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A comparison of the twisted and untwisted structures for one-dimensional carbon nanotube assemblies

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Abstract

The way how carbon nanotubes (CNTs) are assembled together determines the utilization efficiency of mechanical property in their macroscopic assembly materials. For one-dimensional (1D) assemblies, CNTs are often assembled under drawing and twisting into a fiber structure with a twist angle. In this study, an untwisted 1D assembly, CNT strip, is introduced, inside which the CNTs are not only aligned but also overall parallel to strip axis. Due to the shielding effect of the twisted fiber surface, the interior of CNT fiber is loosely packed, and the fiber is more stretchable and hard to become stiff. On the contrary, CNT strip with high straightness or undirectionality can utilize the CNT's mechanical property much more efficiently, as reflected by its higher strength and modulus. These insights can guide different applications of CNT fibers and strips in textile.

Keywords: carbon nanotube, assembly, straightness, twist, mechanical property

1. Introduction

Over the past two decades, the mechanical properties of individual carbon nanotubes (CNTs) and CNT bundles have been intensely investigated [1–7], see a recent review [8]. CNT can ex-

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