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Evolution of the Catalyst Nanoparticles during CVD Growth of Carbon Single-Walled Nanotubes ELENA MORA, ARTHUR EPSTEIN, The Ohio State University, TOSHIO TOKUNE, AVETIK HARUTYUNYAN, Honda Research Institute, THE OHIO STATE UNIVERSITY COLLABORATION, HONDA RESEARCH INSTITUTE COLLABORATION — Despite intense studies, the growth mechanism of carbon single-walled nanotubes (SWNTs) is still debated and current synthesis methods do not allow for full control over the growth. There has been much discussion of whether the active catalytic species are in the liquid or solid phase during SWNTs formation, which is a key to understand and to control the growth of these materials. However, the actual phase of the catalyst and its evolution during carbon SWNTs growth still has to be experimentally verified. We report the observation of carbon induced solid-liquid and solid-liquid-solid phase transitions of the iron nanocatalyst during the synthesis, using differential scanning calorimetry and Raman scattering measurements. We found that as long as the nanocatalyst is in a liquid state, SWNTs growth occurs and continues until its solidification. Moreover, no growth was observed below the eutectic point, when the catalyst is always in solid phase.

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