Supporting Information

One-step Synthesis of Polypyrrole Nanofiber Assemblies with Enhanced Electronic Properties: Implications for The Next-generation Organic Electronics

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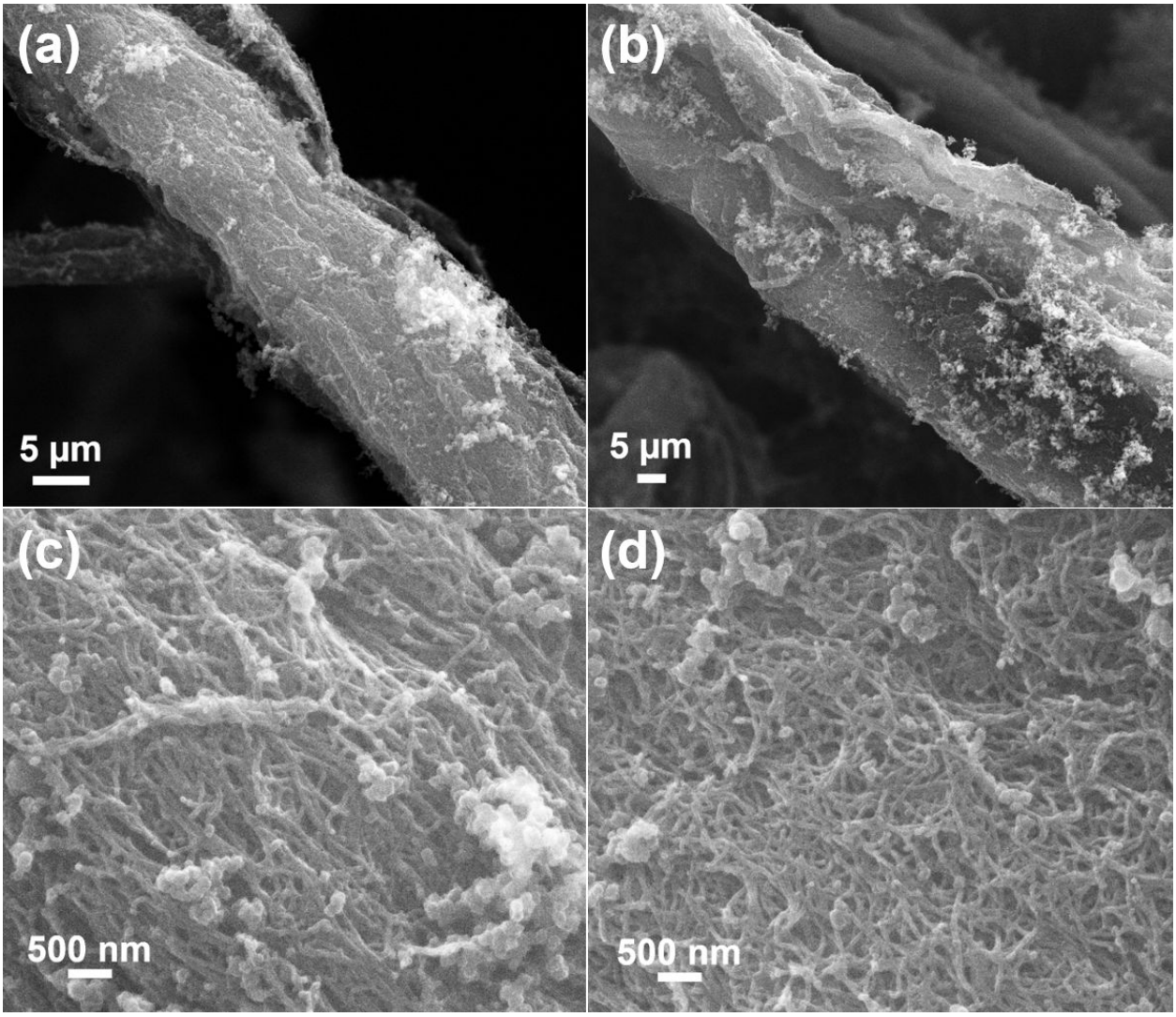

Figure S1. SEM images of the Ppy NF-BFs obtained by the self-assembly of Ppy NFs. (a) shows a Ppy NF-BF with a more homogeneous surface microstructure, while (b) shows a Ppy NF-BF with a more heterogeneous surface microstructure. (c) is obtained from (a) in high magnification, showing the basic structural components of the Ppy NF-BF is the Ppy NFs. (d) is the magnified view from (b), which also shows the Ppy NF-BF is assembled by the Ppy NFs.

