



CHHATRAPATI SHIVAJI MAHARAJ INSTITUTE OF TECHNOLOGY

Affiliated to the Mumbai University, Approved By AICTE - New Dehli.

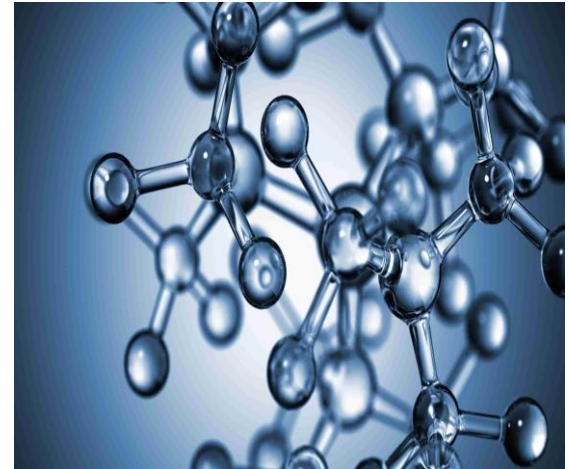
DTE Maharashtra (DTE Code : 3477)

St. Wilfred's Education Society, Near Shedung Toll Plaza, Old Mumbai-Pune Highway, Panvel - 410206.

Tel.: 0214 - 239091 / 61. Mob.: +91-92234 34581 / 92244 34581. Email : swc.mumbai@gmail.com

www.csmit.in

Nano technology



- Subject: Engg. Physics II
- Year : First year Engineering
- Semester : II

Created By –Er. Revatee Bagade

Nanotechnology

Nanotechnology refers to the branch of science and engineering devoted to designing, producing, and using structures, devices, and systems by manipulating atoms and molecules at nanoscale, i.e. having one or more dimensions of the order of 100 nanometres (100 millionth of a millimetre) or less.

NANOMATERIALS

are substances that are, or have been, reduced in size to the range from 1 nm to ~ 100 nm

(i.e. 1 to ~ 100 nanometers,

or 1 to ~ 100×10^{-9} m)

Main purpose of Nanotechnology

Using nanotechnology, materials can effectively be made

- **stronger,**
- **lighter,**
- **more durable,**
- **more reactive,**
- **more sieve-like, or**
- **better electrical conductors,**

among many other traits.

main types of intentionally produced nanomaterials

- carbon-based,
- metal-based,
- dendrimers, and
- nanocomposites.

Carbon-based nanomaterials are intentionally produced fullerenes.

NANOMATERIALS



Diamond



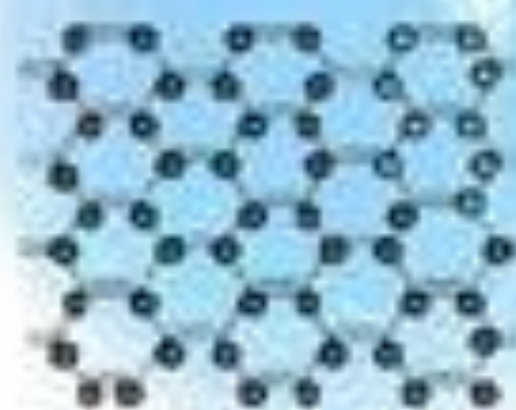
Fullerene



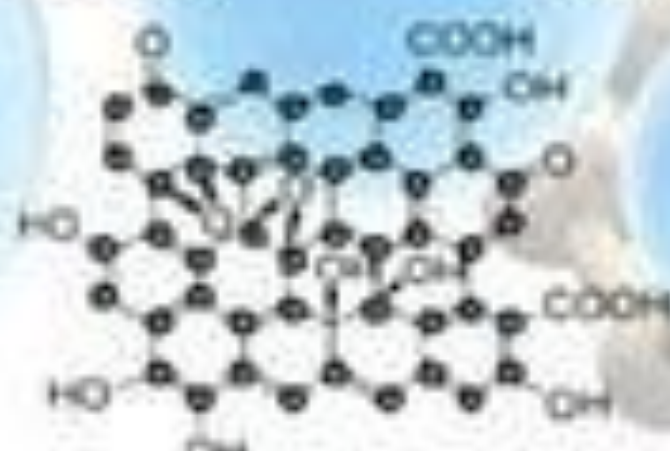
Carbon nanotube



Graphite



Graphene



Graphene oxide

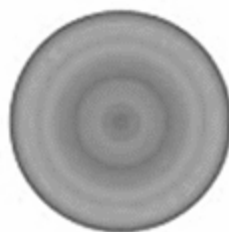


Carbon dot

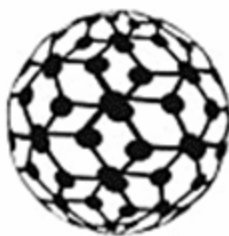
NMs classification based on dimensionality

