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SIMULATION OF NANOWIRE

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Abstract:

The simulation of nanowire has been done based on the material .This is done by changing the material and the radius of the materials like Ge,Cdte,Si,Ito.By changing the radius it shows the absorption level of the particular element .It has done in two ways by increase in size and by increase in thickness.

Keywords: Nanowire, Absorption.

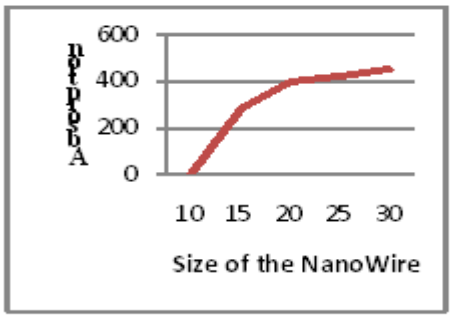
Introduction:

In the past decade nanowires have much attention because of the unique properties that materials display on the nanoscale [1]. A vast variety of materials has been studied, including carbon nanotubes [2], single-element nanowires (Si, Ge) [3, 4]), multicomponent structures (GaAs, GaN, InP, CdS, SiC, Si3N4, SiO2, ZnO, [5,6,7,8,9,10] and even organic materials [11,12]. Nanowires have been manufactured by using a wide range of techniques: electron beam lithography [13], laser ablation [14], template-based methods [15], bottom-up methods such as vapor–liquid–solid techniques [16], chemical and physical vapor deposition [17,18], solgel methods [19], and top-down techniques such as fiber pulling [20] or direct draw from bulk materials [21,22]. Prior to previous papers only two attempts to manufacture submicrometer wires by using a top-down process were reported in the literature Interest in optical fiber nanowires has been limited mainly because of the perceived difficulties by manufacturing suitably low-loss structures in nanowires.

Although several OFNs were fabricated by using an variety of bottom-up methods [23], all of them exhibited an irregular profile and a surface roughness that appear to have minimum the loss levels that could be reliably achieved. It has become commonly accepted to defined by fiber optics nanowires (or photonic nanowires) as fiber waveguides with a submicrometric diameter.

Simulation:

A simulation of nanowire was carried out in nanohub. The materials like si,ge, cdte, ito was choosen as nanowire materials and the radius of the nanowire was varied as 10,15,20,25,30.The absorbtion of each material by fixing the radius and thickness were calculated. From the below figures they show the absorption of each material based on the size and thickness.



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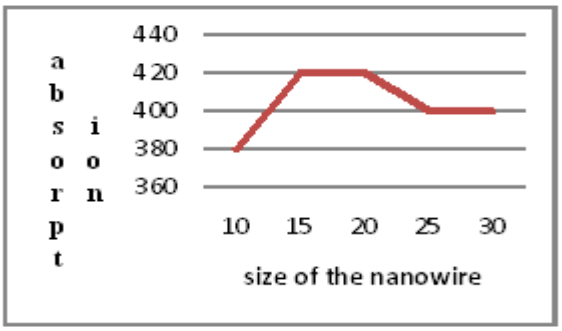

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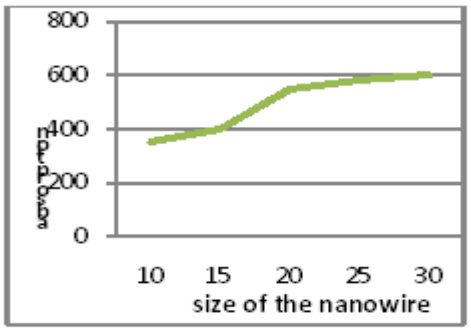

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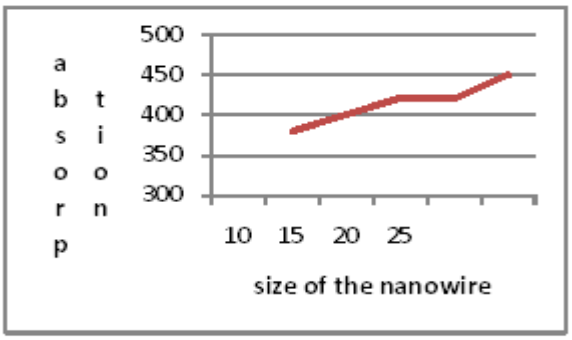

