One Step Direct Synthesis of Multiwalled Carbon Nanotubes from Coconut Shell derived Charcoal

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One Step Direct Synthesis of Multiwalled Carbon Nanotubes from Coconut Shell derived Charcoal

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Abstract

Coconut shell is an example of biomass which is a natural resource of different minerals. We have synthesized multiwalled carbon nanotubes (MWCNTs) over coconut shell derived charcoal pyrolyzed at 900 °C, by utilizing the mineral content in source material as catalysts for carbon nanotube (CNT) growth. Plasma enhanced chemical vapor deposition (PECVD) technique was used for the low-temperature synthesis at 450 $^{\circ}$C. Hydrogen (H_2) was used as etchant gas and acetylene (C_2H_2) as a carbon source for CNT growth. Interelectrode distance, the distance between anode and gas shower, gas mixture ratio (C_2H_2/H_2) and radio frequency (13.56 MHz) power were tuned to achieve the desired plasma. Further CNT growth conditions such as temperature, plasma pretreatment time, flow rates of H_2 and C_2H_2 and synthesis time were also optimized. CNT growth on the charcoal surface was confirmed by scanning electron microscopy and elemental composition near the tips of nanotubes was measured by energy dispersive X-ray