# PURIFICATION AND DIAMETER-DEPENDENT OXIDATIVE STABILITY OF SWNT SYNTHESIZED BY THE HIGH PRESSURE CARBON MONOXIDE PROCESS

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Abstract Body: Low T oxidation followed by brief sonication in hot HCl has been optimized to remove Fe catalyst residues from HiPco material with minimal loss of SWNTs. TGA shows that one pass reduces the Fe catalyst content from typically 6 -10 at.% to 0.6 - 1.6 at.% with ~60% yield, most of which corresponds to Fe removal. In one case, a second pass reduced Fe from 1.6 to 0.4 at.%. Raman scattering reveals a broad diameter distribution with a mean of 1.0-1.1 nm. Neutron diffraction and HRTEM show a low degree of microcrystalline rope formation compared to laser ablation and carbon arc methods. Neither of these attributes are affected by purification or vacuum annealing. Fe catalyzes the oxidation of SWNT; higher oxidation temperatures can be used after the first pass without significant loss of tubes. After purification we find excellent correlation between TGA and Raman data, showing that T(oxidation) varies inversely with tube diameter. This can be explained by the larger strain associated with greater curvature of small tubes. HRTEM shows that the remaining tubes are intact with clean sidewalls, so controlled burning can be useful to narrow the diameter distribution by burning off small-diameter tubes. Reactions with KMnO4 solution further prove the lower stability of tubes with smaller diameter.