

A simple quantitative estimate of the number of functional groups on the surfaces of single-walled carbon nanotubes

최명수, 엄조은, 박재선, 김우재<sup>†</sup>  
가천대학교

We develop a quantitative analytical method to estimate the number of functional groups on single-walled carbon nanotube (SWNT) surfaces by simply measuring the Raman features of functionalized SWNTs. We use diazonium chemistry to attach functional groups to the SWNT surfaces and calculate the number of functional groups on the SWNTs by measuring their densities and using the analytical method developed in this study. We successfully establish a linear relationship between the independently estimated number of functional groups per carbon atom and the area ratio of the disorder mode (D peak, 1289  $\text{cm}^{-1}$ ) to the tangential mode (G peak, 1582  $\text{cm}^{-1}$ ) from the Raman measurements. From this study, we find that the number of functional groups per carbon atom ( $n_f$ ) estimated using the analytical method developed in this study linearly depends on the area ratio of D to G peaks of the Raman spectrum. Therefore this simple and quick estimation scheme can provide an analytical basis for a variety of SWNT applications. We take into account the decrease of the number of surfactants by the coverage of functional groups on SWNTs in this scheme, and also verified that this relation is valid irrespective of SWNT diameter distributions.