

Growth Control of Carbon Nanotube Forest for Electronic and Photonic Devices

Project Leader

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Objective

The characteristic electrical, chemical, physical and optical properties of carbon nanotubes (CNTs) are directly derived from their unique structures [1, 2, 3, 4, 5], such as (a) anisotropic electrical conductivity of horizontally aligned CNTs placed on substrates, and (b) anisotropic optical absorption for vertically aligned CNTs grown on substrates. A carbon nanotube forest is a vertically aligned CNT structure grown on substrates means of the chemical vapor deposition. Highly controlled PVD/CVD processes, including self-organization of catalyst particles, are desired to achieve unique highly oriented and periodically positioned CNT forests for new electronic and optronic applications with surprising properties.

Project Outline

Electromagnetic metamaterials[5, 6], composed of CNT forest meta-atoms, will be synthesized from height controlled, highly oriented vertically aligned CNT forests using a photolithography process. To realize the electromagnetic metamaterials, the following items will be developed in this project: (1) structure control of CNTs in diameter (in 1-100 nm) and (2) in growth height (in 10 nm - 10 μ m); (3) the design of an electromagnetic circuit for CNT forest metamaterials, and (4) photolithography process at the electromagnetic scale of 10 - 100 μ m. [5, 6]

References

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