Electronic Supplementary Material (ESI) for Nanoscale.

Supporting Information

"Percolating Conductive Networks in Multiwall Carbon Nanotube-Filled Polymeric Nanocomposites: Towards Scalable High-Conductivity Applications of Disordered Systems"

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S.1 Effect of Thin-Film Electrode Thickness Variations on Electronic Transport Properties

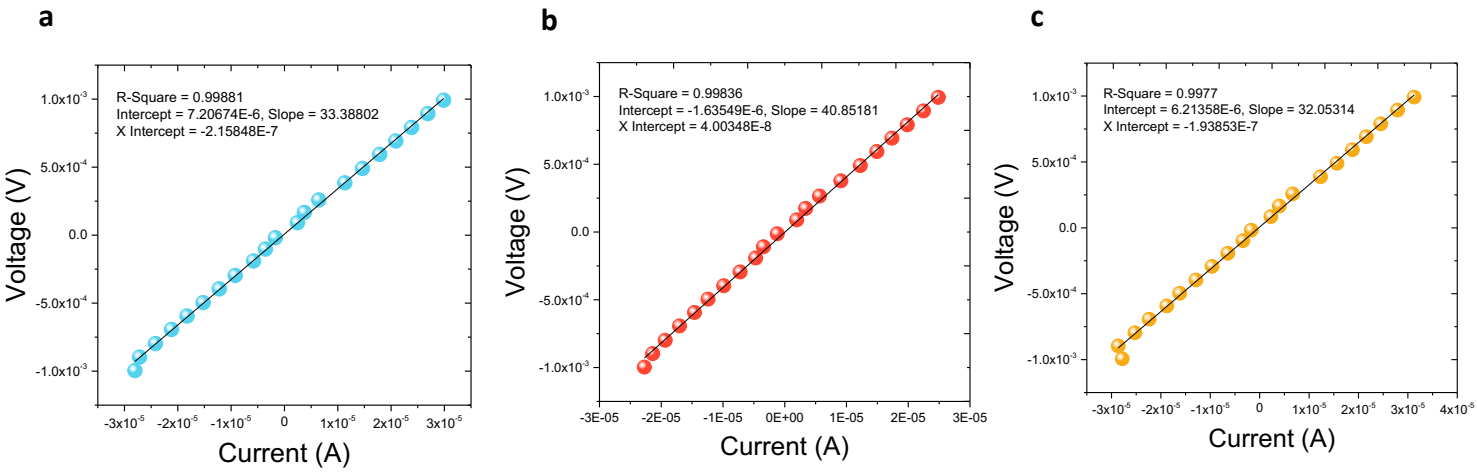

Figure S1 | Effects of Thin-Film Electrode Thickness on Ohmic IV-Curves Across 10 wt.% MWCNT/PU Nanocomposites. (a) Typical IV-curve taken for across a 10 wt.% MWCNT/PU composite using thin-film Au electrodes prepared with a Au - evaporation time of 21 min. **(b)** Typical IV-curve taken across a 10 wt.% MWCNT/PU composite using thin-film Au electrodes prepared with a Au - evaporation time of 42 min. **(c)** Typical IV-curve taken across a 10 wt.% MWCNT/PU composite using thin-film Au electrodes prepared with a Au -evaporation time of 63 min.

S.2 Effect of Thin-Film Electrode Thickness Variations on Electronic Transport Properties

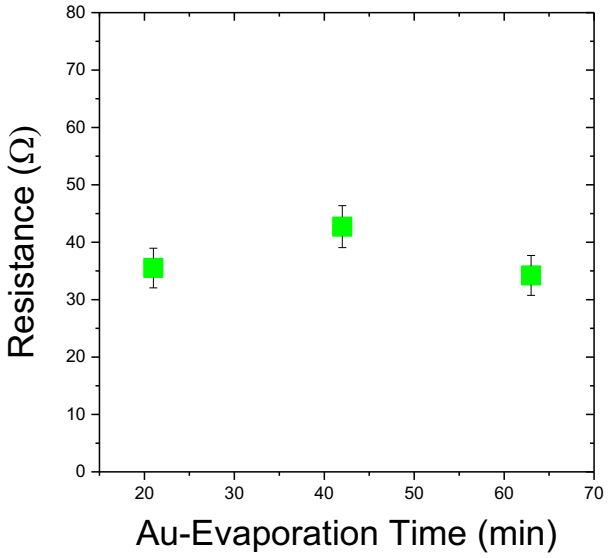

Figure S2 | Mean Resistance Across 10 wt.% MWCNT/PU Nanocomposites Using Thin-Film Electrodes of Varying Thickness. Varying the thin-film electrode thickness did not correspond to any appreciable change in resistance across a 10 wt.% MWCNT/PU composite.

