Supplemental Material

Enhanced Ionic Polymer–Metal Composites with Nanocomposite Electrodes for Restoring Eyelid Movement of Patients with Ptosis

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Effect of rolled graphene layers on the BSA-CNT electrode:

The electrical properties of the BSA-CNT electrode include electric field norm (V/m), current density norm (A/m2), and electrical conductivity (S/m) are listed in Table S1 based on the weight percentage and number of CNT in two rolled graphene layers condition: multi-wall CNT (MWCNT) and single-wall CNT (SWCNT). The optimal electrical conductivity of 3.28E-04 is obtained for BSA-SWCNT and BSA-MWCNT in weight percentages of 0.02% and 0.15%, respectively (Figs. S1, S2). In these optimal percentages, the differences in calculated main results (displacements, stress, and cation concentration) between BSA-MWCNT and BSA-SWCNT were not considerable and we did not report them.

CNT wt%	CNT Number	BSA-MWCNT Electric field norm (V/m)	Current density norm (A/m²)	Electrical conductivity (S/m)
0	0	12000	1.20E-10	1.00E-14
0.013745	9	14128	2.74E-02	1.94E-06
0.030541	20	14425	2.74E-02	1.90E-06
0.12211	80	14815	3.51E-02	2.37E-06
0.15262	100	28408	9.32E+00	3.28E-04
0.24408	160	30528	4.3179	1.41E-04
0.27455	180	30021	3.8112	1.27E-04
0.28978	190	29286	3.438	1.17E-04
		BSA-SWCNT		

0	0	12000	1.20E-10	1.00E-14
0.0019636	9	14128	2.74E-02	1.94E-06
0.0043636	20	14425	2.74E-02	1.90E-06
0.017454	80	14815	3.51E-02	2.37E-06
0.021817	100	28408	9.32E+00	3.28E-04
0.034906	160	30528	4.3179	1.41E-04
0.039269	180	30021	3.8112	1.27E-04
0.04145	190	29286	3.438	1.17E-04

Table S1. The changes in electric field norm (V/m), current density norm (A/m^2), and electrical conductivity (S/m) in BSA-CNT electrode with different rolled graphene layers.
BSA: bovine serum albumin, CNT: carbon nanotube, SWCNT: single-wall CNT, MWCNT: multi-wall CNT.

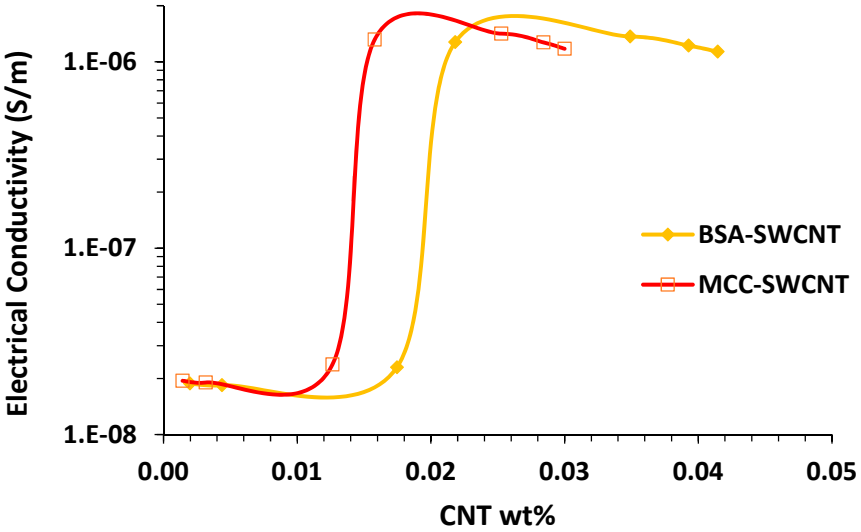

Figure. S1. Electrical conductivity in BSA-SWCNT and MCC-SWCNT (0.00-0.05 wt%).
MCC: microcrystalline cellulose, BSA: bovine serum albumin, CNT: carbon nanotube, SWCNT: single-wall CNT, MWCNT: multi-wall CNT.

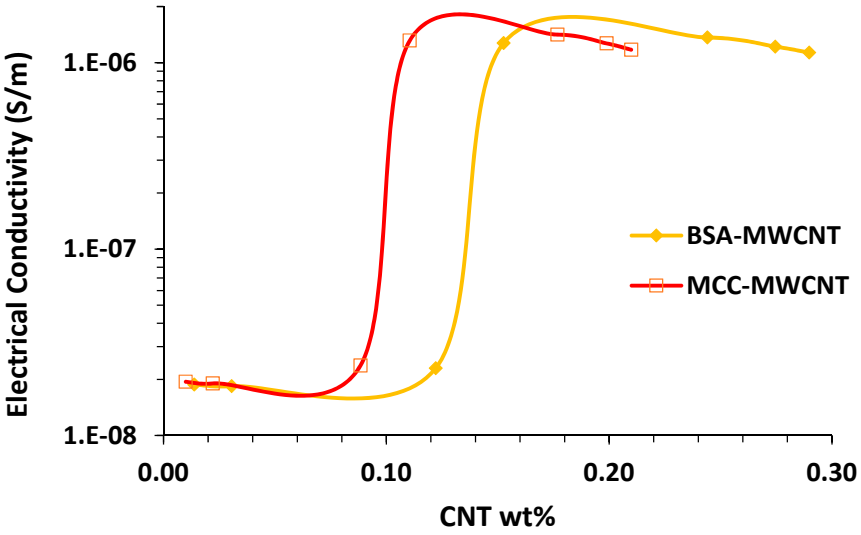

Figure. S2. Electrical conductivity in BSA-MWCNT and MCC-MWCNT (0.00-0.3 wt%). .
MCC: microcrystalline cellulose, BSA: bovine serum albumin, CNT: carbon nanotube, SWCNT: single-wall CNT, MWCNT: multi-wall CNT.