STUDY OF TRANSFERRED HEAT VIA RADIATION AT THE KINDS OF SWNT'S

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Abstract

In recent years the single wall carbon nanotubes (SWNT) have been widely studied. Study of SWNTs dense or SWNTs composite as a black body, is the one of these studies. The aim of this paper is to characterize of armchair SWNT or armchair SWNT dense as the best SWNT kinds for heat transfer via radiation. In this study, The SWNT's armchair, zigzag and chiral were made with equal lengths and similar structures**.** Absorption coefficient of SWNT dense or SWNT composite at the ranges of the (UV) to (IR) radial wavelengths are 98 to 99 percent approximately. Our studies on SWNT kinds show that the numerical value of heat transfer via radiation at the armchair SWNT or armchair SWNT dense is bigger than the similar zigzag and chiral SWNTs. Thus, armchair SWNT or armchair SWNT dense is the best black body at the ranges of the (UV) to (IR) radial wavelengths in the SWNT kinds.

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Introduction

Thermo dynamical properties of single wall carbon nanotube have an important role in each application due to heat transfer via radiation at the SWNT's depending on Thermo dynamical properties of SWNT. Transferred Heat via Radiation at the SWNT's is important issue at the carbon nanotubes heat conduction. In recent years, the Single wall carbon nanotubes dense or SWNTs composite as a black body has been indicative of researcher's attention to Thermo dynamical properties of Single wall carbon nanotubes. Transferred Heat via Radiation at the SWNT's is important issue in the range of Thermo dynamical properties. Electrical arc disembarkation (EAD) method has been used for preparation of armchair, chiral and zigzag SWNT's. (EAD) method has been used for preparation of wire consisting of armchair SWNT's dense and the wire consisting of chiral SWNT's dense and the wire consisting of zigzag SWNT's dense.

Theoretical

Theoretical formulation of transferred heat via radiation is [1 to 4, 8] :

$$\dot{Q} = A\sigma\left[T^4 - T_{SWNT}^4\right] \quad (1)$$

A and σ represents the area and Stefan Boltzmann constant respectively [8]. Where T and T_{SWNT} are temperature of environment and SWNT's respectively. The temperature of environment and SWNT's are keep constant in this study. The diagonal of the SWNT with c=c link's is calculated by [6,7]:

$$d = \frac{a}{\pi}\sqrt{n^2 + m^2 + nm} \quad (2)$$

a is the link length of the c=c at the SWNT and n, m represents the chiral vector coefficient's of SWNT[7]. The Three wires which prepared, is similar to each other and each one of the wires is consisting of similar fully SWNT's and the length of each one of the SWNT's are equal to length of the each one of the wires. Thus, the each one of the wires are similar to each other. The each one of the wires and SWNT are similar fully to cylinder and the section surface of SWNT is

similar to circle. The two cross sections of SWNT's which exists in wire are tangent to the two cross sections of wire. Fundamental of the calculation of transferred heat via radiation for three wires is obtaining of wire area. We can waive from two cross sections area of wire due to the extremely small area of two cross sections area of wire. Thus, the wire area is given by:

$$A=2\pi\frac{d}{2}\times Z\times L=$$

$$L\pi Zd \quad (3)$$

Where d and L are the diagonal of the SWNT and length of the wire respectively, and Z represent the number of SWNT's that exists in the wire.

Results

With attention to Eq.1and 2 and 3, Transferred heat via radiation for wires, is given by:

$$\dot{Q}_W = ZL\sigma$$

The aim of this paper is to characterize of armchair SWNT or armchair SWNT dense as the best SWNT kinds for heat transfer via radiation and armchair SWNT or armchair SWNT dense is the best black body between SWNT kinds. Physical Properties of SWNT are listed in table (1) [7. 8]

Table 1: Physical properties used in this study

Material	a (nm)	σ $(\frac{W}{m^2\times K^4})$	L (m)	Z T (K)	T_b (K)
SWNT	0.142	5.670×10^{-8}	13×10^{-6}	20000 873	298

Using Eq. (4), the transferred heat via radiation for wire consisting of armchair SWNT's dense is:

$$\dot{Q}_W = ZL\sigma a\sqrt{3}n[T - T_{SWNT}{}^4]$$

Using Eq. (4), the transferred heat via radiation for wire consisting of zigzag SWNT's dense is:

$$\dot{Q}_W = ZL\sigma an[T - T^4]$$

Using Eq. (4), the transferred heat via radiation for wire consisting of chiral SWNT's dense is:

$$\dot{Q}_W = ZL\sigma$$

Fig1 is plotted by attention to table1 and Eq. (5) and Eq. (6). Figs. 1, show the transferred heat via radiation versus the (n), for two wires consisting of armchair and zigzag SWNTs dense.

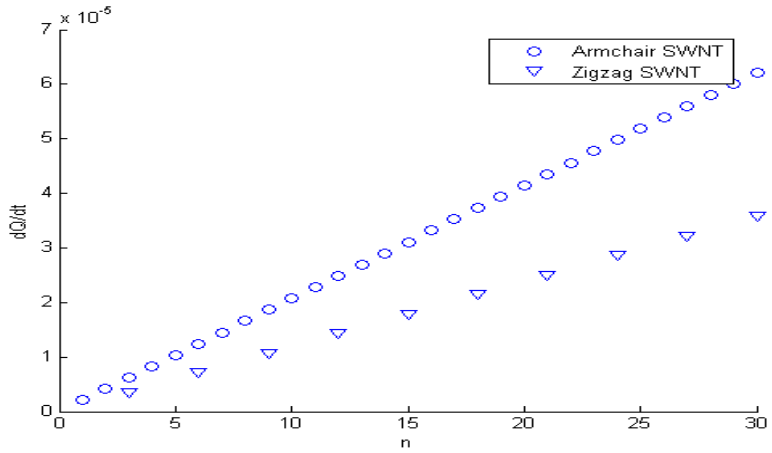

Fig1. Graph of the Eq. (5) and Eq. (6)

Fig.1 shows slope of the wire consisting of armchair SWNT's dense is bigger than the slop of the wire consisting of similar zigzag SWNT's dense. Thus, transferred heat via radiation in wire

consisting of armchair SWNT's dense is bigger than the wire consisting of zigzag SWNT's dense. So, the armchair SWNT heat transfer is bigger than the heat transfer of similar armchair SWNT. This matter occurs due to the thermal conduction of armchair and zigzag SWNT. The thermal conduction of zigzag SWNT is lesser than the thermal conduction of armchair SWNT. Fig.1 shows changes of transferred heat versus the (n) for two wires consisting of armchair and zigzag SWNTs dense is linear but changes of transferred heat versus the (n) for wire consisting of chiral SWNT's dense isn't linear. Thus, with attention to Eq. (7) and Eq. (5), the numerical value of transferred heat for wire consisting of chiral SWNT's dense is lesser than the transferred heat of wire consisting of armchair SWNT's dense, until the numerical value of wires (n) are equal to each other. On the other hand, with attention to Eq. (7) and Eq. (6), the numerical value of transferred heat for wire consisting of chiral SWNT's dense is bigger than the transferred heat of wire consisting of zigzag SWNT's dense, until the numerical value of wires (n) are equal to each other. So, the armchair SWNT's or armchair SWNT dense is the best of the SWNT kinds for heat transfer via radiation and armchair SWNT or armchair SWNT dense is the best black body at the between of SWNT kinds.

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