Electronic Supplementary Material (ESI) for Materials Advances.

SUPPORTING INFORMATION

Electrodeposition of PEDOT:ClO_4 on Non-Noble Tungsten Microwire for Nerve and Brain Recordings

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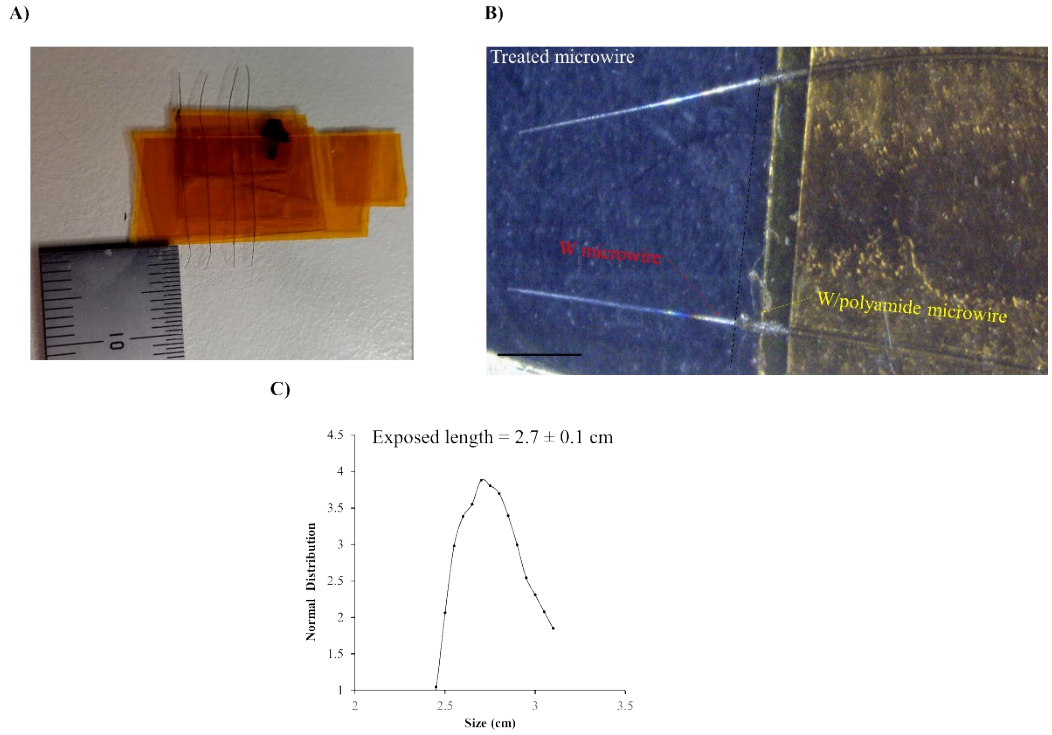

Figure S1. A) Mounting of devices on Kapton© tape for removing the insulation of polyamide (Kapton©) to guarantee consistent exposure of length tip. B) Image of the W-microwires treated prior the electropolymerization. The appearance of the W microwire encapsulated with polyamide inside the Kapton© is also shown (W/polyamide) and C) Normal distribution of 15 microwires annealed (Average of length annealed=2.7 ± 0.1 cm)

