Methods for Enhancing Growth of Carbon Nanostructures
Technology #14015

Applications

This technology can be used to improve the yield of carbon nanotube (CNT) growth processes based on chemical vapor deposition (CVD).

Problem Addressed

CNTs can be grown using CVD by passing a carbon-containing gas at high temperature over nanoparticles affixed to the growth substrate. These nanoparticles -- often composed of a metal or a precursor that transforms into metal under CVD conditions -- acts as seeds or nanopositors for CNT growth. Nanopositors made up of alternative materials such as non-reducible metal oxides or chemically inert materials such as zirconia or diamond have been proposed for use, especially for CNT growth on substrates that undergo undesirable reactions with conventional metallic nanopositors. However, achieving sufficient yield with these nanopositors remains a challenge. This invention provides a method of increasing nanopositor activity that could enable CNT growth with a wider range of nanopositor material and enhance yield for conventional processes.

Technology

This invention describes a method of enhancing yield of CVD-based CNT growth by exposing nanopositors to photon electron radiation during the growth process. Desirable oxide nanopositors such as zirconia, titania, silica, and alumina possess wide bandgaps around 3-5 eV. The precise magnitude of these bandgaps depend on the material composition as well as the presence of defects in the crystal lattice. When nanopositors are exposed to radiation with a wavelength that excites their bandgaps, it develops a hole-electron pair at its surface. The hole-electron pair allow the nanopositor to undergo various reactions with chemical species present in the reaction chamber, thereby facilitating CNT growth.

Advantages

- Increases the range of feasible nanopositor materials
- Enhances yield of CNT growth through CVD

Categories For This Invention:

- Materials
- Micro & Nanotech
- Nanomaterials

Intellectual Property:
Systems and methods for enhancing growth of carbon-based nanostructures
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