Supporting Information for

High strength composite fibres from polyester filled with nanotubes and graphene

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Volume fraction dependence for SWNT-PET composites

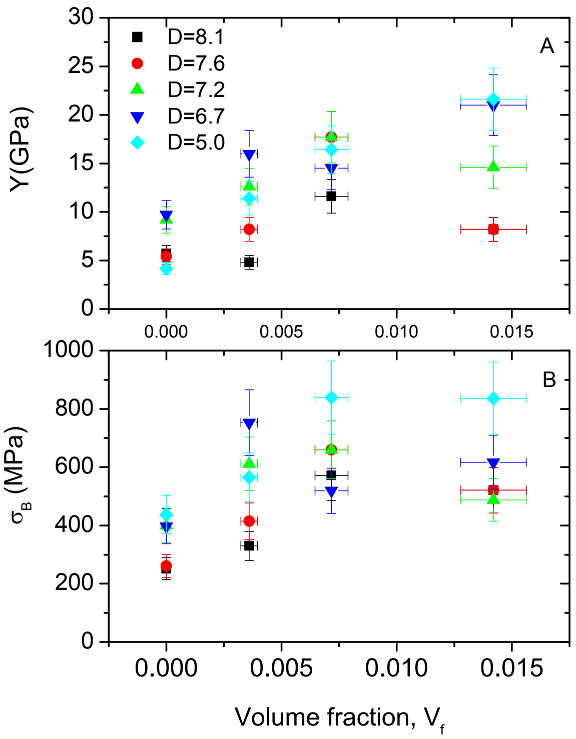

Figure S1: Young's modulus and ultimate tensile strength as a function of nanotube volume fraction for fibres with a range of mean diameters from 5.0 to 8.1 μm.

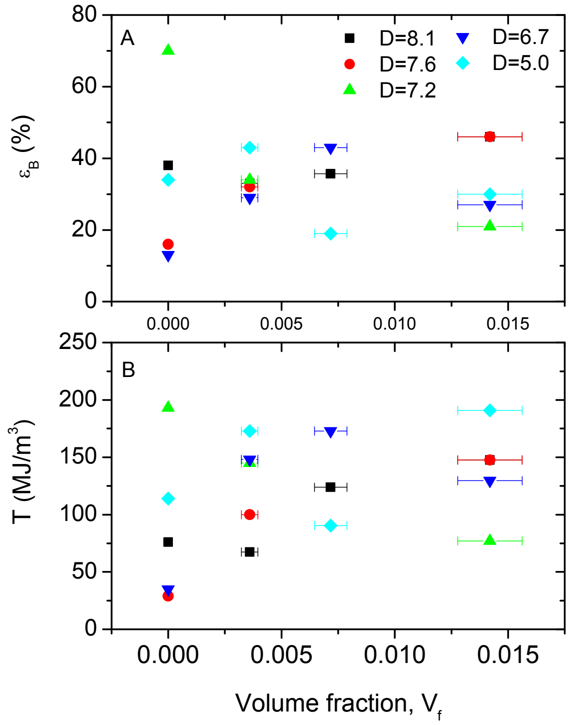

Figure S2: Strain at break and tensile toughness as a function of nanotube volume fraction for fibres with a range of mean diameters from 5.0 to 8.1 μm.

TEM analysis of Graphene Dispersions

It is possible to investigate the graphene dispersion using transmission electron microscopy (TEM) by dropping a small quantity of the dispersion onto holey carbon grids. Representative TEM images are shown in Figure S3.

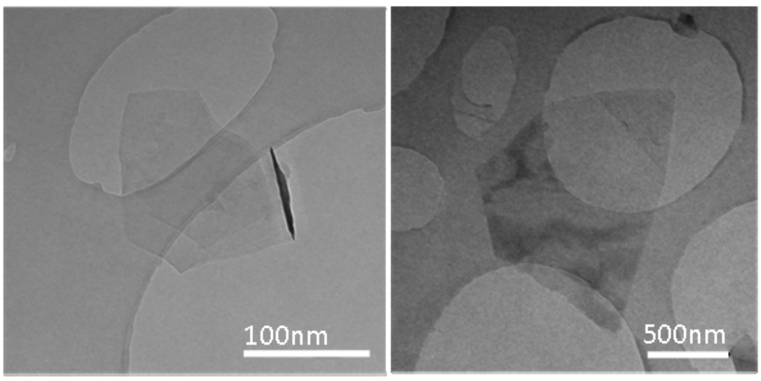

Figure S3: TEM images of exfoliated graphene multilayers deposited from the dispersion used to prepare the PET-graphene composite melts.

TEM flake size statistics can also be found for the graphene dispersion. The flake thickness, N, was measured using the edge counting method, described in detail in *Small* 6, 864 (see figure S4).

