Temperature stability of ferritin as a catalyst for Carbon nanotube growth

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Brigham Young University — In Carbon nanotubes grown with thermal CVD the distribution of tube diameters is dependant upon the growth catalyst. Use of biologically derived catalysts particles have been explored with the hope of narrower diameter distributions resulting from the tight distribution of catalyst particle diameters. Ferritin is the iron storage system in biological systems and consists of a protein shell with an iron hydroxide core. Previous use of catalyst particles generated from ferritin has not consistently resulted in narrow nanotube size distributions. To explore this inconsistency we have studied the particle distribution and temperature stability of surface deposited ferritin on various substrates by TEM. The effects of common substrates (Carbon, SiO$_2$ and Si$_3$N$_4$) on particle densities will be reported. We removed the protein shell with either a low temperature oxygen plasma or a high temperature anneal. With plasma removal of the protein shell the initial particle size and spacing distribution can be maintained at temperatures up to 600 C.