

Electronic Properties of Carbon Nanotubes Probed with Core-level and Valence Band X-ray Photoemission

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The electronic properties of single-walled carbon nanotubes (SWNT) produced with different approaches were systematically investigated with x-ray photoemission technique by following the high-resolution total valence bands and C 1s spectra. The core-energy loss spectra of SWNT were compared with other crystal forms of carbon like fullerenes C₆₀, highly oriented pyrolytic graphite (HOPG), and diamond, as well as amorphous carbon. The stronger plasmon resonance excitation, steeper Fermi edge, lower electron binding energy, and lower work function were observed and discussed in the light of theoretical excitation energies. The metallic and semiconducting carbon nanotubes also explicitly demonstrate their different photoelectronic properties. This work clearly exhibits the power of XPS as elemental specific and electronic tool in the carbon nanotube characterization.

Acknowledgements

This research was conducted with financial support from the Department of Energy, Office of Basic Energy Sciences (grant No. DE-FG03-02ER15345).

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