

Supporting Information for

Highly Conductive and Semitransparent Free-standing Polypyrrole Films Prepared by Chemical Interfacial Polymerization

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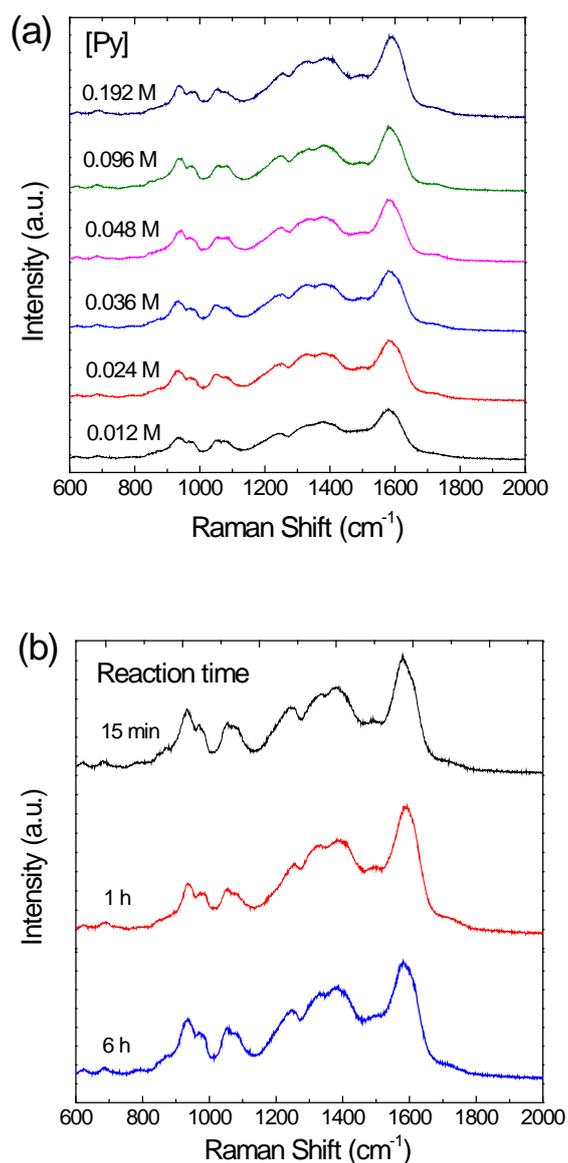


Fig. S1. Raman spectra of the PPy films prepared with different pyrrole concentrations (a) and reaction times (b). Synthetic conditions: $[\text{FeCl}_3]=[\text{PTS}]=0.36$ M, reaction time=25 min (a), $[\text{Py}]=0.024$ M (b).

The intensity ratios of the Raman bands of the symmetric C=C stretching mode at 1580 cm^{-1} to the skeletal band at 1500 cm^{-1} (I_{1580}/I_{1500}) can also be used to determine the relative conjugation length of the PPy.¹ The intensity ratios are very similar for the PPy films prepared with different pyrrole concentrations and reaction times, and they are in the range of 1.9-2.2.

Reference:

1. L. Dauginet-De Pra and S. Demoustier-Champagne, *Polymer*, 2005, 46, 1583.

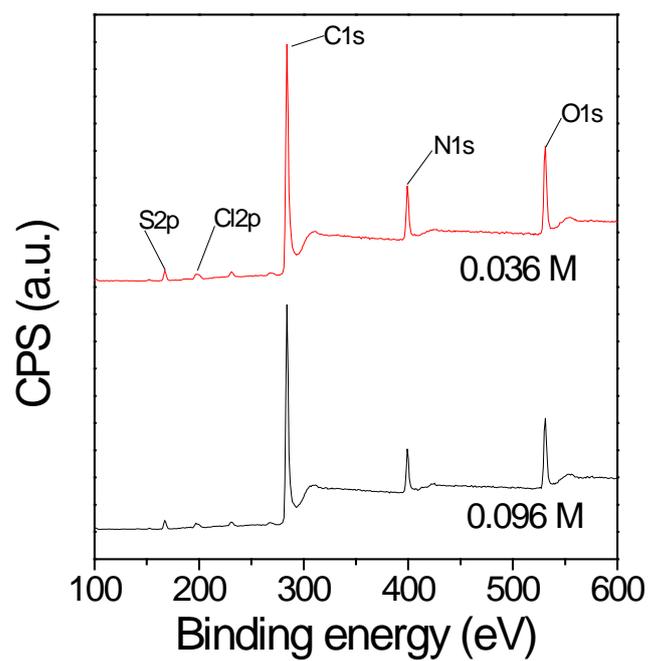


Fig. S2. The typical XPS spectra of PPy films prepared with different pyrrole concentrations.

