

Understanding the Effect of Solution Spinning Processing Parameters on the Structure and Properties of Carbon Nanotube Fiber

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Carbon nanotubes (CNTs) were discovered in 1991 and have been actively researched since this time due to their outstanding electrical, mechanical, and thermal properties. However, translating the single molecule properties of CNTs into macroscale articles has remained a challenge. A promising technique for obtaining high performance fiber materials is wet-spinning solutions of CNTs in chlorosulfonic acid. This is the only technique that creates highly pure CNT fibers with extremely high alignment. Nonetheless, this is a complex process consisting of chemical reactions, mass transport, and non-Newtonian fluid flow. Here, we study some of the key processing parameters such as solution concentration and determine how these parameters effect the alignment and nano-structure of the resulting fiber. We can then correlate how these structural properties correlate to mechanical and electrical properties of the fibers. With this understanding, we can improve the solution spinning process to push the boundaries of CNT materials for next generation wiring and cables.