

**INVESTIGATION ON GROWTH BEHAVIOUR OF CNTS  
BY METAL CATALYSTS IN THERMAL – CVD**

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## **ABSTRACT**

Carbon nanotube (CNT) are single sheets of graphite (called graphene) rolled into cylinders. The diameter of the tubes is typically in nanometers, the lengths are nanometers to micrometers. This huge aspect ratio leads to a wonder of physical and chemical properties.

Carbon nanotube has been prepared by several methods such as laser ablation, Arc discharge, hydrothermal method, chemical vapor deposition. Among these methods, chemical vapor deposition (CVD) is a unique technique to prepare high quality nanotubes from a wide variety of catalyst materials.

To study the influence of the metal catalyst on the nanotube growth characteristics, it proposed to vary the temperature during the growth on Nickel (Ni) and Iron (Fe) catalyst in silicon substrate using Hydrogen ( $H_2$ ) and Acetylene ( $C_2H_2$ ) precursors. The film and nanotubes was characterized using XRD, AFM, SEM, EDAX and TEM.

To study the influence of annealing temperature of Nickel and Iron on a silicon substrate by CVD various temperatures such as 800, 900, 1000, 1050, 1100 and 1150°C.

Prior to the nanotube growth the Nickel and Iron film was deposited by e-beam evaporation on silicon substrate.

Thin film of Nickel and Iron catalysts support Carbon nanospheres growth (CNS) at the temperature of 800, 900 and 1000°C. Multiwall carbon nanotube (CNT) growth was achieved during the annealing temperature of 1050, 1100 and 1150°C. Results obtained from the different annealing temperature were discussed.

Both metal catalysts lead to significantly enhanced carbon nanostructure growth. In particular, the Nickel allows growing carbon nanotubes and nanospheres on diverse substrate materials at temperatures.

The growth mechanism also discussed for the both carbon nanospheres and carbon nanotubes.