# Nanotube Superfiber Materials: Chapter 3. Tailoring the Mechanical Properties of Carbon Nanotube Fibers (Micro and Nano Technologies)

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**Nanotube Superfiber Materials: Chapter 3. Tailoring the Mechanical Properties of Carbon Nanotube Fibers (Micro and Nano Technologies)** T. Filleter, A.M. Beese, M.R. Roenbeck, X. Wei, H.D. Espinosa Performance and efficiency demands in industrial applications are pushing a need for carbon fibers that can outperform existing technologies. Fibers that incorporate carbon nanotubes (CNTs) to enhance specific mechanical properties are a promising route to addressing this need. Some of the major roadblocks to unlocking the full potential of macroscopic fibers based on CNTs are controlling and optimizing the shear interactions within and between CNTs, geometrical organization of the CNTs, and structural properties of the individual CNTs. Several approaches have been pursued in order to optimize the mechanical behavior of CNT fibers, including irradiation-induced covalent cross-linking, reformable or rehealable bonding, and optimized geometrical and structural fiber designs. These approaches are inspired by nature, which uses hierarchical bonding schemes in optimized orientations to tailor the mechanical properties of its materials to the needs and environment of specific organisms. In this chapter, these approaches for developing high-performance CNT fibers will be reviewed, and an outlook of their potential impact will be discussed.

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