

Supporting Information

Organic Single Crystal Surface-induced Polymerization of Conducting Polypyrrole

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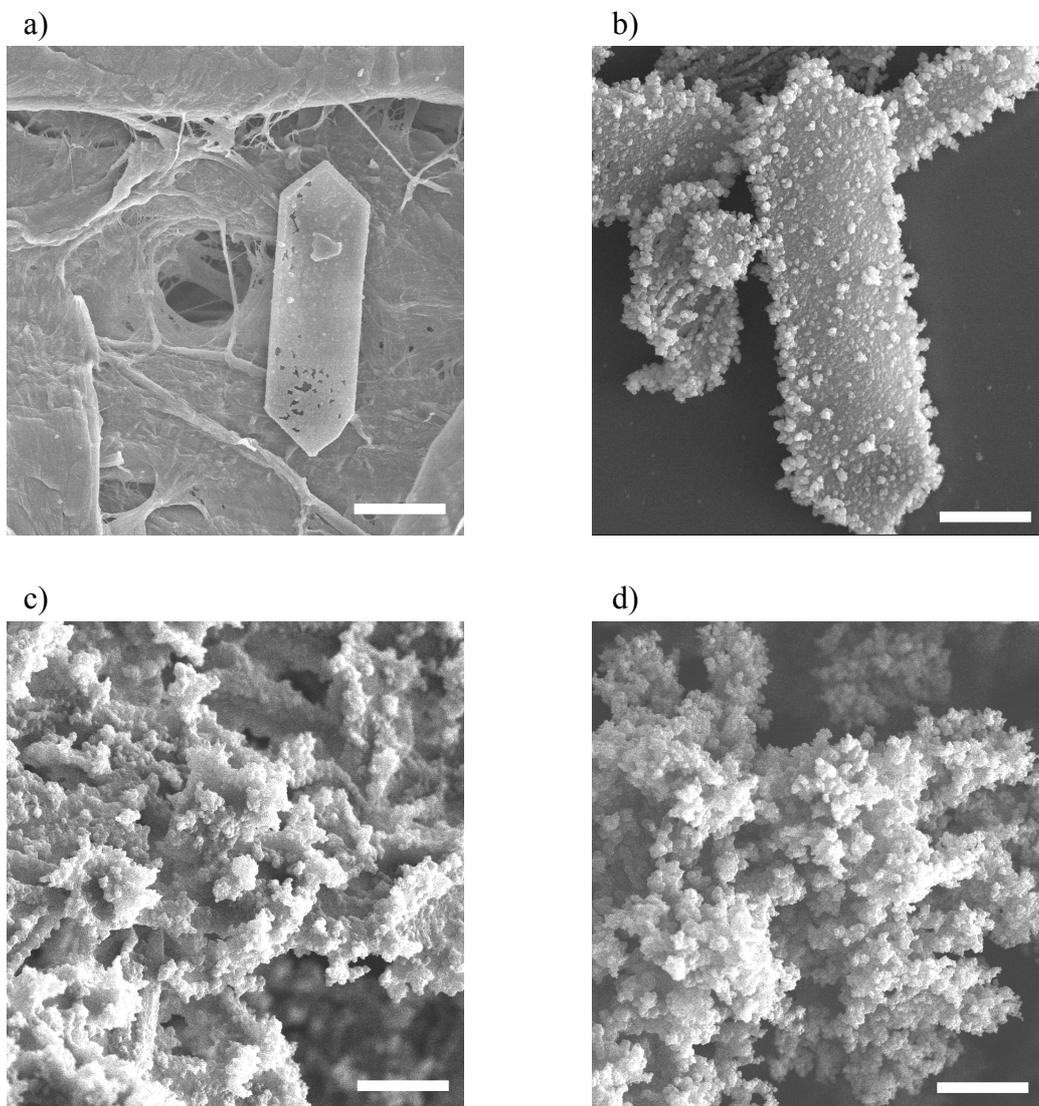


Figure S1. Polypyrrole produced under different polymerization temperatures. a)–d), SEM images (scale bar: 10 μm) of polypyrrole synthesized under different temperatures: a), 0 °C; b), 5 °C; c), 10 °C; and d), 15 °C.

