THE CVD SYNTHESIS AND CHARACTERIZATION OF MULTI-WALLED CARBON NANOTUBES. ***R. DiLeo,*** *R. Raffaelle*, Department of Physics, NanoPower Research Laboratories, rad0468@rit.edu, rprsps@rit.edu*

The design and fabrication of an injection chemical vapor deposition (CVD) reactor was carried out for the synthesis of multi-walled carbon nanotubes (MWNTs) using a cyclopentadienyliron dicarbonyl dimer precursor. Characterization of the as-produced materials was performed using TGA, SEM, TEM, Raman spectroscopy, UV-Vis spectroscopy, AFM, and the BET method of surface area analysis. The quality (metal content, relative Raman ratio of the D/G and G'/G bands) and the properties (diameter and length distribution, surface area) of the as-produced MWNTs materials were investigated. Optimization of synthesis parameters for high quality MWNTs was performed using a fractionated factorial design, 2^{k-p}, with center points. The synthesis parameters of temperature, gas flow, catalyst delivery rate, injector position, and precursor concentration were varied. Optimal conditions for yield and quality were determined at a temperature between 725-800℃, a gas flow of .75 L/min, a catalyst delivery rate of 3.5 ml/hr, and a precursor concentration of .08 M in toluene. The high quality MWNTs produced with a metal content of 4% by weight and an outer diameter distribution of 60-80 nm have the ability to be utilized in various applications, namely, fuel cell electrodes, solar cell additives, and composite reinforcement.