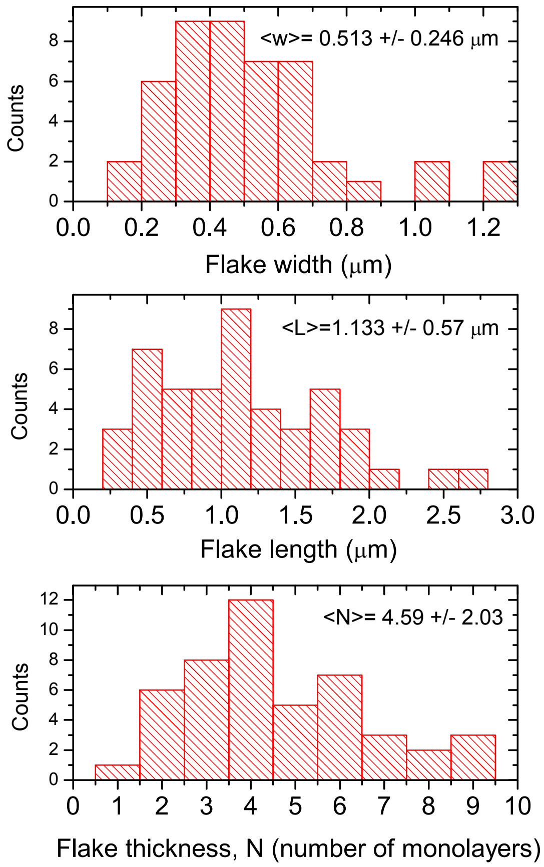

Figure S4: TEM statistics of graphene flakes centrifuged at 1000rpm where w is the width of the flake, L is the length and n is the number of graphene layers.

Raman analysis of Graphene Dispersions

Raman spectra for the graphene dispersion used for this work are shown in Figure S5. A reference graphite powder is shown also as a comparison. Here the D band (~1300cm^{-1}) is indicative of the presence of defects. However, we note that for small flakes such as those observed here, significant D bands can come simply from the presence of flake edges (*Small* 6, 864).

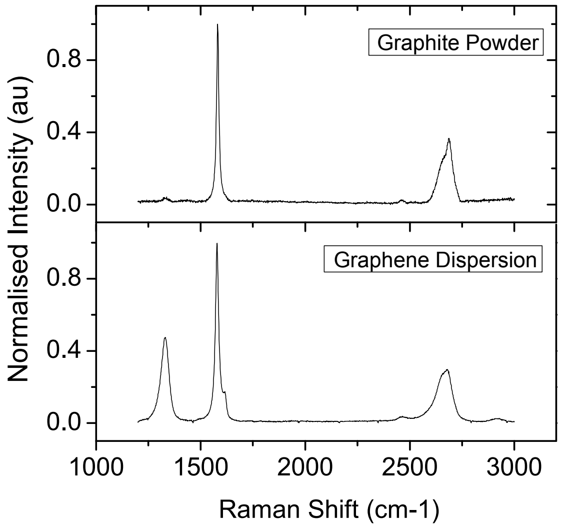

Figure S5: Raman spectra of A) graphite powder and B) the dispersed graphene (after filtration to form a film).

Volume fraction dependence for Graphene-PET composites

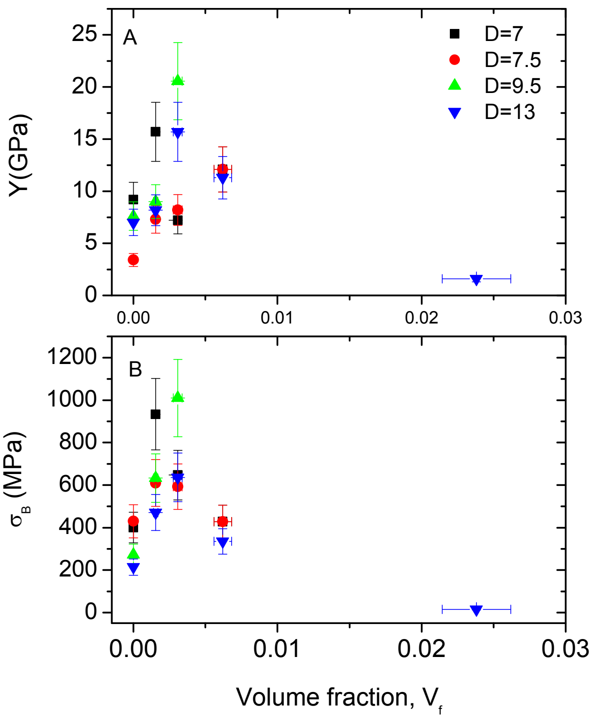

Figure S6: Young's modulus and strength as a function of graphene volume fraction for fibres with a range of mean diameters from 7 to 13 μm.

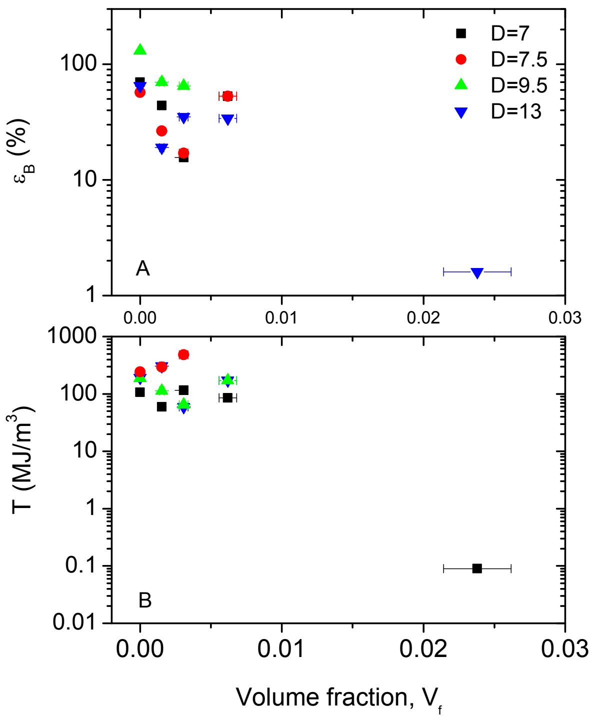

Figure S7: Strain at break and tensile toughness as a function of graphene volume fraction for fibres with a range of mean diameters from 7 to 13 μm.