S.3 Variation in Thin-Film Electrode Thickness

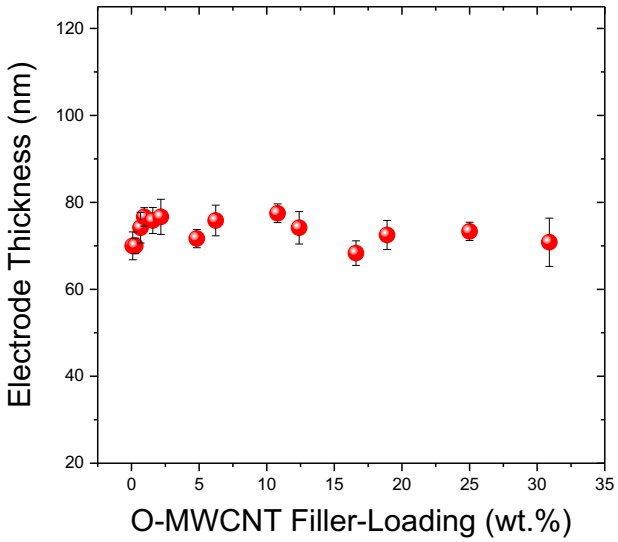

Figure S3 | Variation in Thin-Film Au-Electrode Thickness. A plot of the electrode thickness for each of the 14 different filler-loadings used to characterize the DC electronic transport properties of the O-MWCNT/PU nanocomposites assembled in this work.

S.4 FE-SEM Micrograph of Pristine Polyurethane Microspheres

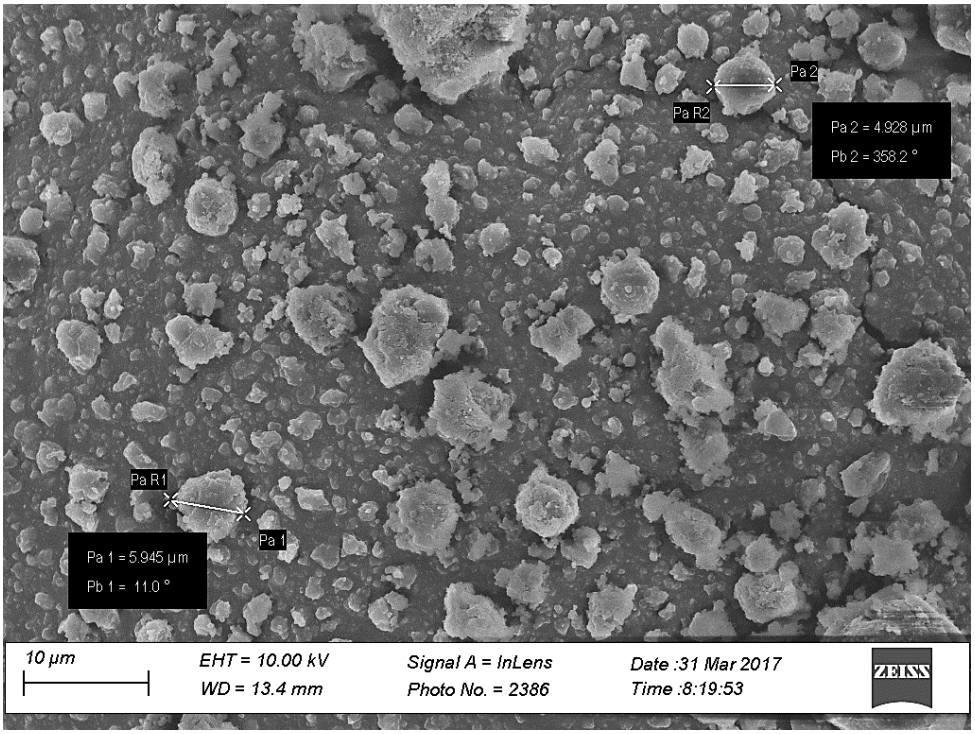

Figure S4 | FE-SEM Micrograph of Neat PU. FE-SEM micrograph illustrating the particle size and geometry of the pristine/neat PU microspheres used in this work in assembling MWCNT/PU nanocomposites.

S.5 Electrical Conductivities of P-MWCNT/PU and O-MWCNT/PU Nanocomposites

P-MWCNT Loading (wt.%)	σ_c (S/cm)
0.10 %	$9.13 \times 10^{-3} \pm 0.13 \times 10^{-3}$
1.16 %	2.05 ± 0.03
1.58 %	0.93 ± 0.01
4.08 %	19.18 ± 0.27
6.37 %	79.27 ± 1.12
10.27 %	198.40 ± 2.80
12.10 %	261.20 ± 3.69
16.16 %	400.06 ± 5.65
19.36 %	456.68 ± 6.45
25.18 %	623.18 ± 8.80
30.96 %	673.73 ± 9.51

Table S1 | Electrical Conductivity of P-MWCNT/PU Nanocomposites. Electrical conductivities of the P-MWCNT/PU nanocomposites assembled in this work presented alongside the corresponding loading of P-MWCNTs.

O-MWCNT Loading (wt.%)	σ_c (S/cm)
9.31×10^{-2} %	$0.12 \pm 6.64 \times 10^{-3}$
0.28 %	$0.15 \pm 7.98 \times 10^{-3}$
0.67 %	$0.08 \pm 4.63 \times 10^{-3}$
0.94 %	0.32 ± 0.02
1.57 %	1.69 ± 0.09
2.17 %	9.75 ± 0.61
4.83 %	15.40 ± 0.69
6.23 %	33.50 ± 1.95
10.80 %	182.00 ± 15.09
12.40 %	257.00 ± 15.57
16.60 %	342.00 ± 18.45
18.90 %	615.00 ± 35.11
25.00 %	783.00 ± 34.82
30.90 %	839.00 ± 71.62

Table S2 | Electrical Conductivity of O-MWCNT/PU Nanocomposites. Electrical conductivities of the O-MWCNT/PU nanocomposites assembled in this work presented alongside the corresponding loading of O-MWCNTs.