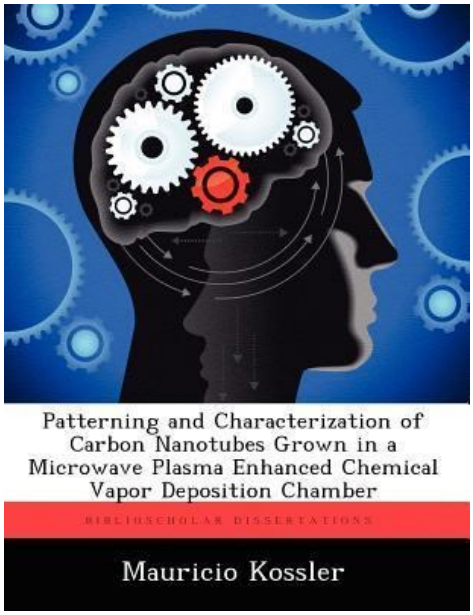

Patterning and Characterization of Carbon Nanotubes Grown in a Microwave Plasma Enhanced Chemical Vapor Deposition Chamber

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This research studies the growth of carbon nanotubes from a nickel catalyst to be used on a eld emission device. A triode structure was created to be able to patterned the CNTs to improve the emission of electrons. Studies are performed on the e ects of hydrogen pretreatment on nickel catalyst of di erent thicknesses and deposition methods on a silicon substrate and how it will a ect the growth of carbon nanotubes using microwave plasma enhanced chemical vapor deposition. The treated catalyst granule size and density was determined optically through scanning electron microscope images and atomic force microscope measurements. It was discovered that sputtered catalyst needs a longer pretreatment than evaporated catalyst. As expected, the pretreatment time must be increased as the catalyst thickness increases to get granule sizes and densities favorable for carbon nanotube growth. We also established the size of the catalyst granules correlated to the diameter of the multi walled CNTs grown. We determined the catalyst can be over treated causing catalyst conglomeration that result in poor CNT growth. The CNTs diameter was determined optically through scanning electron microscope images.