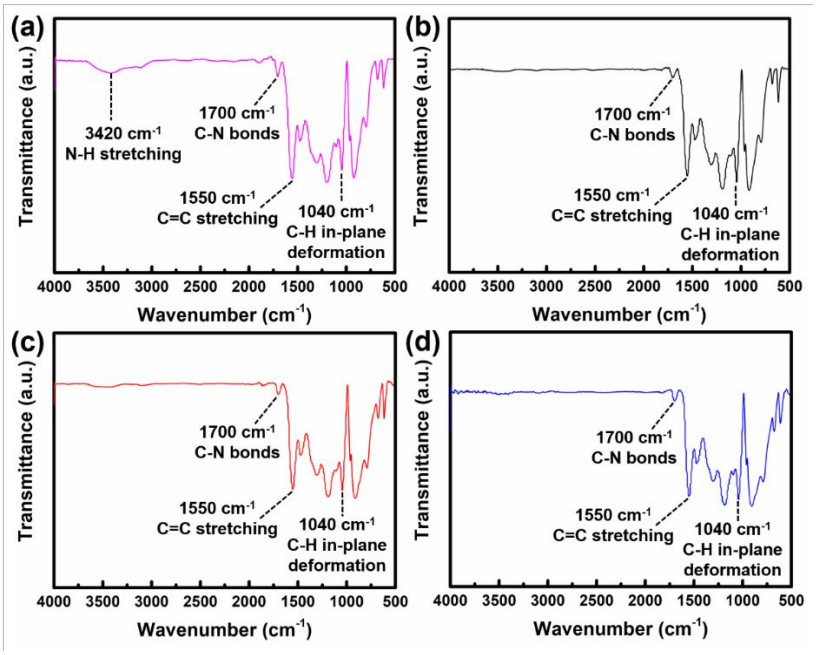

Figure S2. FTIR spectra of (a) Ppy NF, (b) Ppy NF synthesized by adding PEG-1000 (Ppy NF-BF), (c) Ppy synthesized by adding PEG-2000, and (d) Ppy synthesized by adding PEG-4000. The major peaks correspond to Ppy are indexed in the spectra.

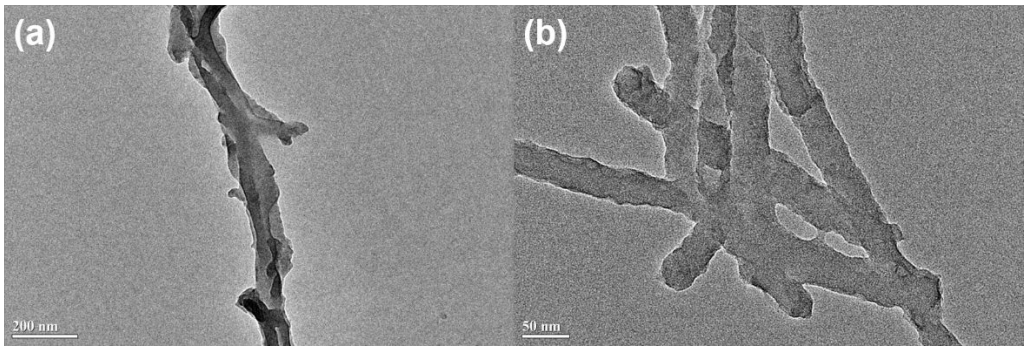

Figure S3. TEM (a) and magnified TEM (b) images of the Ppy NF bundles obtained by bath sonicating Ppy NF-BF in ethanol.