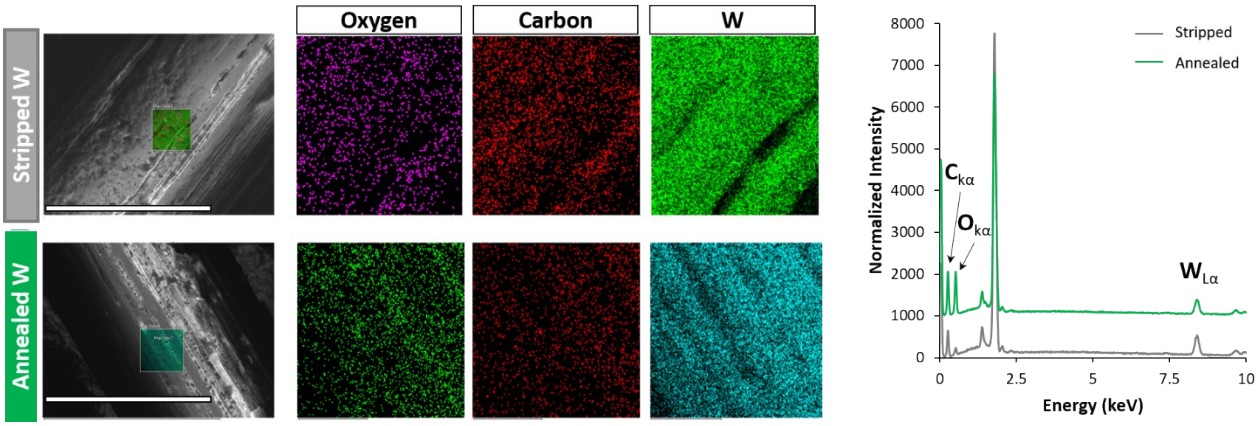

Figure S2. SEM-EDX images of stripped and annealed W-microwires (scale bar: 25 µm) (left) and SEM-EDX elemental spectra of the elements analyzed (right)

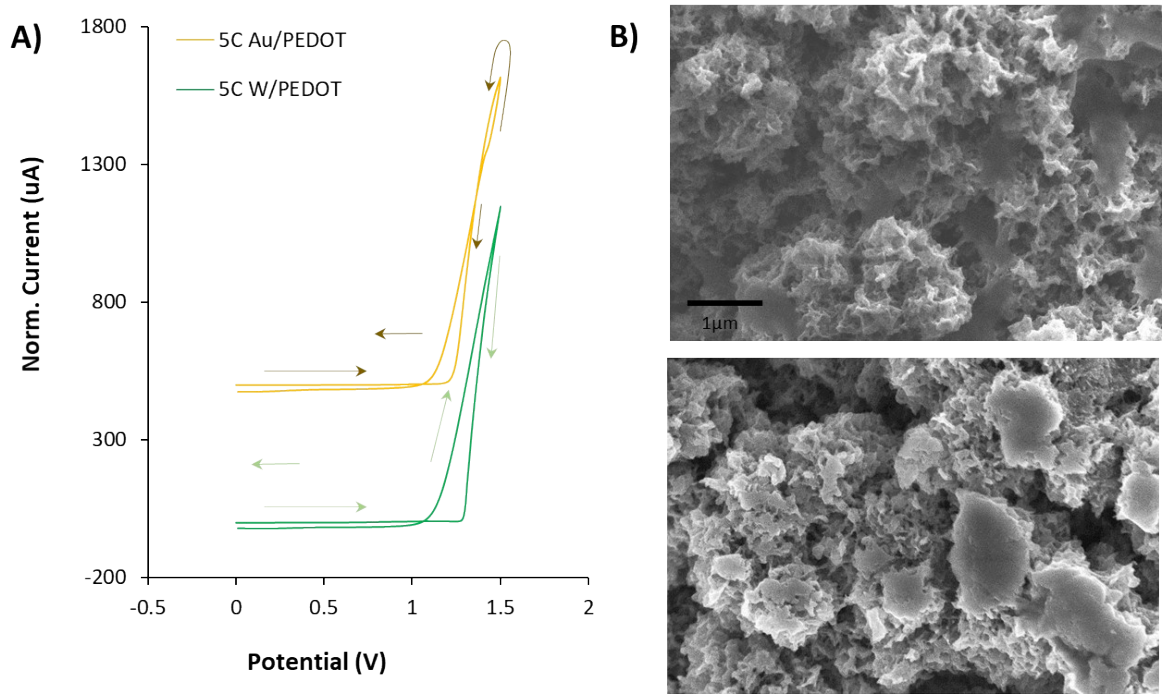

Figure S3. A) First scan of the PEDOT electropolymerization using 5 cycles on Au and Annealed-W microwires, B) SEM images of 5 cycles Au/PEDOT (top) and W/PEDOT (bottom) electropolymerization (scale bar: 1µm)

