International Journal of Psychosocial Rehabilitation, Vol. 24, Issue 05, 2020
ISSN: 1475-7192

Theoretical Analysis of Carbon Nano Tubes

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Abstract--- *In the nano technology the carbon nano tubes are the most important material. the carbon nano tubes are used in nano technology, membranes, polymers and nano medicine and carbon nano tubes are used in cell culture etc. In this article the types of carbon nano tubes, applications, properties are discussed. Carbon nano tubes are allotropic form of carbon and they come under fullerene family*.

Keywords--- *Polymers, Carbon Nano Tubes.*

I. INTRODUCTION

Carbon nano tubes are having sp2 hybridisation with different structures carbon can form closed and open cages like honeycomb arrangement of graphene [1]. Graphite is the best example for carbon nano tubes. graphene is a stronger material than diamond because of sp2 hybridisation. carbon nano tubes are made up of carbon and its shape is tubed like material [2]. Carbon nano tubes have diameter of very small and it is measured with nano scale. Group of graphene's that roll into newspaper form a carbon nanotubes Carbon nanotube can exhibit remarkable electrical conductivity. They also have exceptional tensile strength and thermal conductivity, because of their nanostructure and strength of the bonds between carbon atoms. In addition, they can be chemically modified in many areas of technology such as electronics, optics, composite materials (replacing or supplementing carbon fibers), nanotechnology, and other material science applications, these properties are considered to be useful. [3] The moving up or chiral vector of the graphene layers decides the electrical properties of the nanotubes. Chirality depicts the edge of the nanotube's hexagonal carbon-particle cross section. Easy chair nanotubes – purported on account of the rocker like state of their edges – have indistinguishable chiral files and are exceptionally wanted for their ideal conductivity. They are not normal for crisscross nanotubes, which might be semiconductors. Turning a graphene sheet an unimportant 30 degrees will change the nanotube it structures from easy chair to crisscross or the other way around.

II. STRUCTURE OF CNT

Carbon nanotubes are called as buckytubes carbon nano tubes are have properties like thermal, electrical, and mechanical properties [4]. CNT have fullerene like structure and have graphene sheets and also carbon nano tubes have two types CNT they are single walled carbon nanotubes and multi walled carbon nanotubes [5]

1. Single walled carbon nanotubes: It contains of single layer of graphene it has synthesis process and it uses catalyst for it. these are of low purity and do not have any complex structure it can be twisted easily.[6]
2. Multi walled carbon nanotubes: It contains multi layers of graphene it does not need any type of catalyst for synthesis process and it can be twisted easily when compared to single wall carbon nanotube [7,8]

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DOI: 10.37200/IJPR/V24I5/PR202044
Received: 28 Feb 2020 | Revised: 22 Mar 2020 | Accepted: 02 Apr 2020

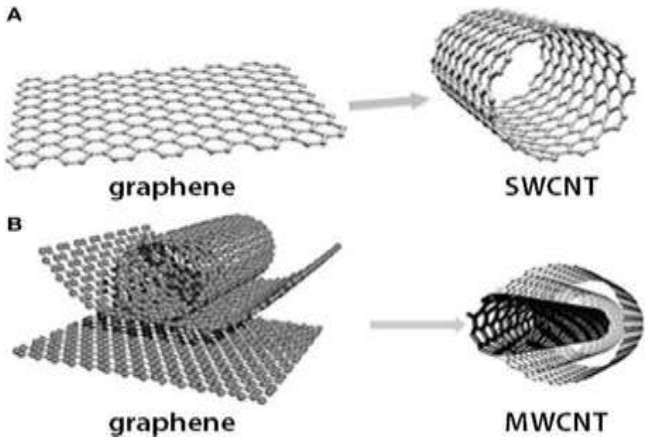

Fig. 1: Structure of CNT

III. Preparation Methods of Carbon Nano Tubes

3.1: Arc discharge method: For best nature of nanotubes plasma-based methods or curve release technique can be utilized. it includes two graphite terminals in nearness of helium and a current of 50 amperes is gone through two graphite anodes. it causes vaporization of graphite; some piece of it gather on response vessel and some of it con

solid ate on cathode. The part which is store on cathode carbon nanotube. on the off chance that we need single walled carbon nanotubes, at that point Co, Ni metals can be presented in anode.

3.2: Laser Method: in 1996 Laser was utilized for generation of carbon nanotubes with 70% immaculateness. By and by this technique is utilized for creation of carbon nanotubes. This procedure comprises of graphite bars and it contain 50:50 impetus blend of Co and Ni at 12000C and argon is coursing through it for test arrangement (Ahmed 2010) [9]. in this technique metal catalyse the development of single walled carbon nanotubes and furthermore many side items are framed. We can get nanotubes by cooling disintegrated species

3.3: Chemical vapour deposition: In the above techniques, there are two significant issues for example requested union and huge scale generation [10]. In 1996, concoction fume testimony technique was utilized for generation of carbon nanotubes This technique is utilized to delivered enormous sum nanotubes. in this procedure response chamber contain blend of nitrogen, ethylene and acetylene. during this temperature of response chamber was 700-9000C and one environmental pressure [11]. This technique is utilized on lower temperature and we get the efficient carbon nanotubes.

