

SYNTHESIS OF LONG STRAND OF CARBON NANOTUBES IN HIGH YIELD

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Carbon nanotube has an extremely high mechanical strength and can be used for reinforced composite. However, most of the synthesized carbon nanotubes showed limited length of hundreds of micrometers. It will be definitely far better if long tubes can be used for the composites particularly for tensile applications. Here we report an improved method to produce carbon nanotube having very long and aligned strands in high yield. Various properties of the tubes examined will be discussed.

Carbon nanotubes were synthesized with n-hexane mixed with ferrocene as catalyst, and with thiophene for long and highly oriented structure. Various process parameters including temperature and feeding rate were tested and their effects on the product were examined. Morphological and structural properties were examined by scanning electron microscopy (SEM), transmission electron microscopy (TEM), Raman spectrum, and thermal gravimetric analysis (TGA). Very high quality single wall nanotubes with 0.8-1.4 nm diameters were synthesized as shown in Raman spectrum (a). The SEM pictures showed a high density of straight carbon nanotubes (b). The strands with 10-30 cm length are highlight in our experiment (c). We could synthesize long strand-like and high yield of web-like product by controlling the process parameters.

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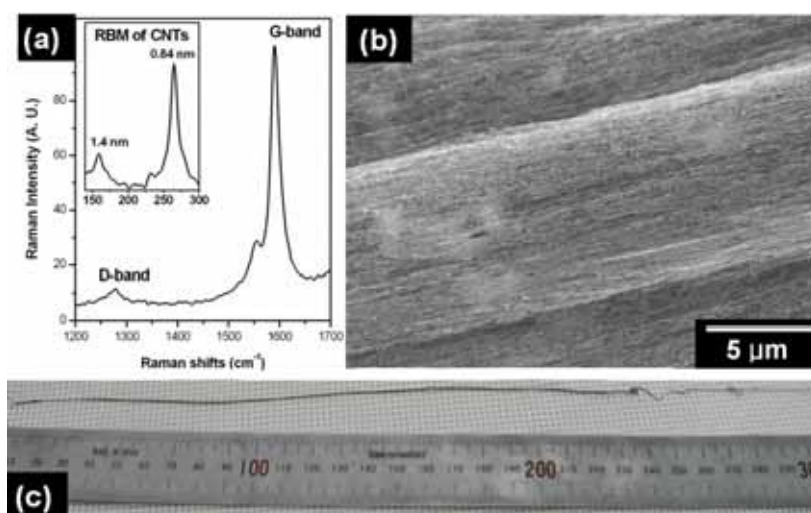


Fig. 1. (a) The Raman spectrum, (b) an image of scanning electron microscopy, and (c) photograph of the synthesized long carbon nanotubes at 1000°C by vapor phase growth method.