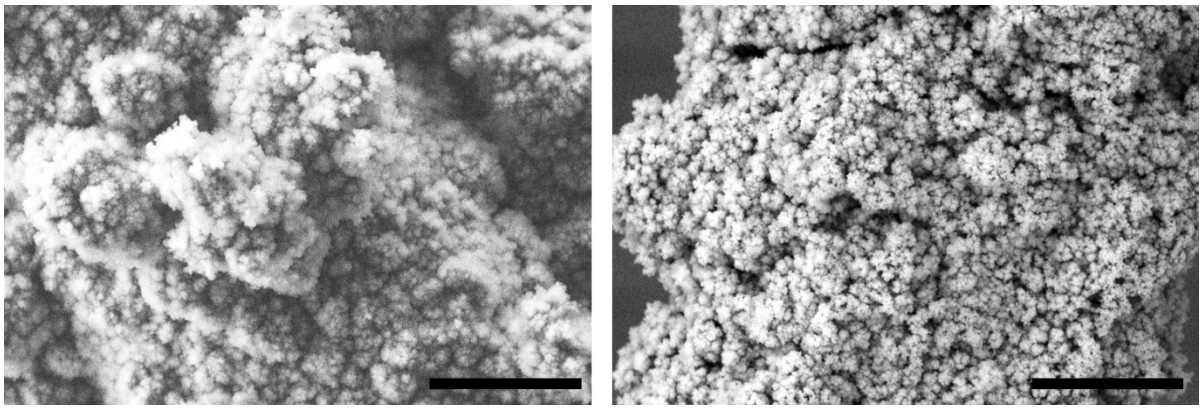

Figure S4. SEM images of 20 cycles Au/PEDOT (left) and W/PEDOT (right) electropolymerization (scale bar: 40µm)

