Supporting Information

Mechanism of Polymer Removal from Semiconducting Single-Walled Carbon Nanotubes via Rapid Thermal Processing: Insights from *In-situ* Environmental Transmission Electron Microscopy

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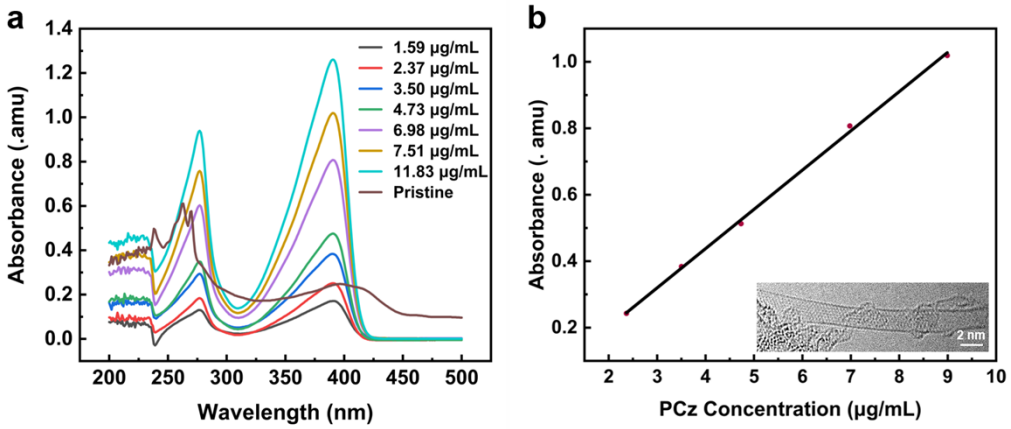

Figure S1. Characterization of pristine sample. (a) *UV-vis* absorption spectroscopy and (b) Liner fitting of absorbance and PCz concentration (the inset is a typical polymer wrapping morphology).

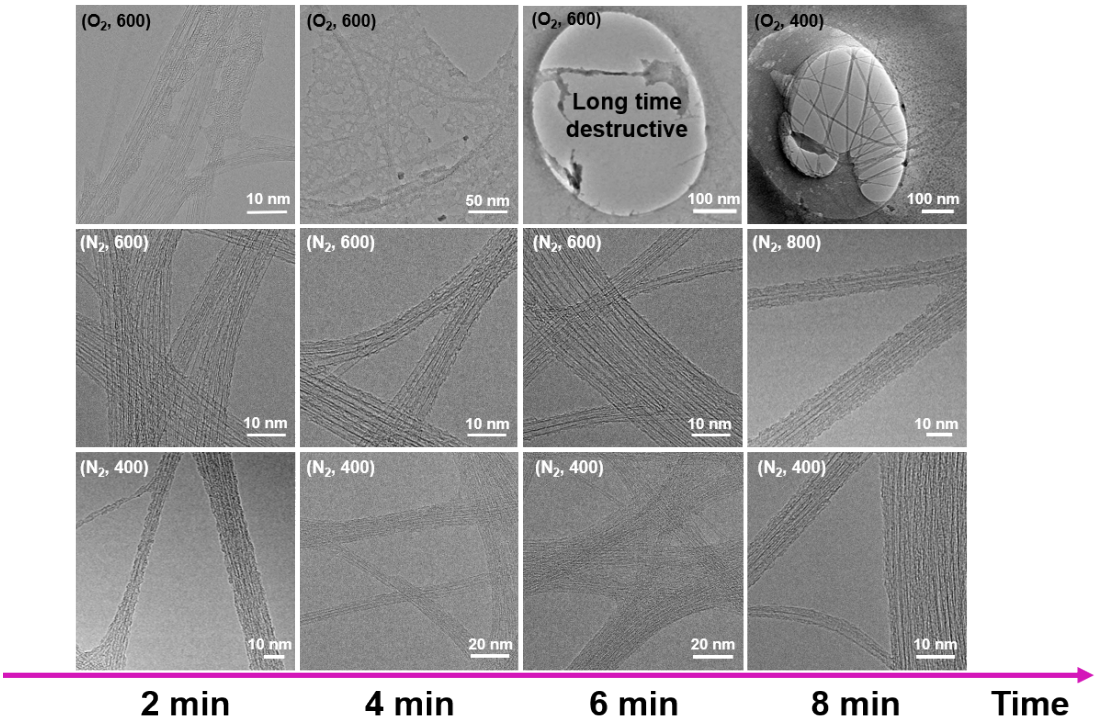

Figure S2. TEM images of CNTs under different RTP time (t= 2, 4, 6, 8 min), temperature (400, 600, 800°C) and gas atmosphere (N_2 and O_2).