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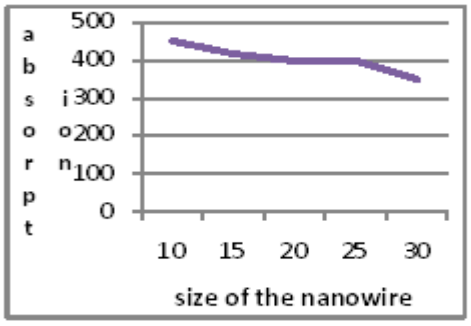

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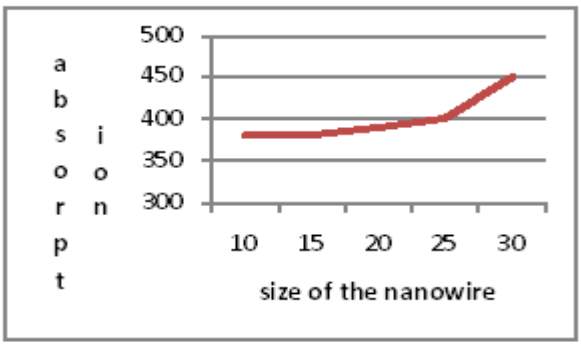

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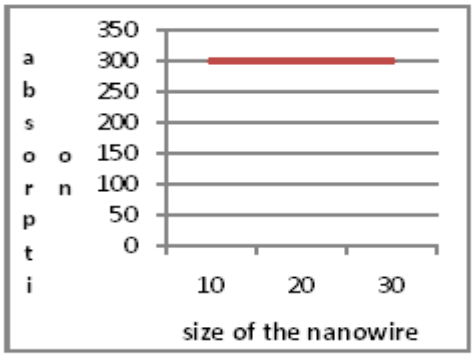

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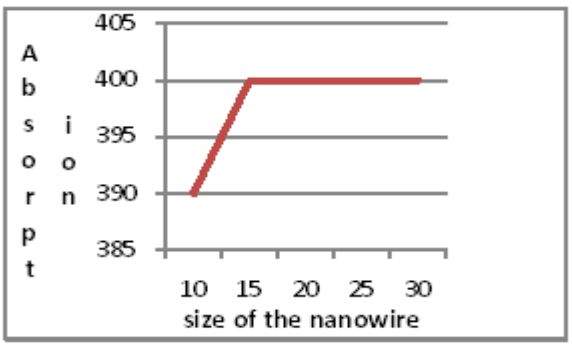

h

Fig: absorption of (a) is for Si and absorption of (b) is for Ge ,absorption of (c) is for Cdte and absorption of (d) is Ito.And absorption of (e) shows the thickness of Si ,absorption of (f) shows the thickness of Ge, Absorption of (g) shows the thickness of Cdte and absorption of (h) shows the thickness of Ito.

Result and Discussion:

Table (1):

SIZE	SI	GE	CDTE	ITO
10	0	350	480	300
15	280	400	420	300
20	400	550	400	300
25	425	580	400	300
30	450	600	350	300

From the above tabular column the following results is found:

1. For the Si/Genanomaterial as the size of the particle increases the absorption increases.

2. For CDTE as the size of the nanowire increases the absorption decreases.

3. For ITO nanowire has same absorption even as the size changes.

The Maximum absorption can be Ge for 30nm nanowire length.

Table (2):

THICKNESS	SI	GE	CDTE	ITO
10	380	380	380	390
15	420	400	380	400
20	420	420	390	400
25	400	420	400	400
30	400	450	450	400

From the above tablular column the following results are obtained:’

1. As the thickness of the Si increases then absorption increases and then decreases.

2. ForGe, Cdte, Ito as the thickness increases the absorption increases.

Conclusion:

1. As the size of the nanowire increases the absorption increases in the case of Si,Ge,Cdte.

2. As the thickness of the nanowire increases the absorption increases for Ge,Cdte,Ito.

3. From the above results the Ge has the maximum absorption while compared with other materials .

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