IV. Carbon Nanotubes Properties

1. CNTs have high thermal conductivity
2. CNTs have high electrical conductivity
3. CNTs are very elastic (18%) longation to failure
4. CNTs have very high tensile strength
5. CNTs are highly flexible can be bent considerably without damage
6. CNTs have a low thermal expansion coefficient

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7. CNTs are good electron field emitters
8. CNTs aspect ratio

V. APPLICATIONS OF CARBON NANO TUBES

- Carbon nanotube membranes for transdermal drug delivery
- Carbon nano tubes for cancer treatment
- Carbon nanotubes for cardiac autonomic regulation
- CNT's for tissue regeneration
- Carbon Nanotubes in drug delivery: future trends

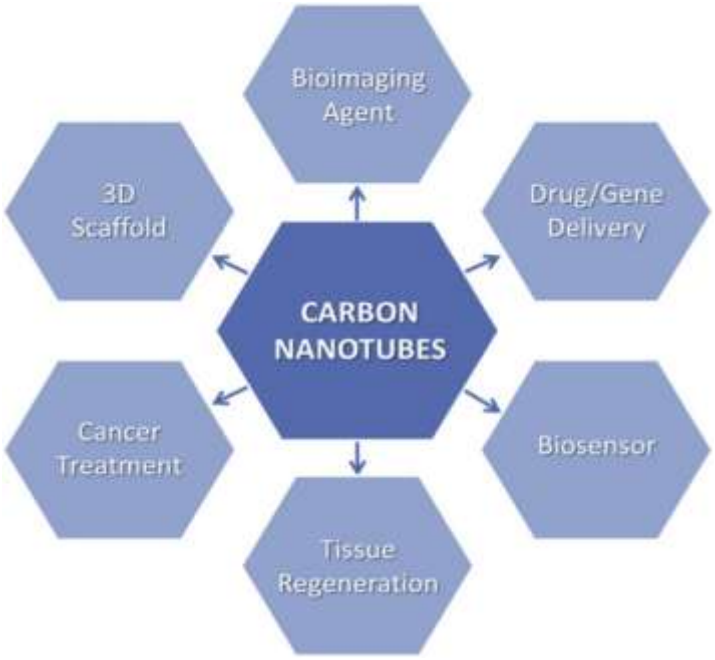

Fig. 2: Applications

How it is Used in Cancer Treatment

Some great proteins are typically overexpressed in malignant growth cells, which can manage the cost of an opportunity for the early location of the disease. Clinically, a few noteworthy tumor markers have been generally utilized in the determination of certain malignancies, including alpha-fetoprotein (AFP), carcinoma antigen 125 (CA125), carcinoembryonic antigen (CEA), human chorionic gonadotropin (hCG), starch antigen 19-9 (CA19-9), and prostate explicit antigen (PSA). Be that as it may, because of the low affectability and particularity for the early location of disease, these markers are just utilized in the accompanying angles, including choosing anticipation, foreseeing treatment reactions, and keeping supervision for careful treatment. Then again, because of their novel electronic, mechanical, and warm properties, CNTs have been proposed as a confident device for identifying the statement of common organic atoms at beginning period of malignant growth. The tale techniques dependent on the CNTs have been accomplished, which have high affectability and wide direct and ultralow identification. Besides, the new arrangement of CNTs can spare time contrasted and the traditional ELISA business test units while

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accomplishing the comparable selectivity [64]. More critically, this methodology can give handheld hardware less cost contrasted and as of now techniques, for example, immunoassays, test-strips, and packs. In synopsis, the CNTs-based recognition might be a specific path for malignant growth determination and treatment in clinical investigation sooner rather than later.

The revelation of biomarkers that can be utilized in the analysis of disease has gotten a rising

VI. LITERATURE SURVEY

Valentin et al. (2004) Coming up next are the past research audit dependent on carbon nanotubes (CNTs) in development. The Carbon nanotubes are one of a kind cylindrical structures of nano meter distance across also, huge length/distance across proportion. The astonishing mechanical and electronic properties of the nanotubes stem in their semi one-dimensional (1D) structure and the graphite-like course of action of the carbon molecules in the shells. In this manner, the nanotubes Have High Young's modulus and rigidity, which makes them ideal for composite materials with Improved mechanical properties [13]

Jose et al. (2014) clarified that Carbon nanotubes have remarkable properties, and, in this manner, they are considered as significant possibility for various applications in nanotechnology. The principle hindrances they present are an absence of solvency and complexities in dealing with. The investigates states diverse research cases that have been completed with cementitious materials to date and surveys the present condition of the craftsmanship and some future patterns for these composites. [12]

VII. SIMULATION OF CNT BASED ON CHIRAL FACTOR

In this simulation we will find the electrical properties of carbon nanotubes based on chiral factor (n, m) by using nano hub online tube software. For a given (n, m) nanotube, if n = m, the nanotube is metallic; if n − m is a multiple of 3 and n ≠ m and nm ≠ 0, then the nanotube is quasi-metallic with a very small band gap, otherwise the nanotube is a moderate semiconductor. Thus, all armchair (n = m) nanotubes are metallic, and nanotubes (6,4), (9,1), etc. are semiconducting. The diameter of CNT can be given as:

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

where a = 0.246 nm.

