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Thermal Conversion of Bundled Carbon Nanotubes into Graphitic Ribbons[1] H.R. GUTIÉRREZ, U.J. KIM, V.H. CRESPI, P.C. EKLUND, Department of Physics, The Pennsylvania State University, University Park, PA 16802 USA — The morphological evolution of purified bundled single-walled carbon nanotubes (SWNTs) heat-treated in a dynamic vacuum from T = 200-2200 $^\circ$C is investigated by transmission electron microscopy, UV-Vis and resonant Raman spectroscopies. The coalescence of neighboring tubes was observed to begin at $\sim$1400 $^\circ$C in both materials. HiPCO (ARC) tubes exhibited $\sim$ 100% (70%) coalescence of the tubes that survive 1600 $^\circ$C. At $\sim$1800 $^\circ$C, the ARC material exhibits a much stronger conversion to multiwall nanotubes (MWNTs) with $\sim$3-5 shells, and, in contrast to the HiPCO material, these MWNTs are often bundled and collapse into graphitic ribbons. To our knowledge, this is the first report of these multilayer nanofilaments. With increasing temperature, Raman scattering and TEM indicate a preferential early loss of small diameter tubes. The small d tubes in HiPCO material appears to produce fragments that coat the walls of the MWNTs and lead to a more structurally disorganized material at 2200 $^\circ$C. Raman scattering spectra indicate that some coalesced SWNTs of d $\sim$ 2.5nm survive vacuum annealing for $\sim$6 h at 2000 $^\circ$C.

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