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Alcohol CVD Growth, Raman and Photoluminescence Spectroscopy of Single-Walled Carbon-13 Isotope Nanotubes

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Using Alcohol catalytic CVD (ACCVD) technique [1] optimized for the efficient production of SWNTs from very small amount of ethanol, SWNTs consisting of carbon-13 isotope (SW¹³CNTs) were synthesized. Raman scatterings from SW¹³CNTs show no change from SW¹²CNTs in spectrum shape except for the Raman shift frequency down-shifted as much as square-root of mass ratio 12/13. On the other hand, SWNTs with mixed 12/13 isotopes from ¹³CH₃-CH₂-OH and CH₃-¹³CH₂-OH show different amount of down-shift in Raman spectra, suggesting that smaller amount of site-1 carbon atom (next to OH) is incorporated into SWNTs; suggesting an important decomposition process of ethanol on catalysts. Furthermore, near infrared photo-luminescence of D₂O-surfactant dispersions of both SW¹³CNTs and SW¹²CNT were mapped. By comparing the excitation spectra, 'pure electronic' and 'ex citon-phonon coupling' [2] transition peaks were clearly identified.

References

[1] S. Maruyama et al., Chem. Phys. Lett., 360 (2002) 229.

[2] V. Perebeinos et al., Phys. Rev. Lett. 94 (2005) 027402.

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