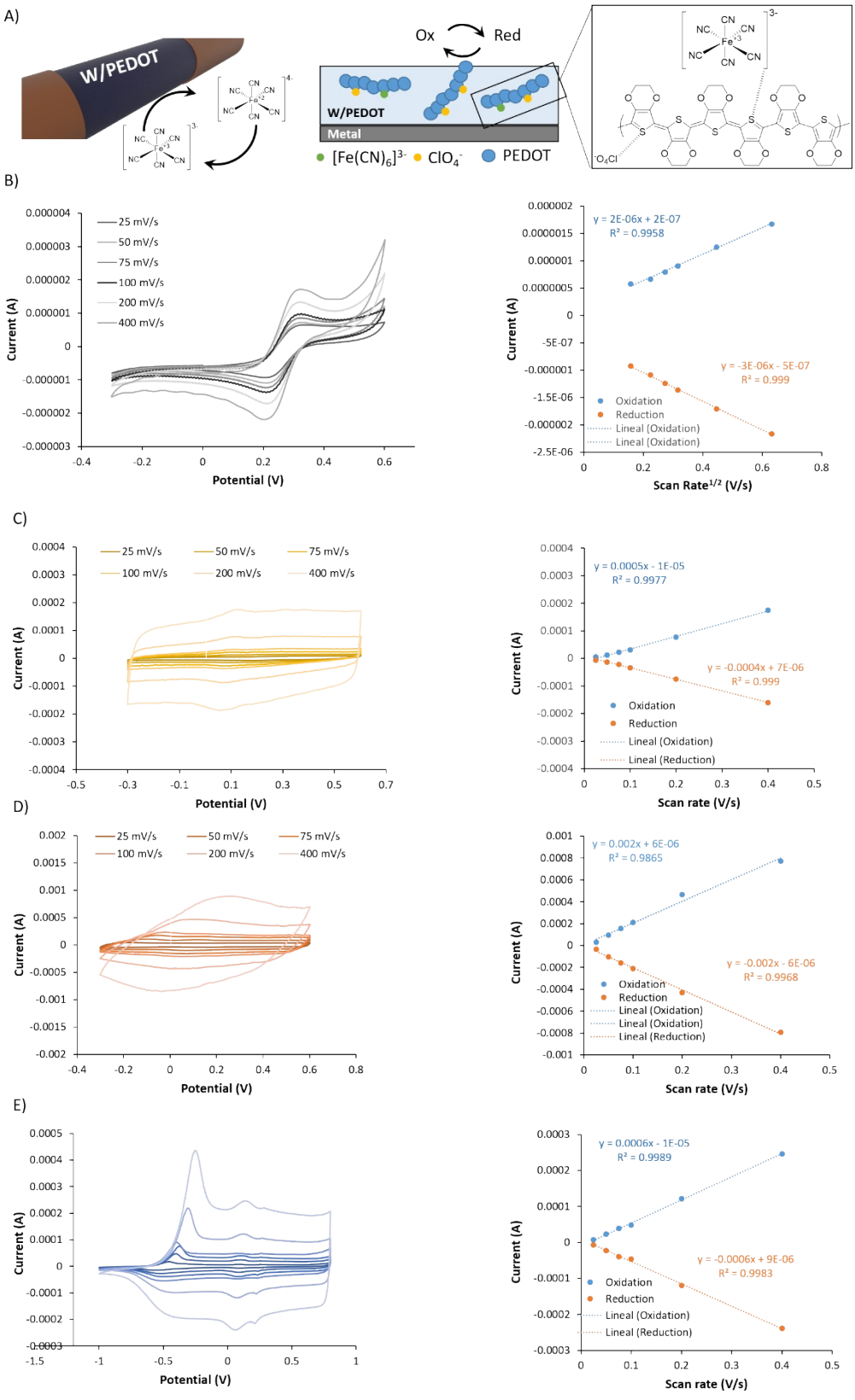

Figure S5. A) Scheme of the redox reaction that occurs in the electrode between the PEDOT coating and the ferrocyanide. CVs of 1 mM $K_3Fe(CN)_6$ in 0.1 M KCl at various scan rates (25, 50, 75, 100, 200, 400 mV s^{-1}) of B) W- microwire and C) 5C W/PEDOT, D) 10C W/PEDOT and E) 20 (Left figure shows:

B) slope of I_{pa} vs. $v^{1/2}$ for 1 mM $K_3Fe(CN)_6$ on W-microwire while C-E): the slope of I_{pa} vs. v for 1 mM $K_3Fe(CN)_6$ on W/PEDOT).

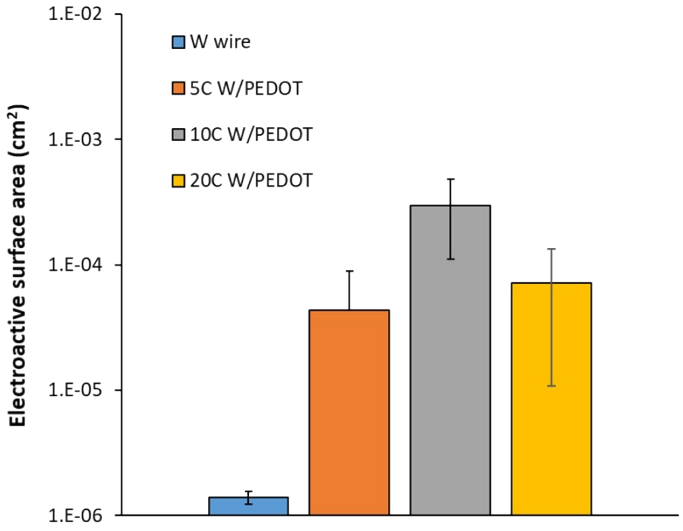

Figure S6. Electroactive surface area calculated using *Randles-Sevcik* equation. The calculation was performed using CVs of 1 mM $K_3Fe(CN)_6$ in 0.1 M KCl at various scan rates 25, 50, 75, 100, 200, 400 $mV \cdot s^{-1}$).

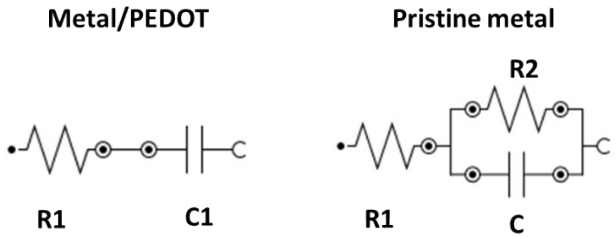

Figure S7. Equivalent circuits used for pristine metal and PEDOT-coated metal

	R1 (Ω)	R2 (Ω)	Capacitance (mF)	X^2
Au pristine	183	1530000	0.000189	4.90
5C Au/PEDOT	126	-	1.49	0.15
10C Au/PEDOT	85	-	2.69	0.17
20C Au/PEDOT	83	-	6.85	0.007
W pristine	140 ± 14	6235 ± 650	0.00032 ± 0.014	1.09
5C W/PEDOT	160 ± 20	-	0.85 ± 0.04	1.08
10C W/PEDOT	210 ± 107	-	1.76 ± 0.21	1.18
20C W/PEDOT	81 ± 97		2.48 ± 0.102	0.51

Table S1. Values of resistivity (Ω), capacitance (mF) and goodness of the fitting measured by X^2. Values were obtained from fitting the equivalent circuits in Figure S7 (n=3).