

Influence of the Co/Mo Ratio on the SWNT Synthesis from Carbon Monoxide

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By using carbon monoxide as carbon source, we have synthesized random, vertical and parallel aligned SWNTs on quartz substrates dip-coated with Co and Mo (COCCVD). In order to study the influence of the Co/Mo ratio in details, combinatorial method [1] with wide nominal thickness profiles of metal catalysts was employed. By the uniquely masked sputter-deposition technique, we prepared a 2-dimensional catalyst library with Mo (0.2 - 4 nm) and Co (0.2 - 8 nm) thickness profiles on a SiO₂/Si wafer [2]. After the CVD using hydrogen / carbon monoxide (500 / 500 sccm) (800 degC, 1 atom), SWNT formation region was confirmed by HRSEM observation and micro Raman analysis. The optimum Co/Mo ratio for the SWNT formation was larger in the order of COCCVD, ACCVD [2] and CoMoCAT [3]. The difference of the optimum Co/Mo ratio between COCCVD and ACCVD is suspected to originate in the relation between the activity of Co and the energy requirement for graphite precipitation in a thermodynamic equilibrium process. Furthermore, the effect of support materials, heating or reducing processes, catalyst preparations will be discussed.

References:

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