ELECTRON MICROSCOPY OF SINGLE-WALLED CARBON NANOTUBES DURING GROWTH ON CoMo BIMETALLIC CATALYSTS

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Single-wall carbon nanotubes (SWNT) can be considered as one of the building blocks for nanoscale science and nanotechonology. Among several methods used to obtain these materials, our group has focused on the disproportionation of CO on bimetallic CoMo catalysts, which exhibited a high selectivity toward the production of SWNT at relatively low temperatures. This good performance has been linked to the interaction between Co and Mo, in the form of a surface cobalt molybdate species, which under reaction conditions becomes Mo carbide and generates small clusters of metallic Co, in turn active for the growth of SWNT. The growth of SWNT over model-catalysts has been investigated by electron microscopy. Our studies have focus on CoMo bimetallic catalysts supported on lacey silicon monoxide grid using CO and CH_4 as carbon source. Our preliminary results show that in the case of CO the length and density of SWNTs increases dramatically with increase in reaction time. These observations are in agreement with Raman studies performed on the same materials. No carbon signal appears during the first few minutes, despite a strong modification in the spectrum. The typical bands characteristic of SWNTs, start appearing only after 3 minutes in contact with CO and become very strong after 10 minutes under reaction. On the other hand, SWNTs were detected after exposure to CH_4 for 5 minutes. The crystal structure of the metal catalyst after reaction with CO and CH4 is also different. These observations can lead to a more detailed understanding of the growth mechanism.