

## **The effect of Ni catalyst on the growth of multi-walled carbon nanotubes by PECVD method**

### **ABSTRACT**

In this paper, the effect of nickel (Ni) catalyst on the growth of carbon nanotubes (CNTs) was studied where the CNTs were vertically grown by plasma enhanced chemical vapor deposition (PECVD) method. The growth conditions were fixed at a temperature of 700°C with a pressure of 1000mTorr for 40 minutes with various thicknesses of sputtered Ni catalyst. Experimental results show that high density of CNTs was observed especially towards thicker catalyst layers where larger and taller nanotubes were formed. The growth rate increases by ~0.7 times with increasing catalyst thickness from 4nm to 10nm. The nucleation of the catalyst with various thicknesses was also studied as the absorption of the carbon feedstock is dependent on the initial size of the catalyst island. From the Raman results, we found that only slight variation in the intensity ratio of G-band over D-band as increasing catalyst thicknesses. The minor difference in G/D ratio indicates that the catalyst thickness does not significantly influence the quality of CNTs grown.

**Keyword:** Carbon Nanotube (CN); Chemical Vapor Deposition (CVD); Nickel; Nucleation; PECVD