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Microgram scale solution processing of single walled carbon nanotubes towards chirally enriched films and fibers ROBERT HEADRICK, MATTEO PASQUALI, Rice University — Self-assembled carbon nanotube (CNT) materials can couple soft flexibility with impressive tensile strength and electrical conductivity, however, they have yet to meet expectations for macroscopic electrical and mechanical properties. To efficiently investigate this disparity, we have developed a method for solution processing microgram quantities of CNTs dissolved in chlorosulfonic acid into high performance aligned films and fibers. We directly compare the properties of fibers prepared by this method and solution spinning with identical batches of CNTs to characterize the impact of alignment, twist, packing density, and aspect ratio. Surprisingly, these fibers can be more than twice as strong as their solution spun counterpart despite a lower amount of alignment. Furthermore, we demonstrate a rapid solution processing method for characterizing potential CNT material properties at a scale two orders of magnitude lower than previously required. Such small material requirement enables the production of films and fibers composed of chirally enriched single walled CNTs. We utilize the aqueous two phase extraction method to isolate samples concentrated in semiconducting and armchair chiralities and characterize their assembled macroscopic properties.

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