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ABSTRACT

We propose a method for controlling the arborescent structure of long carbon nanotubes (CNTs) to harness their intrinsic properties in advanced rubber composites. Our method of structural control was based on a wet-jet mill to vary the shear forces (20-150 MPa) applied to aligned single-wall CNTs in solution. As the pressure of jet mill increased, the resulting suspended CNTs changed from agglomerates of bundled “trunk”-like structures to a CNT “mesh”-like structure with a high degree of disentanglement and absence of the “trunk”-like structures. The sizes of the CNT agglomerates became small and the number increased with the pressure of jet mill, indicating that smaller “mesh”-like CNT structures were formed with shortening of CNTs. This knowledge was used to increase the electrical conductivity of a CNT-rubber composite, highlighting the need to optimize the disentanglement state of the CNTs for application towards