

CVD Generation of Single-Walled Carbon Nanotubes from Alcohol

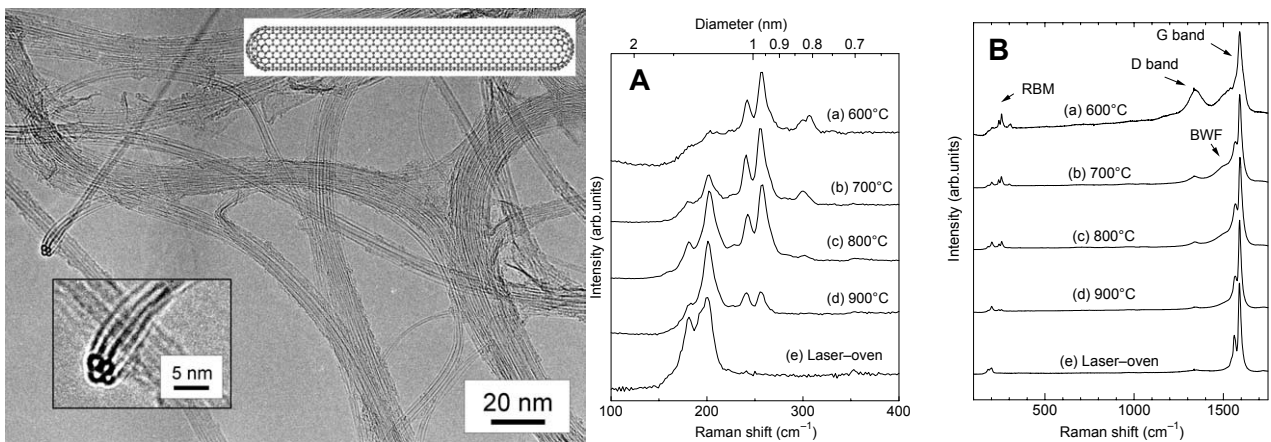
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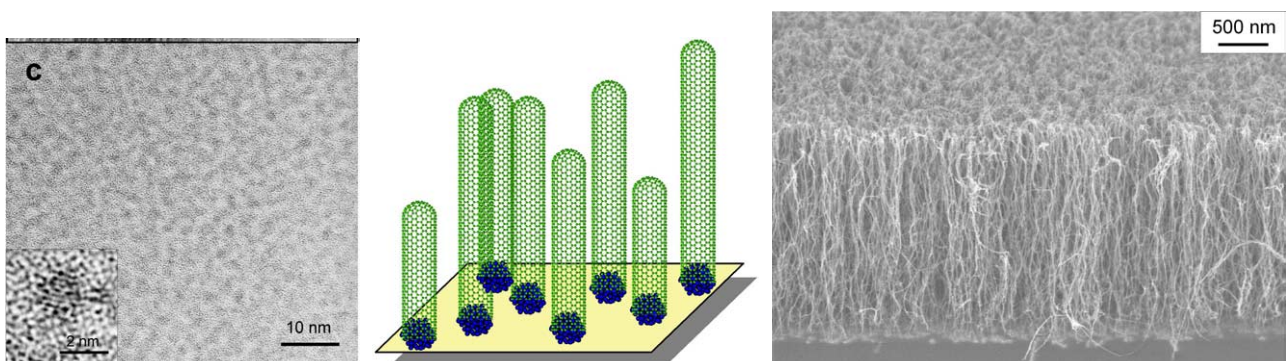
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Recent developments of catalytic CVD generation of single-walled carbon nanotubes (SWNTs) by using alcohol as the carbon source will be presented. High-purity SWNTs can be generated at relatively low CVD temperatures from metal catalytic particles supported on zeolite [1, 2] (Fig. 1) or directly dispersed on flat substrates such as meso-porous silica [3], quartz and silicon [4, 5]. The zeolite support is used for bulk generation and direct growth on substrates is useful for optical or semi-conductor applications. By use of the ethanol, the CVD apparatus can be very simple; the cold-wall CVD with in-situ Raman observation is demonstrated [6]. Recently, the vertically aligned SWNTs mat with a couple of micron meters is grown on quartz substrates by employing the most efficient activation of catalytic metals as shown in Fig. 2 [5]. On the other hand, the chirality distribution of SWNTs determined by the near infrared fluorescence is quite unique for low-temperature CVD condition [7]. The near armchair nanotubes are predominantly generated probably because of the stability of nanotube cap structure for thin nanotubes as shown in Fig. 3 [8]. The growth process of SWNTs simulated by molecular dynamics method [9] gives an important suggestion about this chirality-selective generation of SWNTs. Perspective of chirality-selective CVD generation will be discussed with some experiments using other carbon sources such as fullerene [10].



(a) TEM image of ACCVD sample (b) Raman scattering 488nm(RBM) (c) Raman scattering

Fig. 1 TEM image of Raman scatterings of SWNTs generated from Fe/Co supported on zeolite.



(a) TEM image of catalysts of 1.5nm (b) Image of growth process (c) Vertically aligned SWNTs mat of 2µm

Fig. 2 Generation of SWNTs on flat substrates

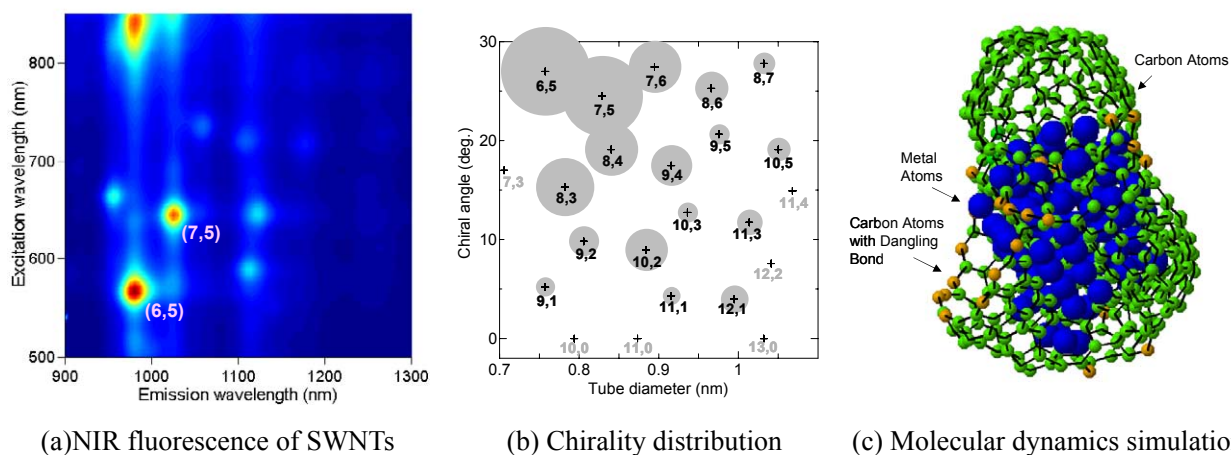


Fig. 3 Chirality distribution by near infrared fluorescence measurement and nanotube cap structure by molecular dynamics simulations

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