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Raman Scattering Study of the Thermal Conversion of SWNTs into Graphitic NanoRibbons. U.J. KIM, H.R. GUTIÉRREZ, PETER EKLUND, Department of Physics, The Pennsylvania State University, University Park, PA 16802 USA — Thermal processing of purified bundled SWNTs in vacuum at high temperatures has been found to lead to a series of important structural transformations: SWNT coalescence (1400 $^\circ$C-1600 $^\circ$C), formation of MWNTs ($\sim$1600-1800 $^\circ$C) and the formation of a new filamentary allotrope, i.e., Graphitic Nanoribbons (GNRs). HRTEM indicates that GNRs are collapsed MWNTS. ARC and HiPCO SWNTs go through the first two transformations, but only ARC material transforms to GNRs. At the highest temperatures, the ARC material is almost completely transformed into GNRs. Here we present the results of Raman scattering experiments on these carbon filaments after high temperature heat treatment (HTT) for $\sim$ 6 hr. For coalesced SWNTs, the structural order in the tube walls is sufficient to observe new low frequency radial (R) Raman modes ($\sim$100 cm^{-1}) identified with the diameter-doubled tubes. We can conclude that small diameter tubes (d$<$ 1.4 nm) are preferentially lost in the range HTT$\sim$1600-1800 $^\circ$C. After HTT$\sim$1800 $^\circ$C, the formation of MWNTs occurs via massive bond rearrangement of coalesced SWNTs, and this transformation is observed in Raman as a broadening of the high frequency bands and a loss of R-band intensity. A few isolated SWNTs with d $\sim$ 1.3-1.5 nm were found to survive HTT$\sim$2000 $^\circ$C, but not HTT$\sim$2200 $^\circ$C.

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