# Effect of Transition Metal Based Catalysts on Carbon Nanotube and Nanofiber Production

Sinem Taş, Firuze Okyay, Yuda Yürüm
Sabanci University Natural Science and Engineering Faculty, Istanbu1,34956, Turkey
sinemtas@sabanciuniv.edu, firuzeokyay@sabanciuniv.edu, yyurum@sabanciuniv.edu

Carbon based materials are interesting and important materials. Among these materials, especially carbon nanotubes (CNTs) have received major attention due to their specific mechanical, physical, electrical properties and technological applications. CNTs are generally produced by three methods; laser ablation, arc discharge and chemical vapor deposition (CVD) [1]. Among these methods, CVD is a promising and cost effective process for the large scale production [2]. Moreover, it is possible to produce aligned at low temperatures. CVD process is based on the catalytic decomposition of hydrocarbon source on the metal loaded substrate. Mesoporous materials, specifically FSM-16, are favorable candidates for the CNTs production with their unique properties such as large surface areas and high thermal stability [3]. Approaching the desired electronic properties of CNTs depends on certain parameters; catalyst, carbon precursor, synthesis temperature, reaction time, and atmosphere.

The main scope of this research is to analyze the effects of transition metal based mesoporous catalysts for carbon nanofiber and carbon nanotube production by means of chemical vapour deposition (CVD) process. FSM-16 was synthesized via intercalating the silicate layers of kanemite $NaHSi_2O_5.3(H_2O)$ by cation exchange process with hexadecyltrimethylammonium bromide. 1, 5, 10 wt % iron and nickel, as transition metals, were loaded on the framework of the FSM-16 by impregnation method. FSM-16, Fe-FSM-16 and Ni-FSM-16 were characterized by X-ray diffraction, BET and scanning electron microscope (SEM). The X-ray diffraction showed that the resultant materials had uniform pore structure with honeycomb arrangement. BET surface area, pore volume and pore diameters were decreased as the metal loading increased. SEM images demonstrated the kanemite sheets were present in the structure of FSM-16 in Figure 1. Carbon nanotubes (CNTs) were synthesized within the metal trapped channels of the FSM-16 via CVD using acetylene as the hydrocarbon source. The resultant nanotubes/fibers were compared under similar reaction conditions and they were characterized by SEM, and atomic force microscopy (AFM).

**References**

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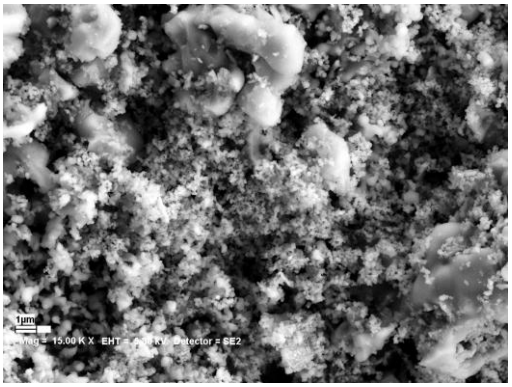

**Figure 1.** SEM image of FSM-16