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Removal of surfactants and adducts from solution-processed single-walled carbon nanotubes[1] ALEXANDER KANE, Sandia National Laboratories — The use of single-walled carbon nanotubes (SWCNTs) in scalable electronics and optoelectronics requires purification of the material to remove contaminants from the growth, and enrichment of the semiconducting fraction of the material through sorting. Centrifugation of aqueous suspensions of SWCNTs allows for both purification and sorting in successive steps with the aid of surfactants, but the suspension process causes oxidative damage to the SWCNTs and the surfactants are difficult to remove from the SWCNT sidewall after deposition on the substrate. These residual surfactants and adductive defects negatively impact device performance. We present a two-step approach towards reducing this disorder post-deposition using mild oxidation to remove the surfactant followed by vacuum annealing to heal the SWCNT sidewall. Thermal gravimetric analysis and temperature programmed desorption show the optimal conditions and fundamental mechanisms. Characterization of the results using Raman spectroscopy, atomic force microscopy, and electronic transport measurements show that the quality of the material is maintained.

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