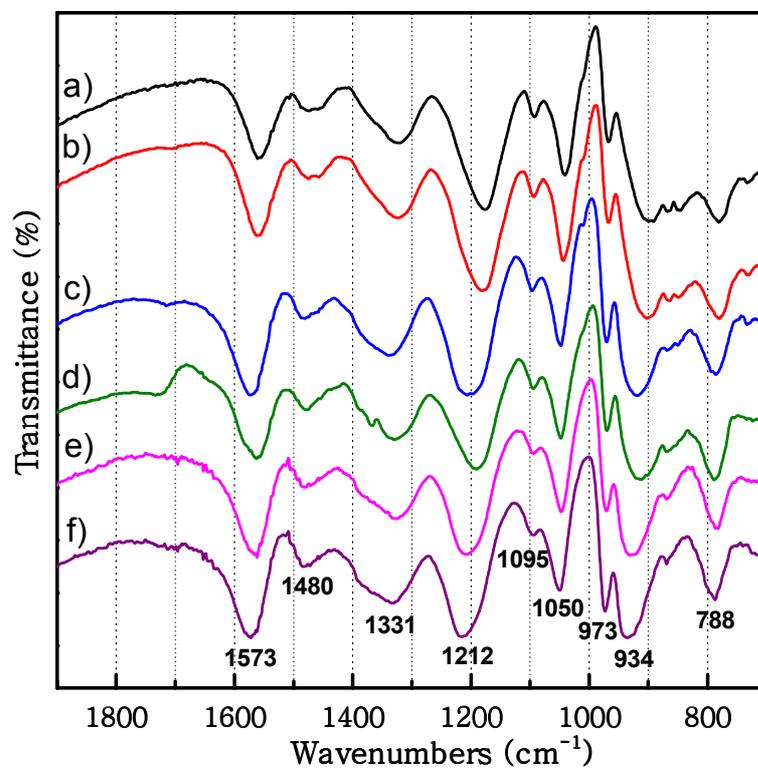


Figure S2. FT-IR spectra of synthesized PPy samples. a), b), c) and d) PPy synthesized at 0, 5, 10 and 15 °C in the presence of KSBA, respectively; e) and f) PPy synthesized at 0 and 15 °C without KSBA, respectively.