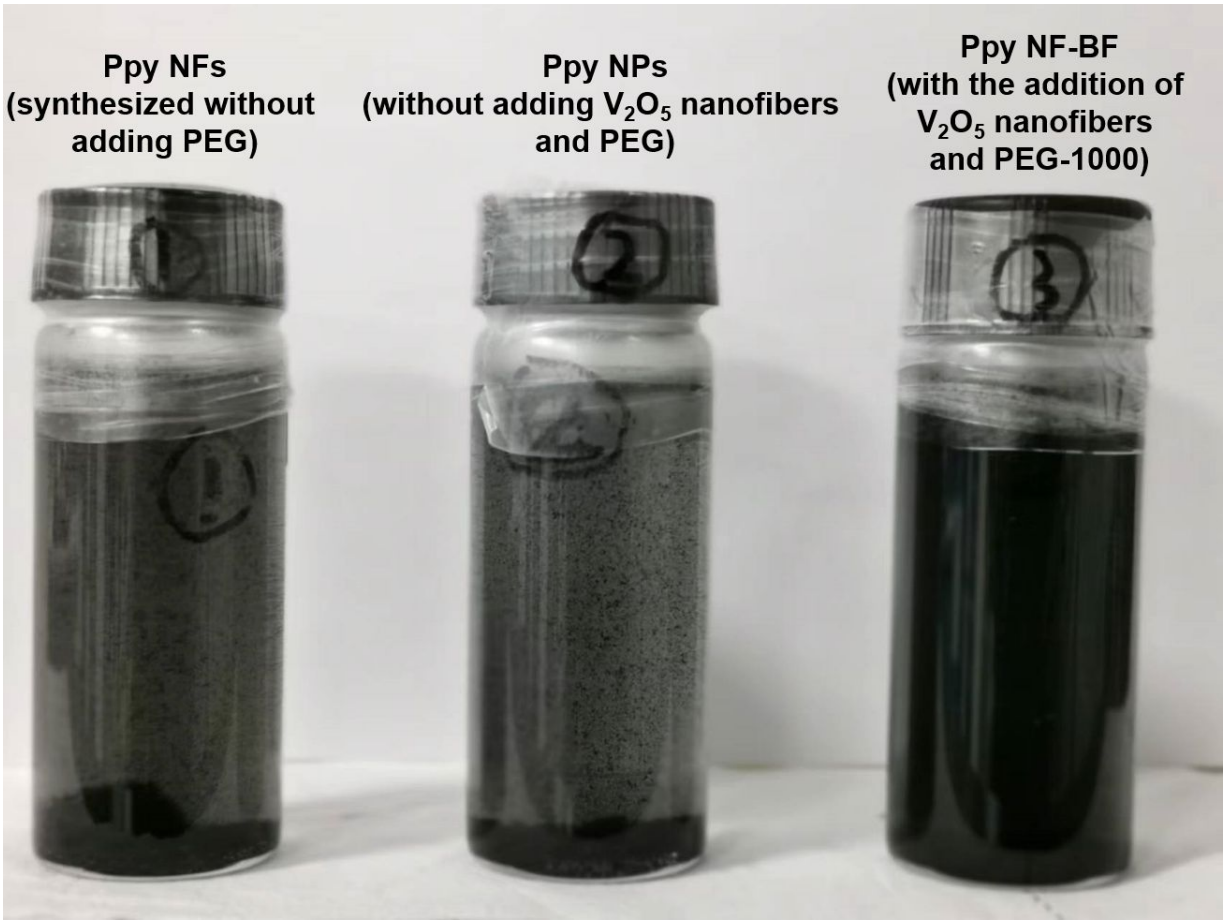

Figure S4. Photograph showing the water dispersion of Ppy NFs, Ppy NPs, and Ppy NF-BF.

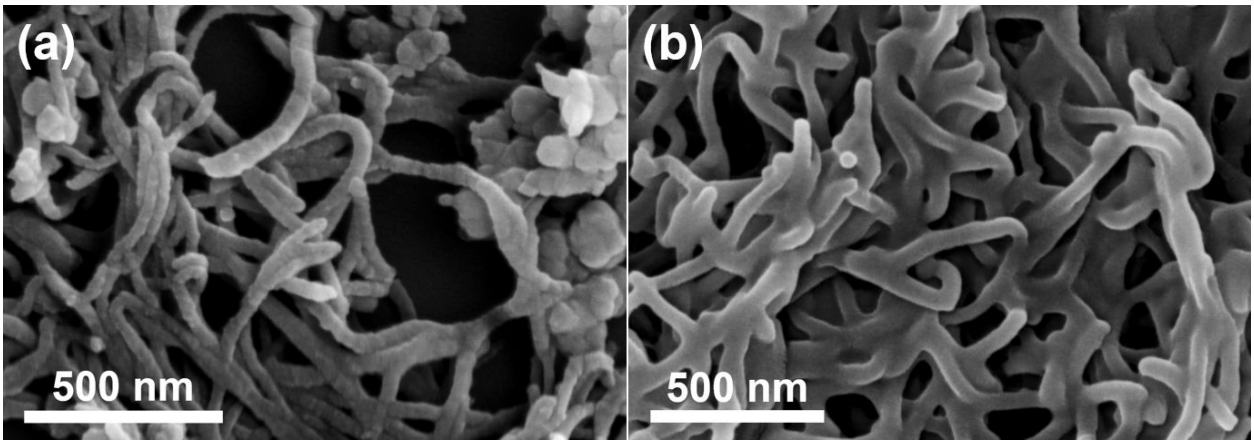

Figure S5. Top-down view of the morphologies of the dispersed phases of (a) Ppy NFs and (b) Ppy NF-BF aqueous dispersion after the bath-sonication process.