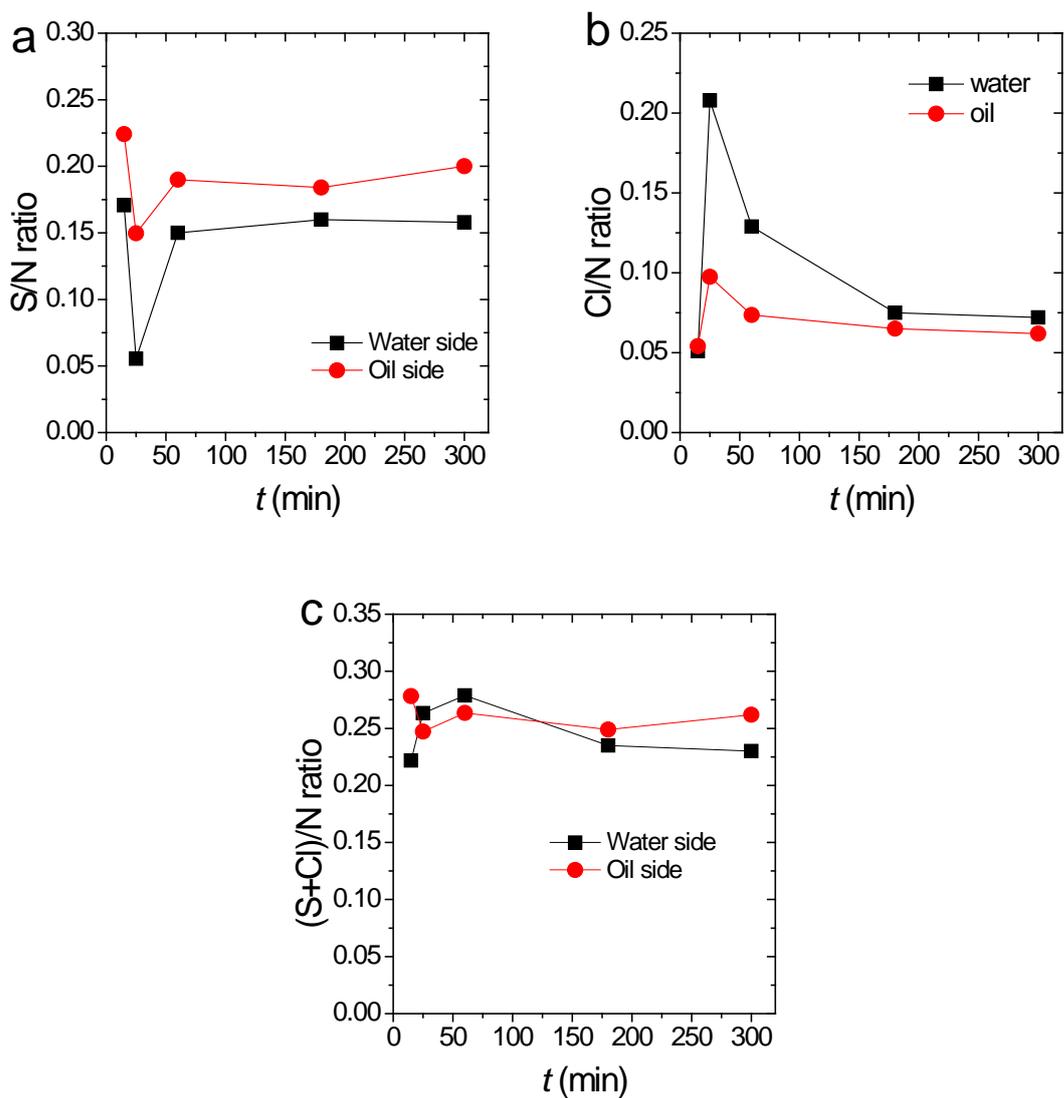


Fig. S3. XPS characterizations of the PPy films prepared with different reaction times. The S/N (a), Cl/N (b) and (S+Cl)/N atomic ratios of the PPy films on the water side and oil (organic) side. Synthetic conditions: [Py]=0.036 M; [FeCl₃]=[PTS]=0.36 M.

