In-situ Raman diagnosis of laser-heated ACCVD growth process of SWNTs

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We have built an atomic force microscope (AFM) with Raman scattering measurement capabilities and succeeded in synthesizing SWNTs on the AFM sample stage [1] using alcohol catalytic CVD method [2]. In this experimental apparatus, in-situ measurements of Raman scattering during whole CVD process was performed. Fig. 1 shows the transition of the intensity of the G-band (a) and Raman scattering peak from the silicon substrate (b) during the CVD process. Mo/Co metal particles, which were directly loaded on the silicon substrate [3], was used as the catalyst and Ar-ion laser (488.0 nm, 54.0 mW) was used as the heating laser and Raman excitation laser. The sample temperature (c) was calculated from the temperature dependence of Raman shift of the silicon peak [4], where the temperature of the sample during CVD process was 800 °C. While the silicon peak intensity was almost constant, the G-band appeared about 40 s after the supply of ethanol gas and its intensity increased with time. However, the intensity increase stopped about 2 min after the appearance of the G-band, which indicated the inactivation of the catalyst metal particles.

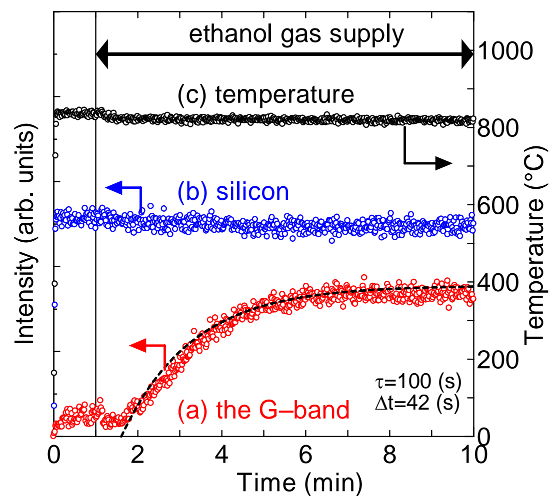

Fig. 1 Transition of the Raman scattering intensity from SWNTs (a) and the silicon substrate (b) during CVD process.

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