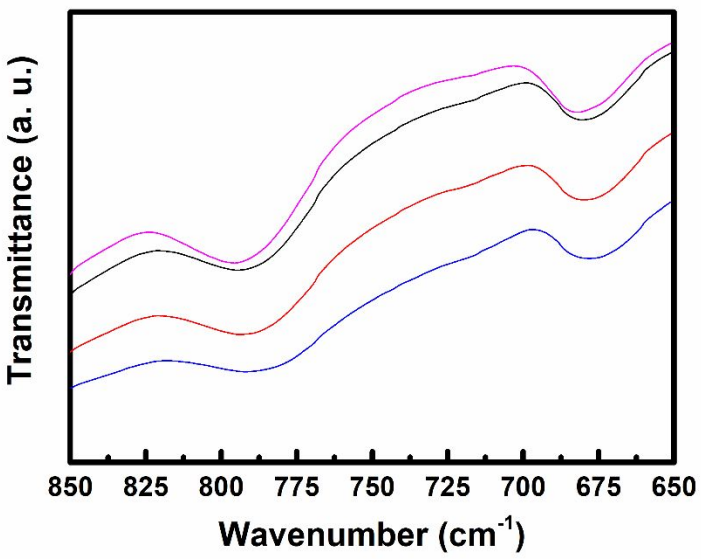

Figure S6. FTIR spectra between 850 cm^{-1} and 650 cm^{-1} of Ppy NF (purple), Ppy NF synthesized by adding PEG-1000 (Ppy NF-BF, black), (c) Ppy synthesized by adding PEG-2000 (red), and (d) Ppy synthesized by adding PEG-4000 (blue).

Table S1. N, O atomic proportions of the as-synthesized Ppy NFs without/with the addition of PEG of different molecular weights.

Sample	N (atomic%)	O (atomic%)	N/O ratio
Ppy NFs	13.89	14.21	0.98
Ppy NF-BF (add PEG-1000)	16.18	14.43	1.12
Ppy NF-PEG (2000)	15.43	14.83	1.04
Ppy NF-PEG (4000)	15.23	15.11	1.01

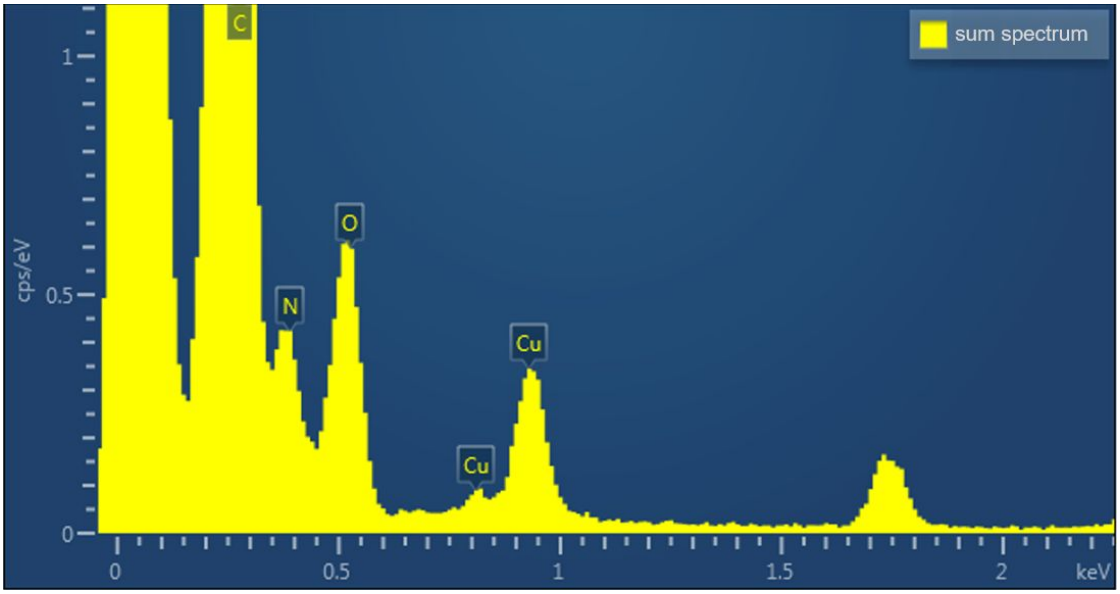

Figure S7. EDX sum spectrum of the mapping area shown in Figure 3.

