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Carbon nanotubes from gold, silver, copper and semiconductor

- Growth mechanism and structural control -



Motivation

Catalyst materials for single-walled carbon nanotube (SWCNT) synthesis have been limited to iron-group (Fe, Co, and Ni) elements. All of these metals are magnetic materials and their catalytic abilities are inactivated on semiconductor surfaces. Liquid states during growth make it difficult to control their structures precisely. To overcome these difficulties, new growth methods are desired.



Originality

Synthesis of SWCNTs from nanoparticle catalysts of gold-group (Au, Ag, and Cu) elements and semiconductors (Si, Ge, SiC) was achieved for the first time. Size control and clean surface of nano-particles are key points. SWNT growth from materials with low affinity to carbon and in the solid phase is incompatible with the traditional growth mechanism and is a quite novel phenomenon.



Impact

This new growth process enables us to use wide varieties of materials as catalyst for SWNT growth and significantly enlarges the flexibility of material selection. This will open up not only new device applications, but also the possibility of achieving precise structural control based on the growth mechanism related to the catalyst surfaces.

This research is a collaborative work with Prof. Homma's lab, TUS.

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