Synthesis of Single-Walled Carbon Nanotubes from Defined Surface of Silicalite-1 Zeolite and their Photoluminescence Characterizations

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Zeolites are microporous, crystalline aluminosilicates constructed from tetrahedral base units. We employed silicalite-1 (MFI-type) zeolite for supporting catalysts for the growth of single-walled carbon nanotubes (SWNTs). Cobalt was deposited on the *b*-surface (010 direction) where open periodic pores of 0.56 × 0.53 nm straight channels exist. The aim of the study is to engineer the chirality distribution of SWNTs by controlling the aggregation and/or morphology of the catalysts expecting their interactions with the crystalline surface.

Figure 1 shows typical FE-SEM images after the growth of SWNTs (CVD condition: 800 °C, 5 min, ethanol vapor = 0.4 kPa) where their intercalations between the top surfaces (*b*-surface) of the crystals are recognized. Such an intercalation of SWNTs allows us to use micro-photoluminescence spectroscopy to characterize the grown SWNTs *individually*. Figure 2 shows several PL spectra measured from those SWNTs. The effects of the SWNT growth conditions on the resultant chirality/diameter distributions are investigated.

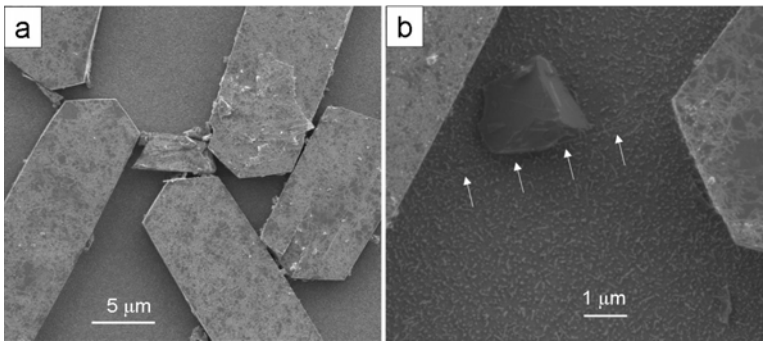

Fig. 1: FE-SEM images of the sample after the SWNT growth. (a) Silicalite-1 crystals on a quartz substrate. (b) Suspended SWNT between top surfaces of two silicalite-1 crystals (indicated by arrows).

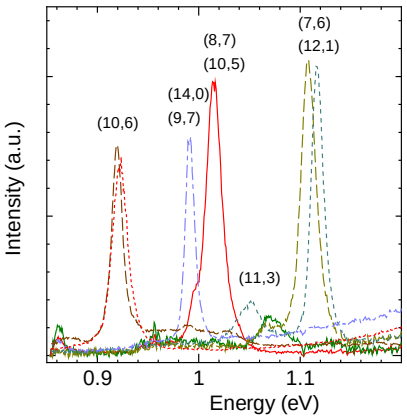

Fig. 2: PL spectra obtained from the sample. Excitation wavelength is 710 nm.

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