Table S2. Elemental analysis result of the EDX spectrum shown in Figure S7.

Element	k factor	Absorption correction	Weight percentage (%)
C	3.115	1.09	79.90
N	1.807	1.58	5.48
O	1.455	1.28	5.93
Cu	1.421	0.98	8.69
Total			100.00

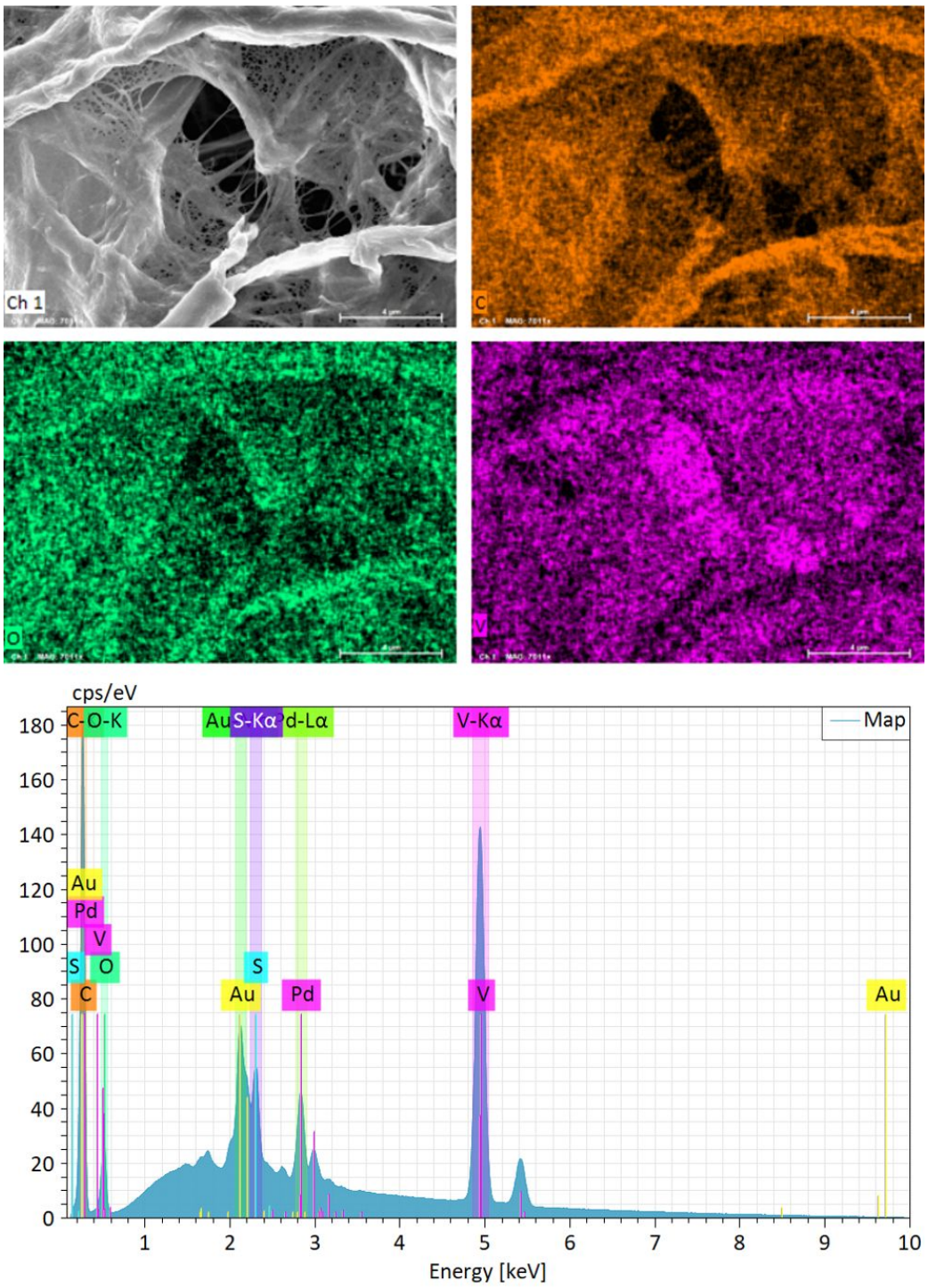

Figure S8. EDX mapping results for the freeze-dried PEG-1000/V_2O_5 sample.

