

Review Article

Overview Of Carbon Nanotubes

Vishakha N. Dhanwate¹, Yogesh P. Patil²

^{1,2}Dept of Engineering Sciences

^{1,2} AISSMS, Institute of Information Technology, Pune.

Abstract- These days nanotechnology is rising incredibly fast and has endless applications in approximately the whole thing we do. The medicine we take, food we eat, chemicals we use, car we drive and much much more. Comfort level of human life style can be more superior because of advanced research and development in the field of nano materials. A range of engineering materials are considered a great deal for their properties in their nano form. Surface activity in nano form increases manifold than in bulk form due to increased surface area. In this paper we are briefing the introduction and uses of carbon nanotubes (CNT). CNT are distinctive since the bonding among the atoms is extraordinarily strong and the tubes can have extreme aspect ratios.

Keywords- Nanotechnology, Nanomaterials, carbon nanotube, CNT

I. INTRODUCTION

The first clarification and size dimensions of nanoparticles were made at some stage in first decade of 20th century. Richard Adolf Z sigmondy was the first who used nanometer explicitly for characterizing particle size. A nanometer is one-billionth of a meter, or about 10,000 times smaller than a human hair. A carbon nanotube can be as thin as a few nanometers yet be as long as hundreds of microns. To put this into perspective, if your hair had the same aspect ratio, a single strand would be over 40 meters long.

II. SYNTHESIS OF NANOPARTICLES

Bottom up approach: These try to find to assemble minor components into more multipart assemblies. For example DNA nanotechnology utilizes the specialty of Watson-crick base pairing to construct well defined structures out of DNA and other nucleic acids, designing molecules with well defined shape, more generally molecular self-assembly seeks to use concepts of supramolecular chemistry and molecular recognition in particular cause single molecular recognition in particular cause single-molecule components to automatically arrange themselves into some useful confirmation (Yogesh P. Patil et al 2016).

Top down approach: These try to find smaller devices by using larger ones to direct their assembly. For examples fabricating microprocessors is smaller than 100nm, solid state techniques can also be used to create devices known as nanoelectromechanical systems, AFM tips can be used as a nanoscale “write head” to deposit a chemical upon a surface in a desired pattern in a process called dip-pen nanolithography (S. K. Kulkarni, Nanotechnology Principles and practices, 2011).

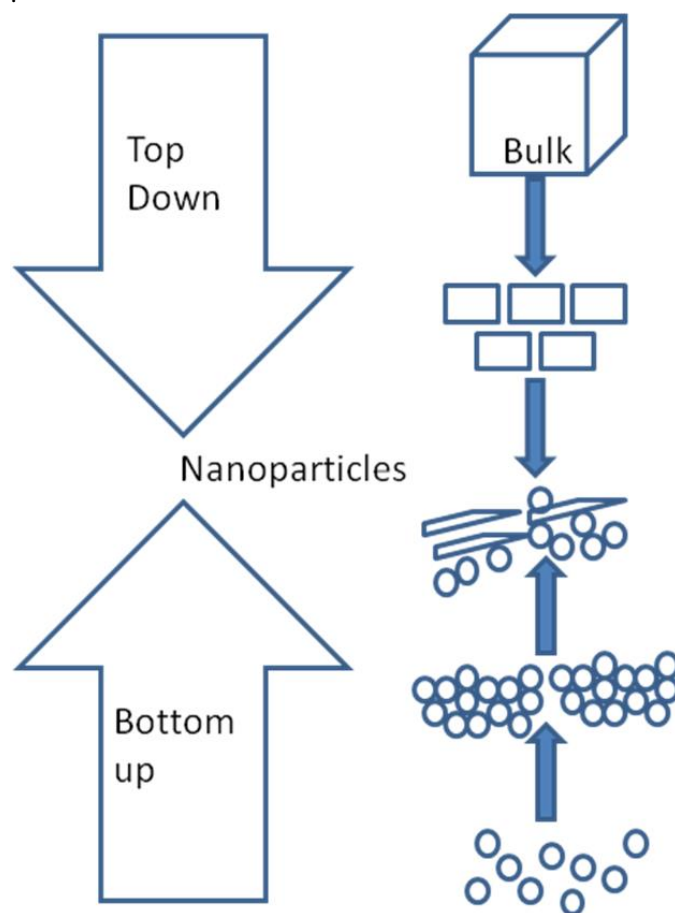


Fig. 1 Synthesis approaches

There is a large number of techniques available to synthesize different types of nanomaterials in the form of colloids, clusters, powders, tubes, rods, wires, thin film etc. Nanomaterial synthesis and processing can be done with various methods. Nanoparticles deal with very fine structures a nanometer is a billionth of a meter.

