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Corresponding Author: Shoushan Fan

Supporting Information: The Raman spectra have 3 features below 2000 cm^{-1} , the disorder induced D band, the graphite like G band related to the E_{2g2} graphite mode, and the D' band which is also disorder induced and related to the maximum of the graphite 2D phonon density of states¹ (Fig. 1). Normally, the G band can be decomposed into two close modes for the vibrations along the nanotubes axis and in circumferential direction, but here we will consider it as only one band since we have not been able to observe this decomposition clearly. At higher frequencies than 2000 cm^{-1} , overtones of these bands are seen. 2×D, D+G and 2×G are the overtones of D/D, D/G and G/G modes respectively. Raman modes of ¹³C nanotubes ($\omega_{13\text{C}}$) exhibited clear shifts to lower frequencies compared to those of ¹²C nanotubes ($\omega_{12\text{C}}$), with a uniform ratio of $\omega_{13\text{C}} : \omega_{12\text{C}} \sim 0.96$ (for the details see table 1).

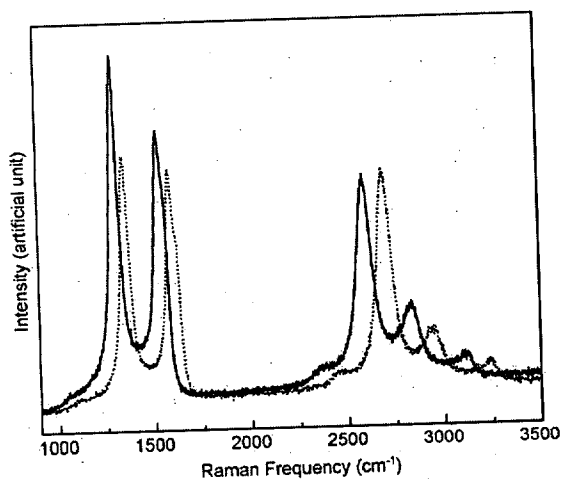


Figure 1 Raman spectra of pure ¹³C nanotube array (solid) and pure ¹²C nanotube array (dotted).

Table 1. Experimentally measured Raman modes of pure ¹²C and pure ¹³C multi-walled carbon nanotube arrays.

Raman modes ^a	D	G	D'	^a	2×D	D+G	2×G
¹³ C MWNT (cm^{-1})	1298	1526	1558	2345	2590	2833	3099
¹² C MWNT (cm^{-1})	1350	1585	1620	2452	2700	2947	3232
Ratio of ¹³ C / ¹² C ^b	0.961	0.963	0.962	0.956	0.959	0.961	0.959

^a This band has no explicit name in the graphitic Raman spectrum.

^b The ratio of the Raman frequencies of ¹³C nanotubes over the corresponding frequencies of ¹²C nanotubes.

- (1) Ekhard, P. C.; Holden, J. M.; Jishi, R. A.; *Carbon* 1995, 33, 959.
 (2) Rao, A. M.; Jorio, A.; Pimenta, M. A.; Dantas, M. S. S.; Saito, R.; Dresselhaus, G.; Dresselhaus, M. S. *Phys. Rev. Lett.* 2000, 84, 1820.