Table S3. Elemental compositions of the EDX mapping area.

Element	Normalization mass percentage (%)	Atomic percentage (%)	Absorbance error (%)
V	60.37	41.69	1.66
O	18.74	41.21	1.69
Au	8.43	1.51	0.27
Pd	6.49	2.15	0.19
C	3.76	11.01	0.36
S	2.22	2.43	0.09

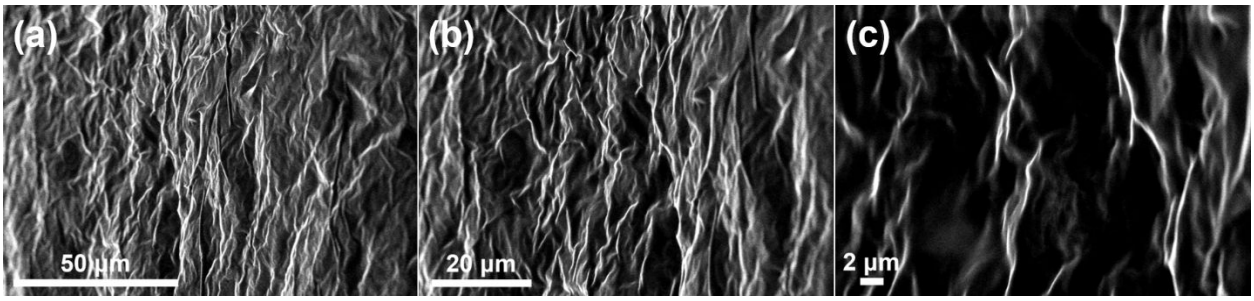

Figure S9. (a) Cross-sectional view of the freeze-dried PEG-1000/V_2O_5 gels. (b) Magnified SEM image of (a) shows the stacking layers of the dried gels. (c) High-magnification image shows the layers are stacked parallelly.

Table S4. Particle size distributions and zeta potentials of the water dispersions (concentration = 0.3 mg mL^{-1}) of Ppy NF and Ppy NF synthesized by adding PEG with different molecular weights.

Sample	T (˚C)	Average particle size (Z-average, nm)	Polydispersity index (PDI)	Zeta potential (ζ, mV)
Ppy granules	25	1470	0.290	+15.6
Ppy NFs	25	1467	0.236	+18.5
Ppy NF-BF (add PEG-1000)	25	849.8	0.109	+24.7
Ppy NF-PEG (2000)	25	1231	0.390	+20.0
Ppy NF-PEG (4000)	25	1423	0.560	+21.0