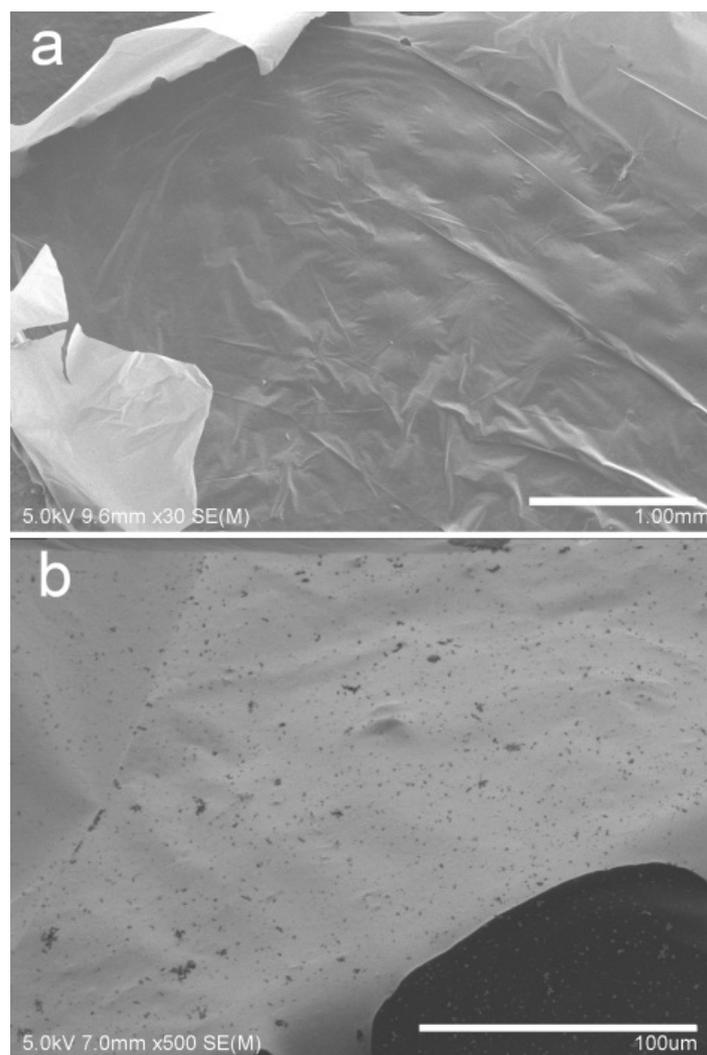


Fig. S4. SEM image of PPy films prepared by the chemical interfacial polymerization. Synthetic conditions: $[\text{FeCl}_3]=[\text{PTS}]=0.36\text{ M}$, reaction time= 25 min, and (a): $[\text{Py}]=0.024\text{ M}$; (b): $[\text{Py}]=0.12\text{ M}$. Scale bar: 1 mm (a); 100 μm (b).

Fig. S4 shows the morphologies of the free-standing PPy films viewed with low magnifications. The thin PPy films, especially the one prepared with a very low $[\text{Py}]$ (0.024 M), are very smooth and uniform. For the film made with a higher $[\text{Py}]$ (0.12 M), only some small particles are present on the surface.

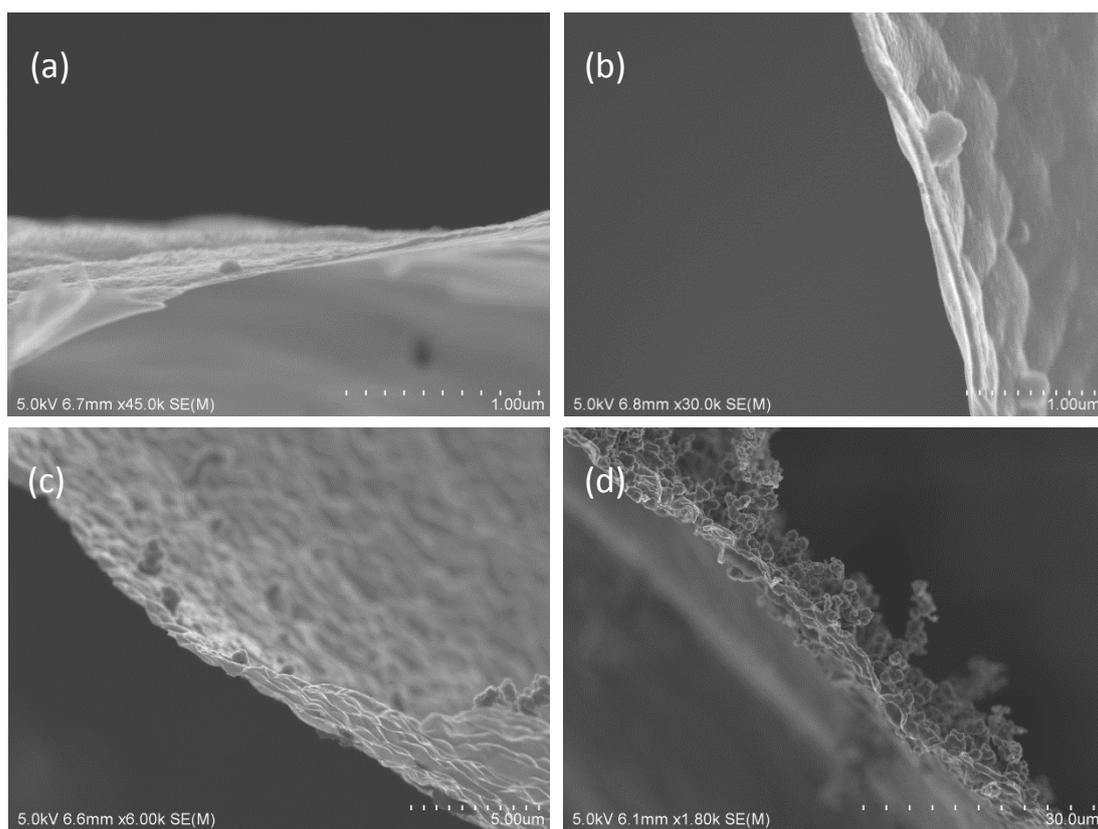


Fig. S5. Cross-sectional SEM images of the PPy films prepared with different pyrrole concentrations. Synthetic conditions: [Py]=0.012 M (a), 0.024 M (b), 0.048 M (c), and 0.48 M (d); [FeCl₃]=[PTS]=0.36 M, reaction time=25 min.