

Growth process and optical properties of vertically aligned single-walled carbon nanotube mats

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The growth process and optical properties of vertically aligned single-walled carbon nanotube (VA-SWNT) “mats” directly grown on quartz substrates are presented and discussed. Since growth technique of the VA-SWNT mats were developed in 2003 by our group [1], we have performed so far several morphological and optical investigations on the VA-SWNT sample [2-5].

The growth process of the VA-SWNT mats during CVD were investigated by an *in situ* optical absorption monitoring of the sample substrate [2,3]. The measurement revealed that the growth speed is monotonically and exponentially deteriorates to the cease of the growth typically within 3 - 5 min [2,3]. Observed growth curves were analytically fitted and explained well by a first-order chemical kinetic equation between the catalyst metal (cobalt) and incoming carbon source (ethanol vapor) [3].

Using this VA-SWNT sample, we have investigated polarization dependent optical absorption properties of SWNTs in range of 0.5 - 6 eV. The UV absorption peak of SWNTs at ~ 4 - 5 eV is actually made up of two components that have different polarization dependencies and physical origins [3-5]. An analytical pathway of determining the nematic order parameter of the VA-SWNT mat has been developed, from which bare optical absorption cross-sections of SWNTs for both parallel and perpendicular light polarizations have been determined [3-5].

References:

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