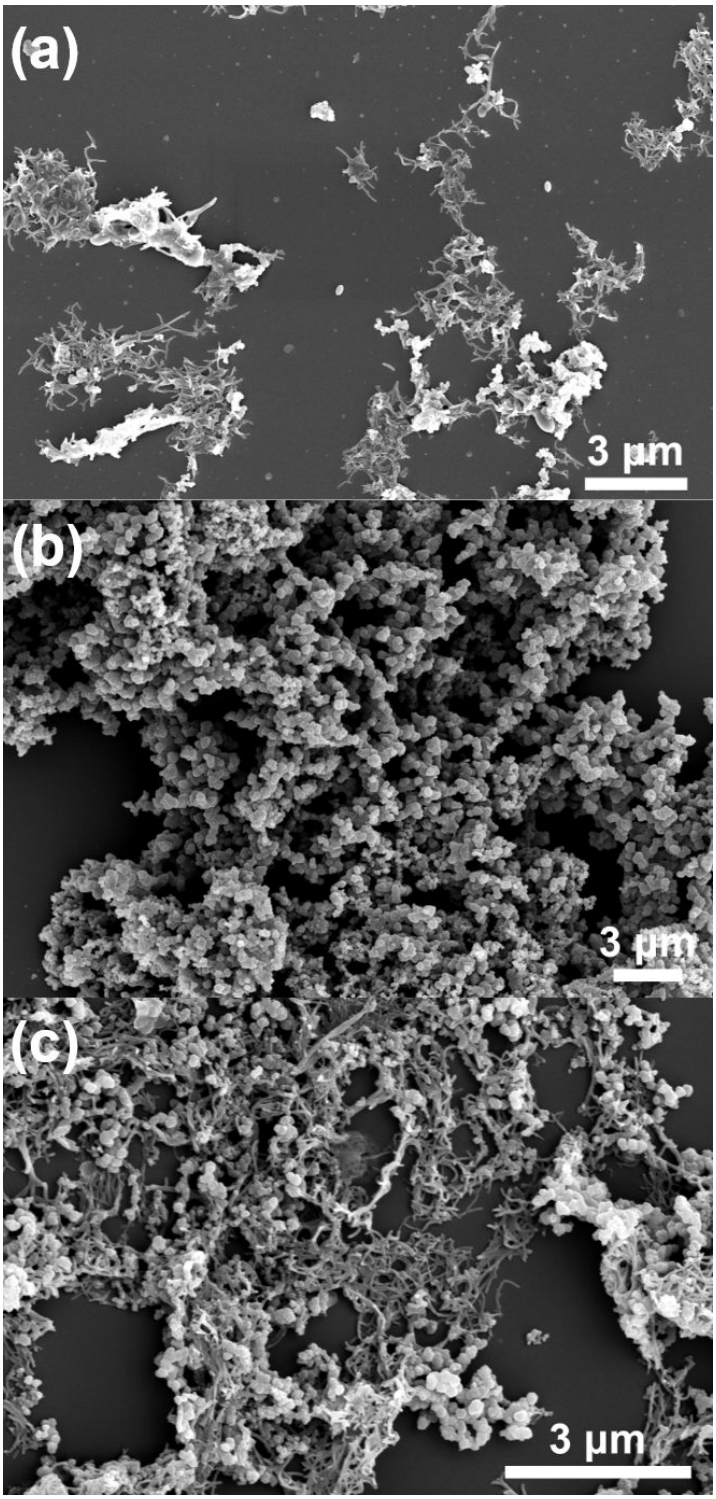

Figure S10. SEM images of the air-dried products of the (a) Ppy NF-BF dispersion, (b) Ppy NP dispersion, and (c) Ppy NF dispersion, where the sizes and distributions of the dispersed phase can be observed.

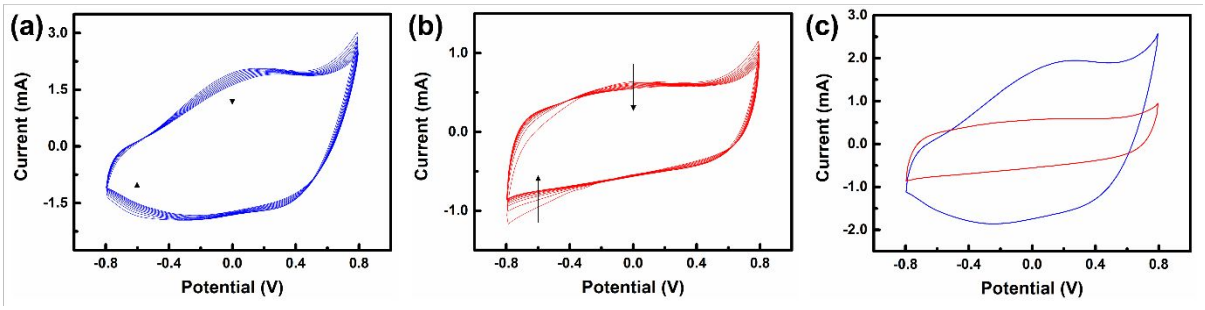

Figure S11. Cyclic voltammograms (CV) of (a) Ppy NF-BF and (b) Ppy NFs (10 cycles in total) in 0.1 M KCl, scan rate: 20 mV s^{-1}. The cycling direction and the redox peak positions are marked as black arrows. The peak corresponds to the doping process is centered at -0.05 V, while the peak corresponds to the de-doping process is centered at -0.6 V. (c) Comparison between the CV curves of Ppy NF-BF and Ppy NFs.

