Supporting Information

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A Meta-Analysis of Conductive and Strong Carbon Nanotube Materials

John S. Bulmer,* Adarsh Kaniyoor, and James A. Elliott
Supplemental Section for

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John Bulmer, Adarsh Kaniyoor, James Elliott

Department of Materials Science and Metallurgy, 27 Charles Babbage Road, University of Cambridge, CB3 0FS, UK

Below are various t-tests used to statistically compare properties of two CNT categories.

ANOVA and t-test comparing strengths of aligned MWCNT material versus aligned FWCNT material.

Supplemental Figure S1. t-test showing on average aligned FWCNTs are stronger than aligned MWCNTs. Note that a statistically significant difference between these populations persists even after removing the stratified data point near 10 GPa.
ANOVA and t-test comparing strengths of the two leading varieties of aligned FWCNT material, fibers produced by the direct extraction from floating catalyst CVD (DS-CNT) and fibers produced from extrusion of a CNT liquid solution (SS-CNT). In this analysis, we consider only aligned FWCNT materials. Further, for the SS-CNT group where there are multiple solution methods, we restrict this analysis to just samples with acid/doping exposure. Acid-based SS-CNTs are well known to yield the best properties of SS-CNT and makes a more fair comparison of averages between DS-CNT and SS-CNT.

Supplemental Figure S2. t-test showing, on average, the tensile strength of fibres derived from direct FC-CVD extraction (DS-CNT) and fibres derived from extrusion of super-acid CNT solutions (SS-CNT) are equal. Here we only considered the aligned FWCNT subsets. Further, we restricted the SS-CNT subset to those with doping/acid exposure, the most favourable embodiment of SS-CNTs.
Here we test the on/off effect of doping on strength, for several different CNT categories.

ANOVA and t-test comparing strengths of aligned MWCNT material, with and without doping.

Supplemental Figure S3. t-test showing no strength difference from doping on MWCNT materials.
ANOVA and t-test comparing strengths of aligned FWCNT material extracted directly from Floating Catalyst CVD (DS-CNT), with and without exposure to doping or acids.

Supplemental Figure S4. t-test showing doped aligned FWCNT materials are stronger than undoped. This is just from CNT materials extracted directly from FC-CVD (DS-CNT).

ANOVA and t-test comparing strengths of aligned FWCNT material from extrusion from liquids (SS-CNT), with and without exposure to doping or acids.
Supplemental Figure S5. t-test showing doped aligned FWCNT materials are stronger than undoped, for wet-spun fibres (SS-CNT). This is somewhat misleading however in that the super-acid extruded subcategory has better properties generally than other wet-spinning techniques and is typically in a doped configuration.

Now we compare the thermal conductivity of aligned MWCNT materials against aligned FWCNT materials.

ANOVA and t-test comparing thermal conductivity between aligned FWCNT material and aligned MWCNT material.

Supplemental Figure S6. t-test showing no major difference in thermal conductivity of aligned MWCNT and FWCNT materials.

Now we compare the specific strength of wet spun and FC-CVD derived fibres.
Supplemental Figure S7. t-test showing fibres derived directly from FC-CVD (DS-CNT) are decisively stronger than wet-spun fibres (SS-CNT) on the basis of weight. Again for the SS-CNT fibres, we only consider those with acid exposure because it is the most favourable embodiment of SS-CNT methods.
Here we show the correlation and power law of electrical conductivity and tensile strength against the CNT diameter (with and without the weighted adjustment) of all four bulk CNT categories grouped together (unaligned MWCNT, aligned MWCNT, unaligned FWCNT, aligned FWCNT).

Log Electrical Conductivity vs Log CNT diameter

| Correlation | Fitted Slope for Power Law | Fitted Slope Standard Error | Correlation and Fit Probability | Adjusted Fitted Slope for Power Law | Adjusted Fitted Slope Standard Error | Adjusted Correlation and Fit Probability | Number of data points |
|-------------|-----------------------------|-----------------------------|---------------------------------|-----------------------------------|--------------------------------------|----------------------------------------|------------------------|
| -0.34       | -0.63                       | 0.09                        | -0.01                           | -0.35                             | 0.73                                 | -0.01                                  | 408                    |

Log Tensile Strength vs Log CNT diameter

| Correlation | Fitted Slope for Power Law | Fitted Slope Standard Error | Correlation and Fit Probability | Adjusted Fitted Slope for Power Law | Adjusted Fitted Slope Standard Error | Adjusted Correlation and Fit Probability | Number of data points |
|-------------|-----------------------------|-----------------------------|---------------------------------|-----------------------------------|--------------------------------------|----------------------------------------|------------------------|
| -0.21       | -0.26                       | 0.07                        | -0.01                           | -0.32                             | 0.46                                 | -0.01                                  | 271                    |

Supplemental Figure S8. Tables quantifying the relationship of physical properties against CNT diameter, where all four categories have been grouped together.