

# In-situ observation of SWNT growth by Raman scattering

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Inside an atomic force microscope (AFM) with Raman scattering measurement capabilities, we have synthesized SWNTs on the sample stage by using a laser-heated cold-wall alcohol catalytic CVD method. Raman scatterings from the SWNT samples were measured in-situ during the CVD process. Mo/Co metal particles, which were directly loaded on the silicon substrate by a dip-coat technique, were used as the catalyst and a CW-Ar-ion laser (488.0 nm, 50.0 mW) was used as both the heating and Raman excitation laser. After the supply of the ethanol gas (0.02-0.2 Torr), there was a certain delay time before the G-band from SWNTs appeared in the in-situ Raman scattering spectra. The intensity of the G-band increased with time, however, the intensity increase stopped after several minutes. The incubation time between the supply of ethanol gas and the beginning of SWNT growth was nearly inversely proportional to the ethanol gas pressure, and was independent of the CVD temperature.