

Influence of Co/Mo Ratio on Synthesis of Single-Walled Carbon Nanotubes from Carbon Monoxide

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Co and Mo are often used as catalysts for the catalytic chemical vapor deposition (CCVD) synthesis of single-walled carbon nanotubes (SWNTs) on a substrate. We succeeded in synthesizing random, vertical and parallel aligned SWNTs on Co and Mo dip-coated quartz substrates from carbon monoxide (COCCVD) in 2004. But we need more detailed knowledge concerning the influence of the Co/Mo ratio on the SWNT synthesis for mass production and application to optical or electronic devices. In this study, it was evaluated by the combinatorial method [1], using a library (silicon substrate with oxide layer) of sputter-deposited Co and Mo patterns.

COCCVD was done at 800°C at 1atm using hydrogen / carbon monoxide (500 / 500 sccm) with the library and restricted SWNT formation region was confirmed by HRSEM observation and micro Raman spectroscopic analysis (Fig.1). For the comparison CCVD from ethanol (ACCVD) was done at 800°C at 12 torr. It resulted that the Co/Mo ratio for SWNT formation was large in the order of COCCVD, ACCVD and CoMoCAT [2] (Fig.2).

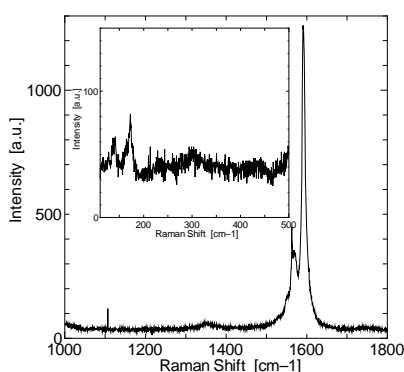


Fig.1 Raman Spectrum from COCCVD

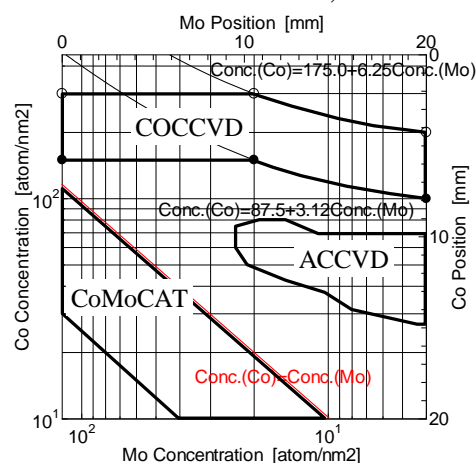


Fig.2 SWNT formation Region

[1] S. Noda, et al., Appl. Phys. Lett., 86 (2005)173106.

[2] J.E.Herrera et al., J. Catalysis 204 (2001), 129.

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