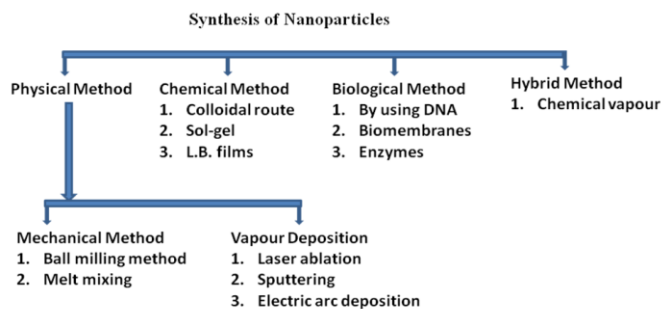


Fig. 2 Methods of synthesis

Either to assemble atoms together or to dis-assembles(break or dissociate) bulk solids into finger pieces until they are constituted of only a few atoms.

III. CARBON NANO TUBE

Carbon nanotubes are special tubular structures of nanometer diameter and large length/diameter ratio. The nanotubes may consist of one up to tens and hundreds of concentric shells of carbons with adjacent shells separation of 0.34 nm. Carbon nanotubes (CNTs) are flawless cylinders of one or more layers of graphene. Apart from the well-known graphite, carbon can build closed and open cages with honeycomb atomic arrangement. First such structure to be discovered was the C₆₀ molecule by Kroto et al. [Kroto et al, 1985]. Researcher Iijima observed for the first time tubular carbon structures [Iijima et al, 1993]. CNT are unique because the bonding between the atoms is very strong and the tubes can have extreme aspect ratios. CNT are metallic or semiconducting, depending upon ISSN: 2320-5407 Int. J. Adv. Res. 4(8), 1008-1017 1013 diameter and chirality. As a diameter increases, band gap increases. In the metallic state conductivity is very high. CNT is also good heat conductor. CNT are poor transmitter of electromagnetic energy. So their plastic composite can be used as light weight protector that is shielding material which protects the computers and electronic devices from weapons that emit electromagnetic pulse. Also because of low resistivity and high conductivity CNT used as interconnector, and due to their nano size, it is possible to obtain small electronic devices. As we know hydrogen is one of the best sources for fuel cell, but due to its inflammable and explosive properties, there are lots of difficulties in hydrogen storage. But CNT is best alternative to store hydrogen in it. Many researchers and corporations have already developed CNT based air and water filtration devices. It has been reported that these filters can not only block the smallest particles but also kill most bacteria. When human being carry forward the advances in technology, it is necessary to find out effects of products and byproducts on our day to day life. As our concern is with nanomaterials, therefore it is important to detect that how small size can affect the cells, whether barrier

to brain is crossed by the particles and so on. On the other hand researcher believe that nanomaterial are useful for decreasing the environment pollution. But at the same time ongoing research at the various institutes reveal that CNT are as much lethal as asbestos may be [Sargent et al, 2014]. Though there is no any Mesothelioma patient is observed because of CNT till date, however researchers are reported that CNT induces Mesothelioma along with a positive control in mice [Atsuya Takagi et al 2008].

REFERENCES

- [1] Atsuya Takagi , Akihiko Hirose , Tetsuji Nishimura , Nobutaka Fukumori , Akio Ogata , Norio Ohashi, Satoshi Kitajima and Jun Kanno, Induction of mesothelioma in p53+/- mouse by intraperitoneal
- [2] application of multiwall carbon nanotube The Journal of Toxicological Sciences 33, 1 (2008) 105-116
- [3] Ijima S, Ichihashi T. Single-shell carbon nanotubes of 1-nm diameter. Nature 363 (1993)603-605.
- [4] Kroto H. M., J.R. Heath, S.C. O'Brien, R.F. Curl, R.E. Smalley, C₆₀: buckminsterfullerene, Nature 318 (1985) 162-165
- [5] S. K. Kulkarni, Nanotechnology Principles and practices, second edition capital publication, New Delhi, (2011) 1-26.
- [6] Sargent, L.M., Porter, D.W., Staska, L.M., et al. Promotion of lung adenocarcinoma following inhalation exposure to multi-walled carbon nanotubes. Particle and Fibre Toxicology, (2014), 11-13.
- [7] Yogesh P. Patil and Vishakha N. Dhanwate, Interfere of nanomaterials in human life, Int. J. Adv. Res 4, 8 (2016)1008-1017.