

アルコールCVDによるSWNT直径と配列構造の制御 Diameter and morphology control of SWNTs by alcohol CVD

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The concentration of Co-Mo binary catalyst concentration and the effect on the morphology of single-walled carbon nanotubes (SWNT) was investigated by scanning electron microscopy and optical spectroscopy. We found that there is some critical concentration or catalyst density below which SWNTs will not be vertically aligned. Higher Mo concentrations resulted in vertically aligned, small-diameter SWNTs.

Single-walled carbon nanotubes (SWNTs) were grown on silicon substrates by the alcohol catalytic CVD method [1]. The substrates were prepared by a dip-coating method [2] using 0.01 %wt Co metal and different Mo concentrations. The effect of different of binary catalysts ratios on the SWNTs was observed by scanning electron microscopy (SEM) and evaluated by optical absorbance and resonance Raman spectroscopy. From SEM, it was clearly observed that the growth direction and nanotube length depend on Mo concentration. Vertical alignment [3] was only realized below a critical Mo concentration of 0.01 %wt. Above this concentration, dense mats of SWNTs grew in the plane of the substrate. Furthermore, we also found the mean SWNT diameter decreases with increasing Mo concentration [4]. This is shown by UV-vis-NIR absorbance (Fig. 1) and resonance Raman spectroscopy. Both of these methods indicate a clear tendency toward small-diameter SWNTs resulting from increased Mo concentration.

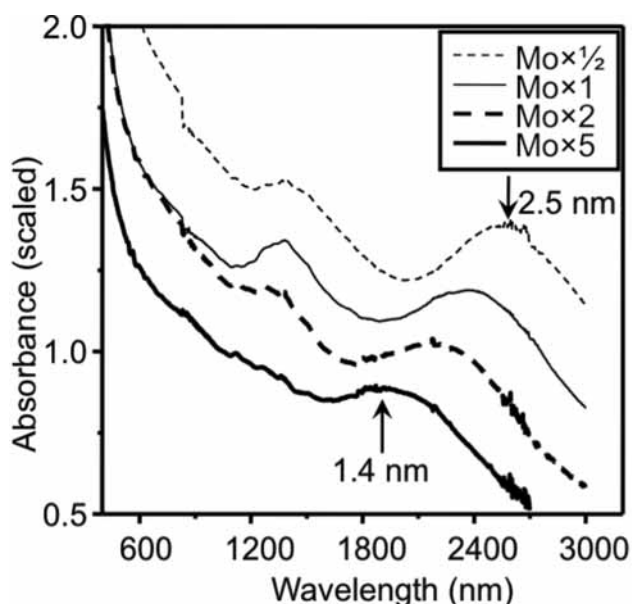


Figure 1: Optical absorbance spectra indicating average diameter of vertically aligned single-walled carbon nanotubes synthesized using different concentrations of molybdenum catalyst.

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 [4] R. Xiang, E. Einarsson, Y. Murakami, J. Shiomi, S. Maruyama, *in preparation*.