Generation of SWNTs on Si Wafer by Alcohol Catalytic CVD

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We have demonstrated the high-purity and low-temperature synthesis of SWNTs by alcohol catalytic CVD (ACCVD) technique [1]. The CVD reaction temperature can be as low as 600°C with ethanol as the carbon source. The controlled synthesis of SWNTs on quartz with electrodes was demonstrated by Dai's group by CVD method using CH_4 as carbon source [2]. Since the optimum reaction temperature is about 900°C in their method, usual pattern semi-conduction material will be considerably damaged. By using ACCVD technique, lower temperature generation of SWNTs on Al patterned Si surface should be principally possible.

We tried to generate SWNTs on Si wafer by ACCVD technique. Zeolite particles supporting Fe/Co catalysts were dispersed in ethanol, and this dispersion liquid (about 1 $\mu\ell$) was dropped onto a Si wafer (10×10 mm). Then, this wafer was heated about 900°C in an electrical oven in Ar atmosphere and after the evacuation of Ar, ethanol vapor was introduced for 10 min. We could find that the bundles of SWNTs were generated from the surface of zeolites in SEM images as in Fig. 1. Many bundles observed as low-contrast image in Fig. 1 seemed to be running on Si wafer, probably because of the attachment by van der Waals force.

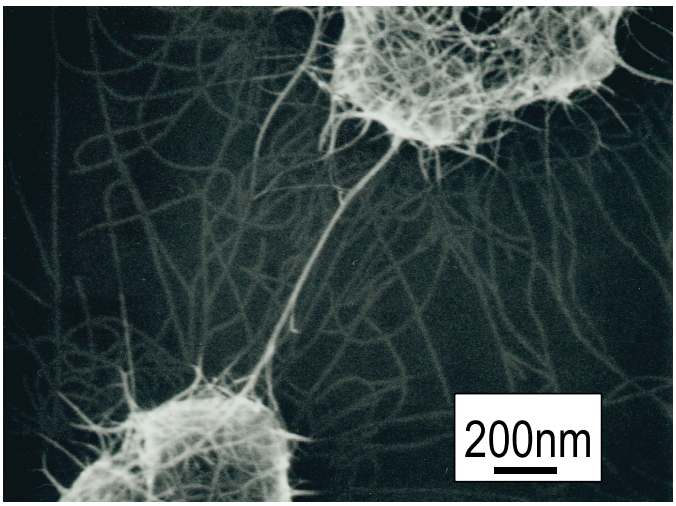

Fig. 1 SEM image of SWNTs on Si wafer grown from Fe/Co loaded zeolite particles

[1] S. Maruyama, R. Kojima, Y. Miyauchi, S. Chiashi and M. Kohno, *Chem. Phys. Lett.*, (2002), in print.
[2] Y. Zhang and H. Dai, Appl. Phys. Lett., 79 (2001) 3155.

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