Fluorination and their properties of single-walled carbon nanotubes

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Single-walled carbon nanotubes (SWCNTs) were fluorinated at several different temperatures. Single-walled carbon nanotubes were prepared by the conventional catalytic arc discharge. The change of atomic and electronic structures of fluorinated SWCNTs was investigated using X-ray photoelectron spectroscopy (XPS) and electrical resistivity measurements. The resistivity was measured by four-point probe method after palletizing the powder. The structure was analyzed by Fourier Transformed (FT) Raman Spectroscopy. XPS data show a clear binding energy shift towards the higher energy with increasing fluorination temperatures. At low temperature of up to 200 oC, they show an ionic bonding character which implies the sidewall functionalization, whereas at high temperature the binding energy shifts to higher binding side, revealing a covalent bonding character of CFn, which implies resistivity increase by enhancing sp3 bonding and disintegration of nanotubes walls, as confirmed by the four-point resistivity.