

PURITY ASSESSMENT OF MULTI-WALLED CARBON NANOTUBES BY RAMAN SPECTROSCOPY

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Abstract

A method of purity assessment for multi-walled carbon nanotubes (MWNTs) using Raman spectroscopy has been developed. Reference sample sets were constructed using MWNTs, synthesized by injection chemical vapor deposition (CVD), and carbon impurities (i.e. carbon soot and nanostructured carbon). Raman spectroscopy was performed and ratios of the characteristic peaks were measured (i.e. I_D/I_G , I_G/I_G , and I_G/I_D). Different vibrational modes in the various carbon species give rise to these peaks and result in characteristic Raman spectra for MWNTs and carbon impurities. Calibration curves were constructed from the reference sample sets. These calibration curves were used to evaluate MWNTs synthesized under varying experimental conditions (i.e. temperature of 650- 950 °C, gas flow rate of 0.5 – 1.75 L/min, precursor injection rate of 1.5 – 4.5 mL/hr, and precursor concentration of 0.04 - 0.1 M) to determine their ‘purity’. The limits associated with this method are discussed in relation to other qualitative and potentially quantitative methods of determining MWNT purity.