THE ROLE OF REACTION TEMPERATURE ON THE GROWTH OF CARBON NANOMATERIALS

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Well aligned multi wall carbon nanotubes (MWCNTs), carbon nanofibers (CNFs) and other type of carbon nanostructure materials have been synthesized by a fabricated floating catalyst chemical vapor deposition (FC-CVD) method. This involved the pyrolysis of benzene-ferrocene vapor mixture. Carbon nanotubes films with a diameter of 2-50 nm and nanofiber with a diameter range from 100-300 nm were synthesized in a benzene/hydrogen atmosphere. Furthermore vapor grown carbon fibers have been synthesized with different diameters and lengths. Iron clusters that were produced from the thermal decomposition of ferrocene films were used as catalyst for the synthesis of the carbon structures.

The effect of the reaction temperature on the production of carbon nanomaterials was investigated. The reaction temperature was varied from 500 °C to 1200 °C. By controlling the growth temperature, carbon nanotubes (CNTs), carbon nanofibers (CNFs) and vapor grown carbon fiber with different structures were produced. Increasing the temperature has a remarkable effect on the size and shape of the catalyst and this in turn affected the diameter distribution and structure of the carbon materials. The carbon nanotubes were produced from 600 °C to 850 °C with maximum yield at 850 °C, while for the production of carbon nanofibers the reaction temperature was from 900 °C to 1000 °C with a maximum yield at 1000 °C. Vapor grown carbon fibers were produced at 1050 °C to 1200 °C with maximum yield at 1050 °C.