Fluorescence and Raman spectroscopy of single-walled carbon-13 nanotubes

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Photoluminescence [1] and Raman scatterings of single-walled carbon nanotubes (SWNTs) synthesized from isotopically-modified ethanol were studied. Using Alcohol catalytic CVD (ACCVD) technique optimized for the efficient production of SWNTs from very small amount of ethanol, SWNTs consisting of carbon-13 isotope ($SW^{13}CNTs$) were synthesized in addition to normal SWNTs consisting of mainly ^{12}C. The vibrational features of $SW^{13}CNTs$ were compared with those of normal SWNTs through NIR-luminescence mapping and Raman spectroscopy.

Fig. 1 compares Raman scattering spectra for $SW^{13}CNTs$ and normal SWNTs excited with 488 nm laser. Small D-band signal at 1350 cm^{-1} suggests that high quality SWNTs were synthesized from tiny amount of ethanol. There was almost no change in Raman spectra shape for $SW^{13}CNTs$ but the Raman shift frequency was $\sqrt{12/13}$ times smaller because of the heavier carbon atoms.

In addition to Raman spectroscopy, we have mapped the NIR-luminescence of D_2O-surfactant dispersions of both $SW^{13}CNTs$ and normal SWNTs. By comparing the two maps, luminescence peaks corresponding to electronic transitions with vibrational excitation were identified.

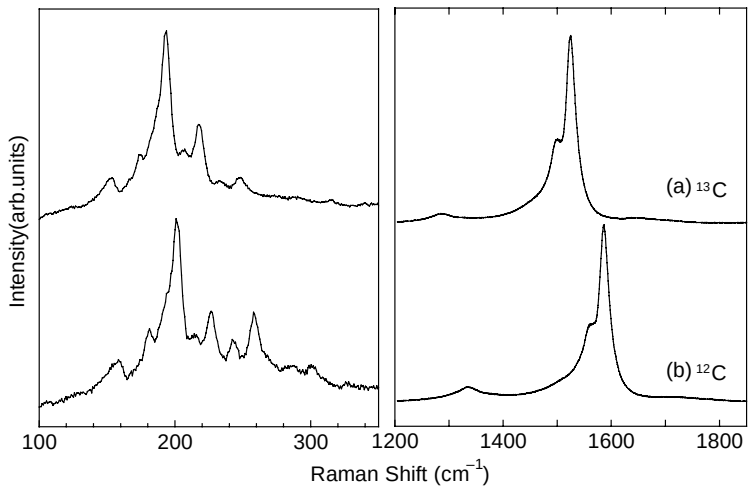

Fig. 1 Raman spectra of (a) $SW^{13}CNTs$ (b) normal SWNTs.

[1] S.M. Bachilo, *et al*., *Science* **298** (2002) 2361

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