

Single-wall Carbon Nanotube Production by the Arc Process: A Parametric Study

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Abstract

Single wall carbon nanotubes are produced using the arc discharge process. Graphite anodes are filled with a mixture of nickel and yttrium metallic powders, then vaporized by creating a high current arc. By varying the current, gap distance, and ambient pressure it is shown that the best yield of single wall carbon nanotubes is obtained within a narrow range of conditions. The relative yield and purity of the product are indicated semi-quantitatively from scanning electric microscopy (SEM) and thermogravimetric analysis (TGA). Two types of anodes have been investigated. The first is hollow and filled with a powder mixture of graphite, nickel and yttrium. The second is filled with a paste made of a mixture of metal nitrates, graphite powder and carbon adhesive, then reduced in an argon atmosphere at high temperature. Product purity and yield will be compared for the two types of anodes. The graphite in the anodes may have hydrogen attached in the pores. To remove this impurity anodes have been baked up to 1400 - 1500 C. The effect of baking the anodes on impurities in the product will be given.