The angle of CNT is given by

$$\tan\theta = \frac{\sqrt{3}m}{2n + m}$$

Procedure

- Open nano HUB.
- Go to Resources -> Tools.
- Select Carbon nanotube -> CNT Bands

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- Press Launch tool in info section.
- Select the -> Structure - > Carbon Nanotube
- Select n and m value
- Click on Simulation
- Select ->Result -> Molecular structure
- Select -> Result -> Density of states
- Repeat the above steps for various values of Source/Drain Length

VIII. ADVANTAGES OF CARBON NANO TUBES

1. Very little and lightweight making fantastic substitution for metallic wires.
2. Assets required to deliver them are copious and many can be made with just a modest quantity of material
3. Are impervious to temperature changes importance work practically similarly just as in extraordinary cold as they to in outrageous warmth.
4. Improve conductive mechanical properties of composites.

IX. DISADVANTAGES OF CARBON NANO TUBES

1. It is hard to keep up high calibre and lower polluting influences.
2. Cost of nanotechnology is high.
3. In arc discharge and laser strategy enormous measure of vitality is required to finish the procedure.
4. It is hard to target huge measure of graphite in modern procedure.

X. RESULT AND MODEL OUTPUT

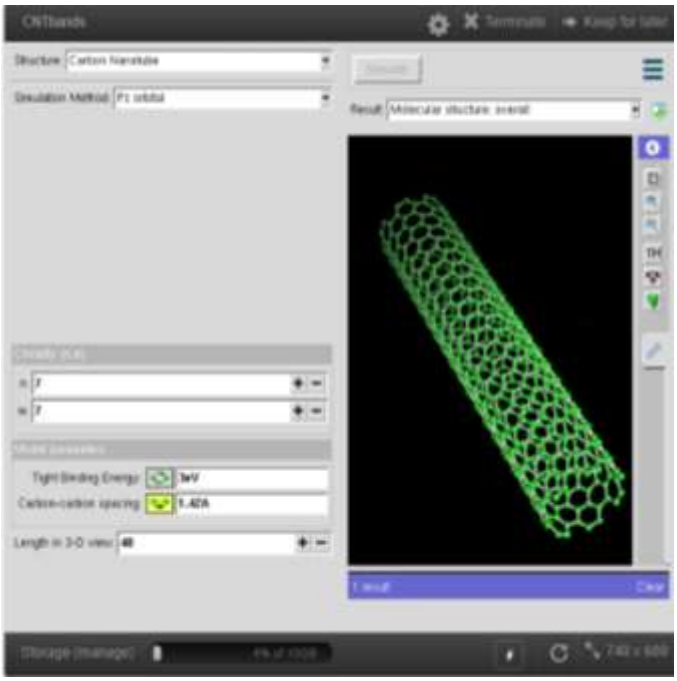

Fig.3: Molecular Structure

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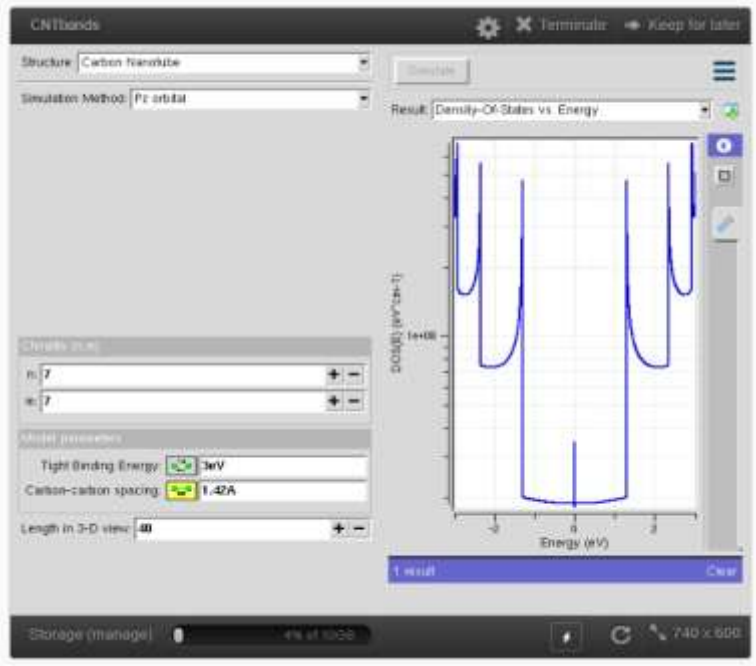

Fig. 4: Density of States

XI. CONCLUSION

This survey paper depends on properties, applications and impediments of carbon nanotubes. The point of this paper isn't just to lay weight on its novel properties yet additionally its unsafe impacts that can happen during the utilization of metals that dangerous. In this examination we notice that substance fume statement is best techniques for creation of carbon nanotubes since it gives high immaculateness carbon nanotubes. Scientists checking out carbon nanotubes and liable to give greater progression in coming future.

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