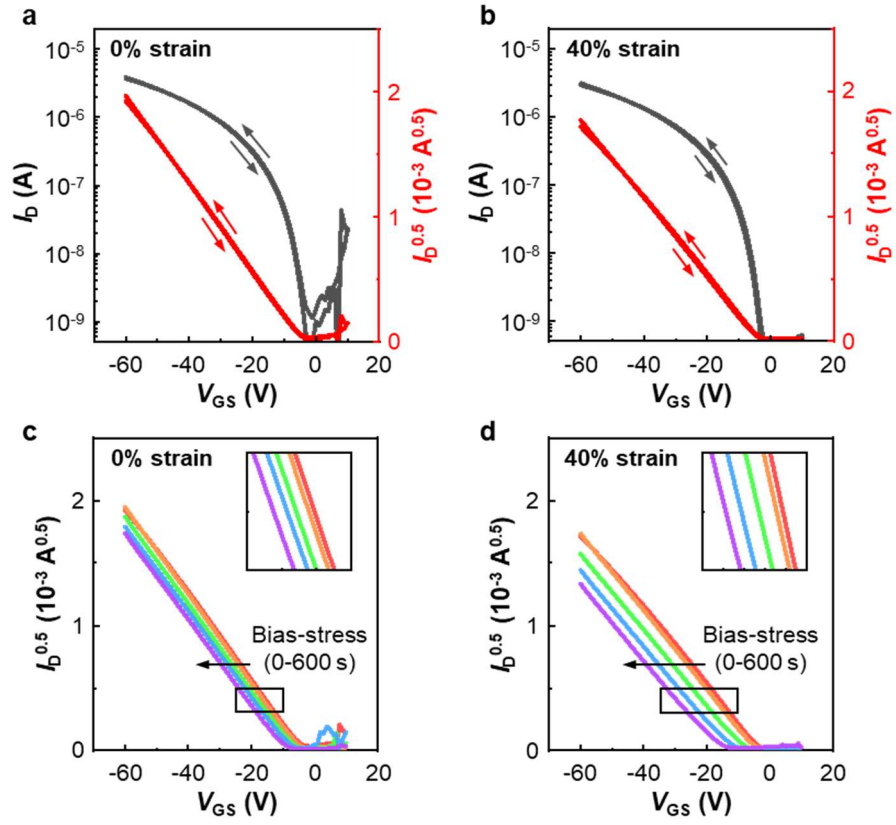
Supplementary Fig. 3. UV-vis absorption spectra of IDTBT films at different tensile strains. The spectra were obtained with polarized light sources: (a) parallel to the strain direction and (b) perpendicular to the strain direction.



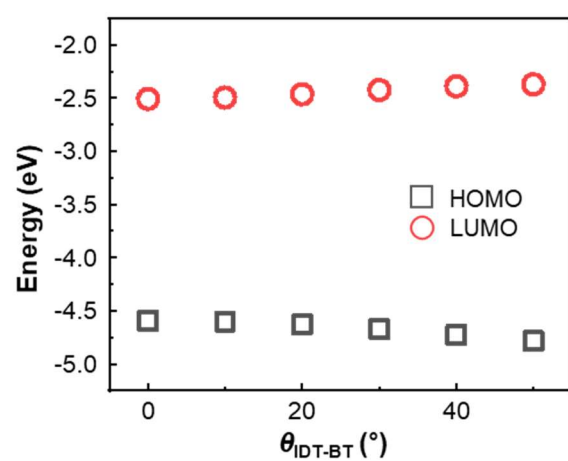
Supplementary Fig. 4. (a) Chemical structure of IDTBT. The dihedral angle between IDT and BT units is indicated ($\theta_{\text{IDT-BT}}$). (b) DFT-simulated Raman spectra of IDTBT with different $\theta_{\text{IDT-BT}}$. The position and intensity of the peaks change with $\theta_{\text{IDT-BT}}$.



Supplementary Fig. 5. (a) Experimentally measured Raman spectra of IDTBT films under various tensile strains. (b) Optical microscope images of the IDTBT films used in the Raman spectrum measurements. The Raman spectra of each sample was measured over a large area ($40\ \mu\text{m} \times 10\ \mu\text{m}$, red square) and then averaged.



Supplementary Fig. 6. (a, b) Transfer curves of fresh (no bias-stress applied) FET devices with 0% (a) or 40% (b) strain on the IDTBT film. The devices show negligible hysteresis. (c, d) Transfer curves of the devices with 0% strain (c) or 40% strain (d) on the IDTBT film after applying bias-stress. The transfer curves shift more as the bias-stress time increases. The insets in (c) and (d) are enlargements of the boxed areas.



Supplementary Fig. 7. DFT-calculated HOMO and LUMO energy levels of IDTBT as a function of $\theta_{\text{IDT-BT}}$.