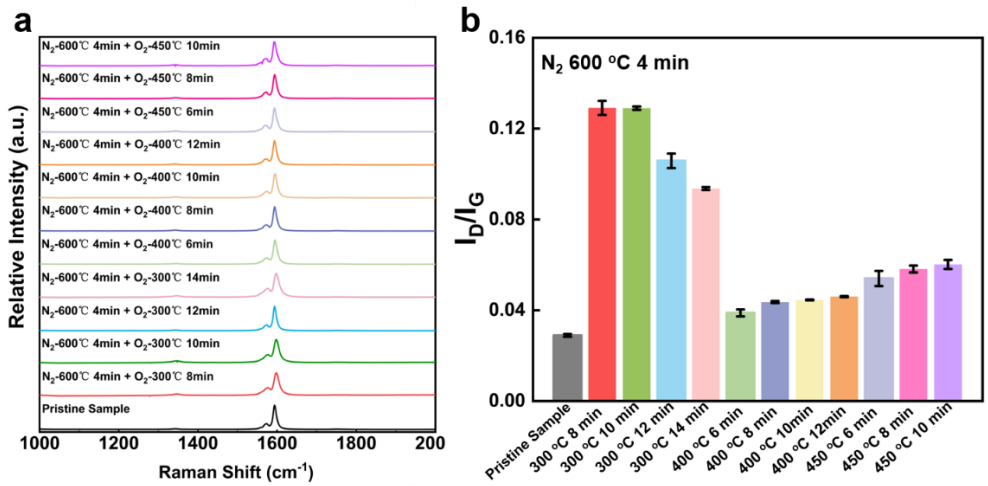

Figure S3. Detailed Raman results. (a) Raman full spectra under different RTP treatment conditions. (b) I_D/I_G defect ratio statistics under different treatment conditions.

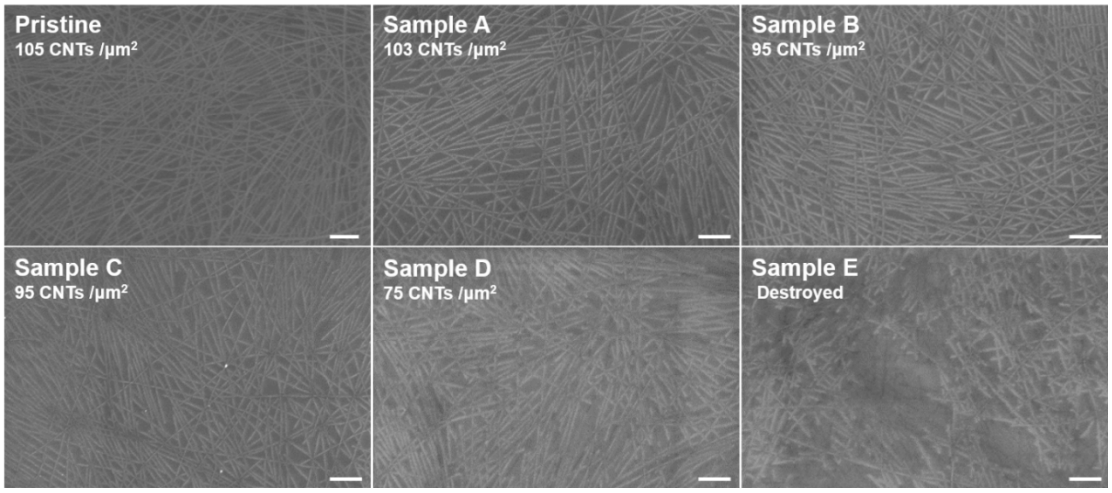

Figure S4. SEM characterization of the carbon nanotube network. (scale bar: 200 nm)

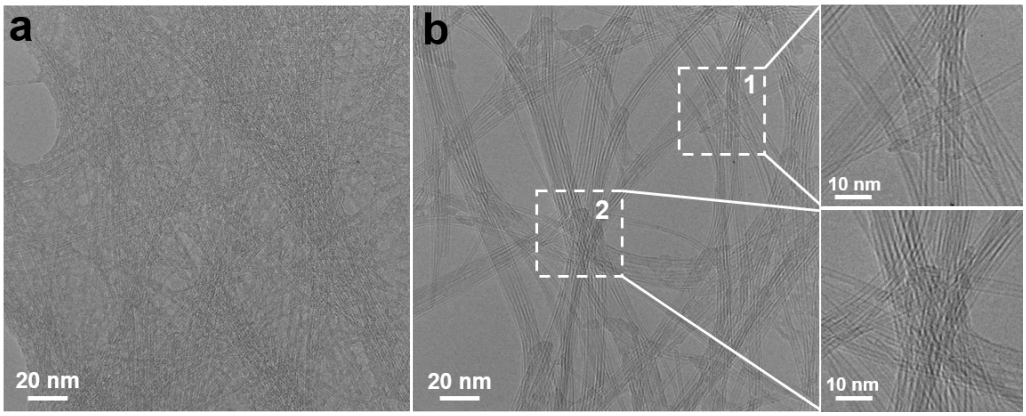

Figure S5. *In-situ* TEM control experiment without electron beam irradiation. (a), (b) are the TEM characterizations before and after the *in-situ* experiment without e-beam exposure, respectively.