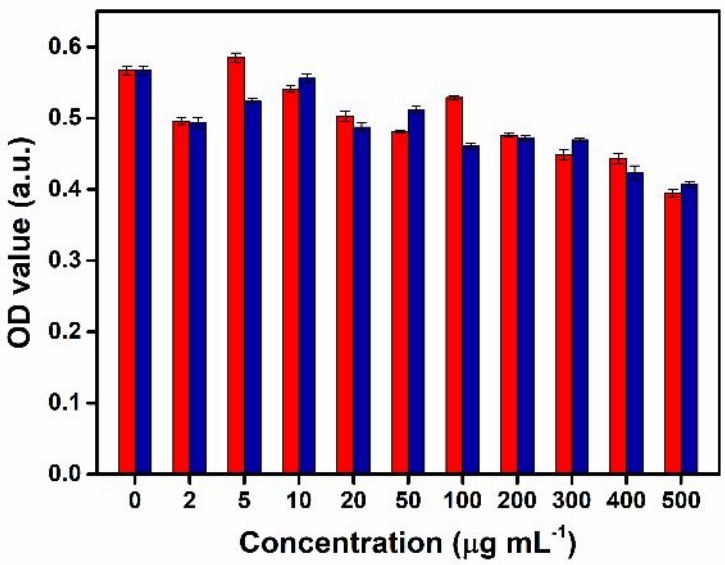

Figure S12. MTT test results of Ppy NFs (red column) and Ppy NF-BF (blue column) with respect to Schwann cells.

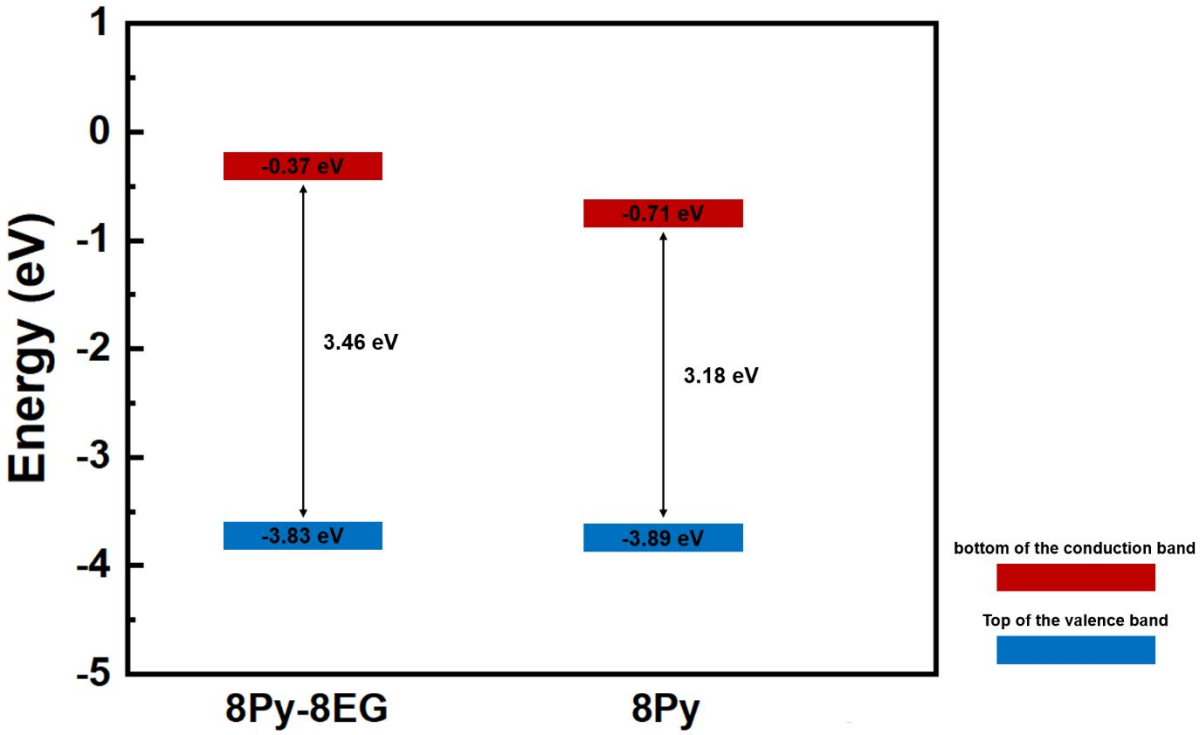

Figure S13. Energy diagram of the 8Py-8EG complex and 8Py oligomer.