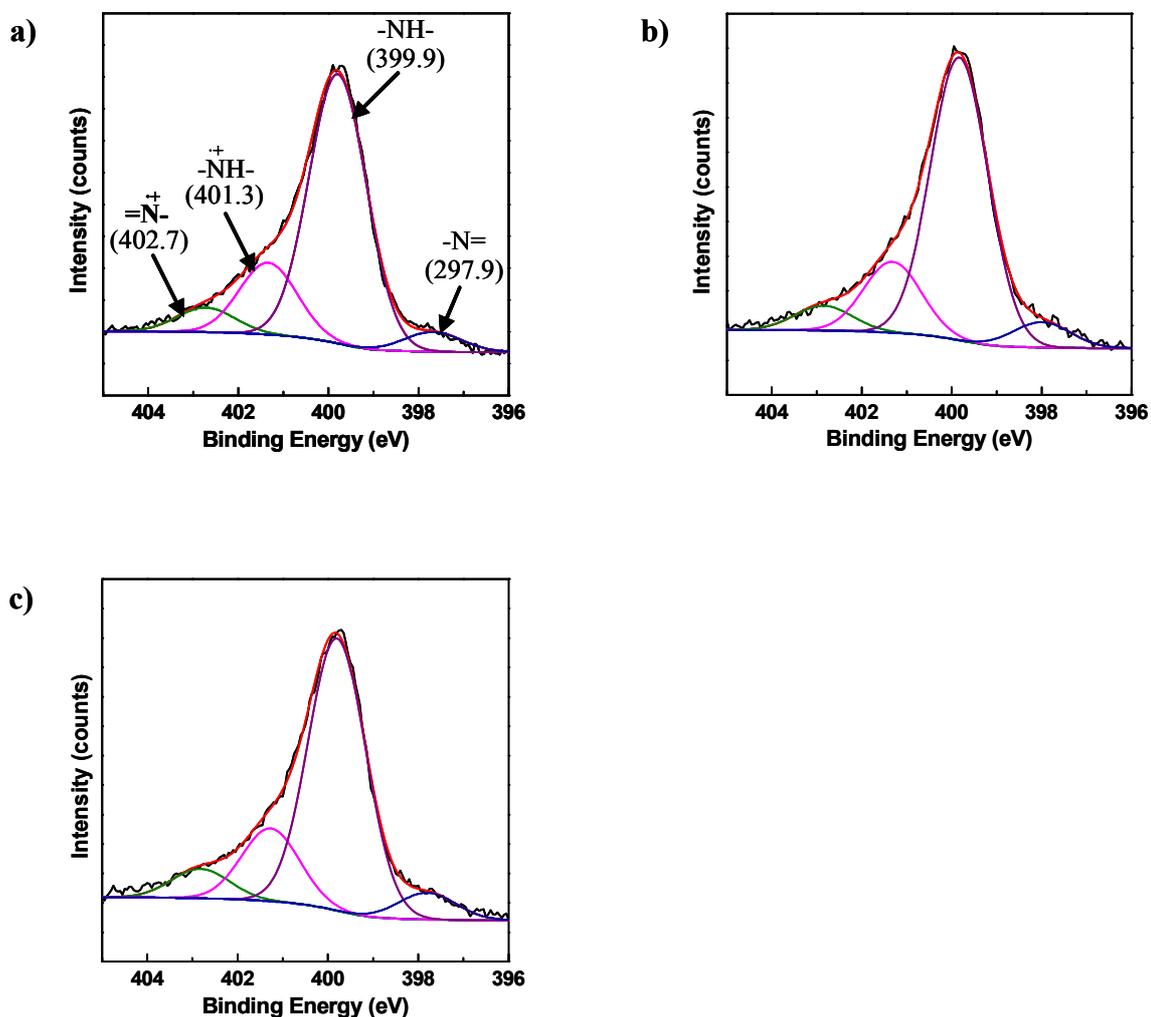


Figure S3. N1s core level spectra of x-ray photoelectron spectroscopy. **a), b)** PPy synthesized at 0 and 15 °C in the presence of KSBA, respectively; **c)** PPy synthesized at 0 °C without KSBA. The area ratio of $(=\text{N}^+ + -\text{NH}^+)/N_{\text{total}}$ indicating the doping level of the samples is 0.25, 0.24, and 0.25 in **a)–c)**, respectively, and the respective average electrical conductivity is 412, 174, and 75 Scm^{-1} . This indicates that the samples have similar doping levels irrespective of the polymerization conditions.

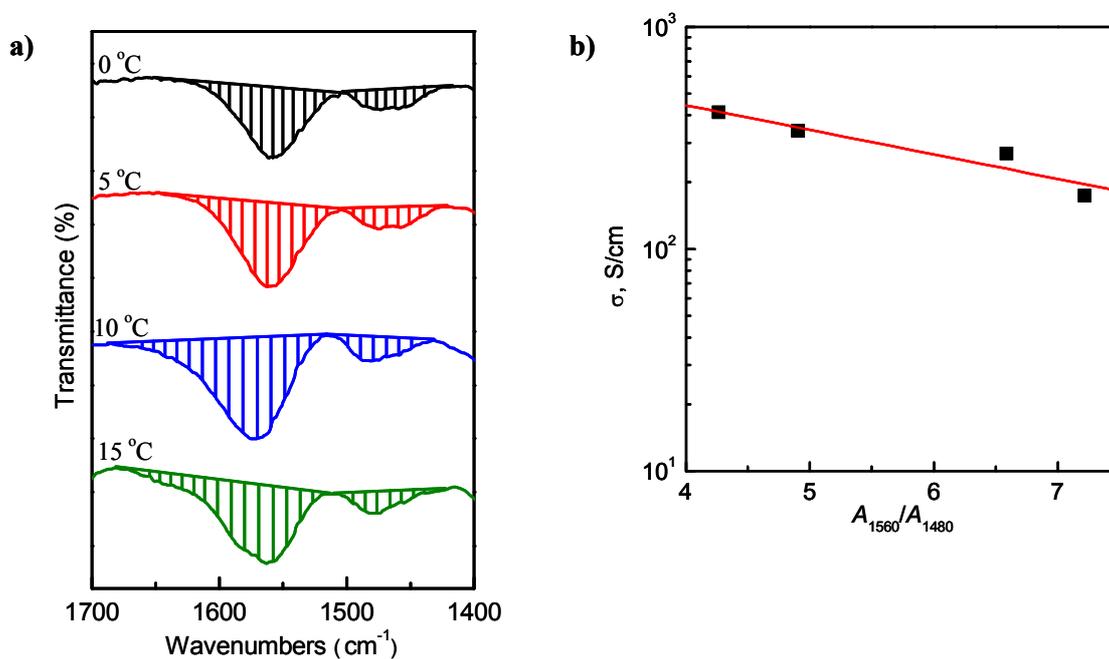


Figure S4. Qualitative measurement of conjugation length. **a)** Transmission Fourier transform infrared (FT-IR) spectra of PPy samples polymerized in the presence of KSBA at a given temperature. The 1560 and 1480 cm⁻¹ bands are aligned vertically in these spectra; **b)** Plot of the conductivity versus the ratio of the integrated absorption intensities of the 1560 and 1480 cm⁻¹ bands for the samples in Figure S2a. According to Tian and Zerbi, the conjugation length is inversely proportional to the ratio of the peak areas at 1560 and 1480 cm⁻¹, indicative of antisymmetric ring stretching mode and symmetric mode in the Py ring, respectively. It is clear that the log conductivity of our synthesized PPy is linearly related to A_{1560}/A_{1480} .



Figure S5. SEM image of the KSBA crystals at polymerization $t = 60$ min. White arrows indicate the fragments of the KSBA crystals by continuous dissolution and mechanical stirring. Therefore, the PPy structure patterned after the pre-existing KSBA crystal is easily separated from the KSBA crystal.