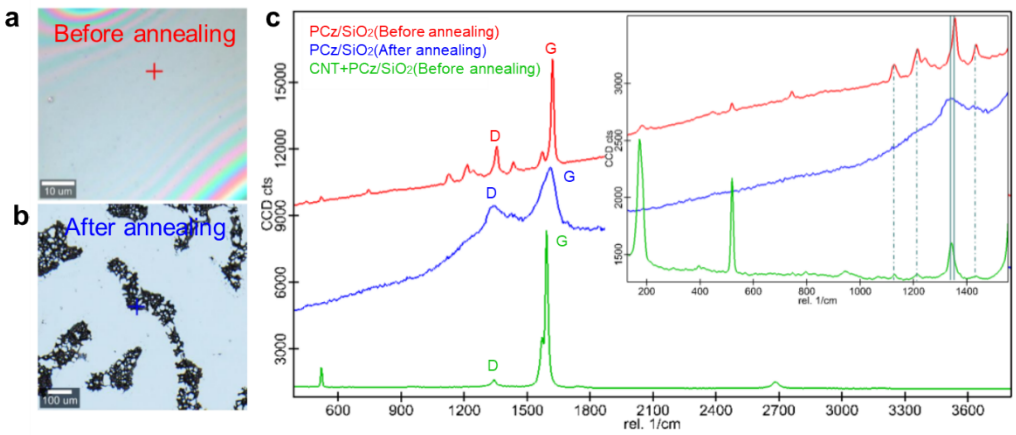

Figure S6. The Raman spectra of PCz/SiO_2 before and after annealing.

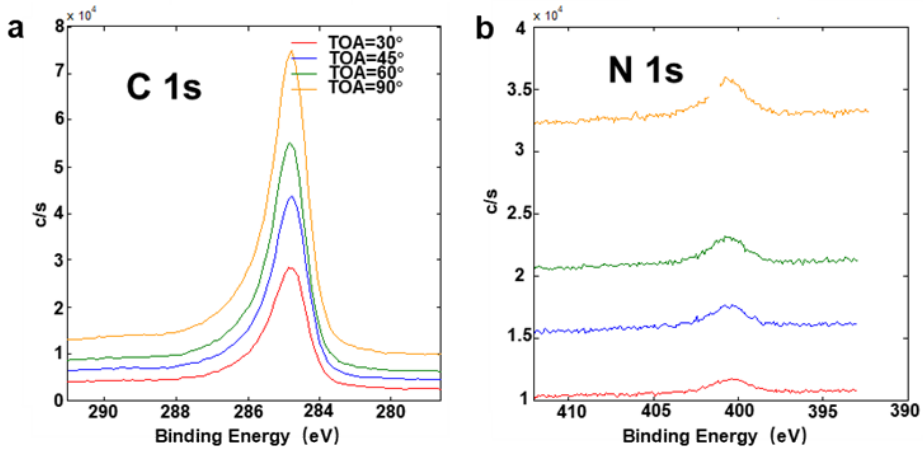

Figure S7. Angle-resolved X-ray photoelectron spectroscopy (ARXPS) data for a representative PCz-coated s-SWCNT sample. High-resolution spectra of the (a) C 1s and (b) N 1s regions acquired at take-off angles (TOA) of 30°, 45°, 60°, and 90°. These measurements demonstrate the effect of TOA on the detected signal intensity and are used to assess surface sensitivity.

Table S1. Atomic concentrations of detected elements from angle-resolved XPS measurements on a representative PCz-coated s-SWCNT sample. Values (at%) are quantified from spectra acquired at take-off angles (TOA) of 30°, 45°, 60°, and 90°, corresponding to the data shown in Figure S7. Elements typically include C, N, O, and Si from the polymer and substrate.

Components / Atomic Concentration	C 1s	O 1s	N 1s	Si 2p
TOA 30	48.92	31.46	0.74	18.87
TOA 45	40.80	37.91	0.56	20.73
TOA 60	35.34	42.43	0.54	21.69
TOA 90	28.20	48.62	0.48	22.71