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Large scale synthesis of carbon nanotubes by plasma rotating arc discharge technique

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The large scale synthesis of carbon nanotubes is achieved by the plasma rotating arc discharge. The graphite anode is rotated at the high velocity for the synthesis of carbon nanotubes.

Conventional arc discharge is an unstable process because of the cathode spot phenomena, which induces an inhomogeneity of the electric field distribution and a discontinuity of the current flow.[1] The rotation of the anode distributes the microdischarges uniformly and generates the stable plasma.[2] The centrifugal force by the rotation generates the turbulence and accelerates carbon vapors perpendicular to the anode. And it is not condensed at the cathode surface but collected on the graphite collector that was placed periphery of the plasma.

As the rotation speed of the anode increases and the collector gets closer to plasma, the nanotube yield increases. The reason is because two conditions are optimized. The one is the high density of carbon vapor that is created by uniform and high temperature of plasma for nucleation and the other is the sufficient temperature of collector for nanotube growth.[3]

The Plasma Rotating Electrode Process is a continuous process of the stable discharge and expected to make the mass production of high quality nanotube.

[Reference]

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