0D

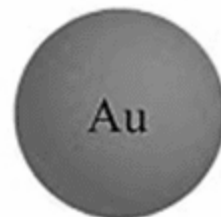
Nanospheres,
clusters



Quantum dots



Fullerenes



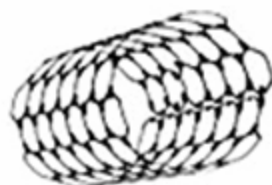
Gold nanoparticles

1D

Nanotubes,
wires, rods



Metal nanorods,
Ceramic crystals



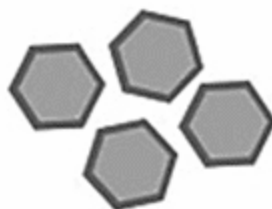
Carbon nanotubes,
Metallic nanotubes



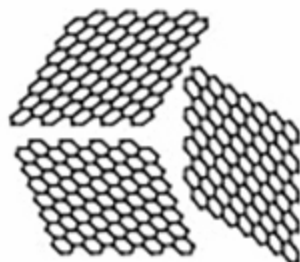
Gold nanowires,
Polymeric nanofibers,
Self assembled structures

2D

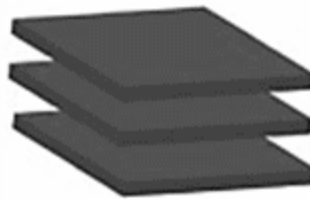
Thin films, plates,
layered structures



Carbon coated
nanoplates



Graphene sheets



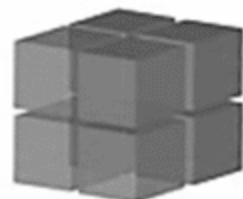
Layered nanomaterials

3D

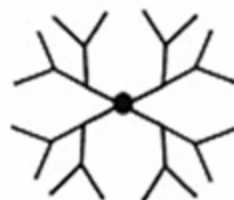
Bulk NMs,
polycrystals



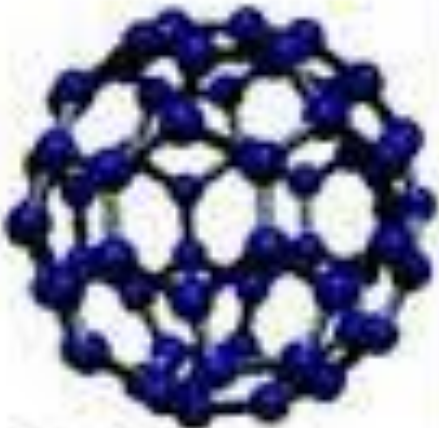
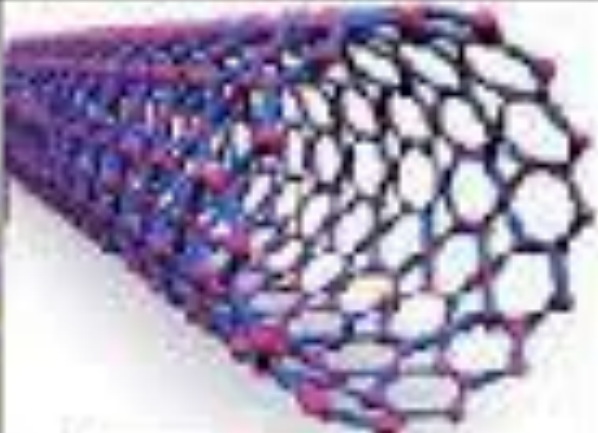
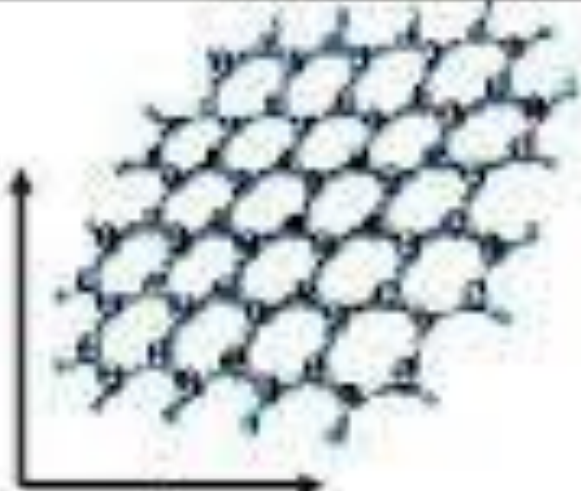

Liposome



Polycrystalline



Dendrimer

0D	1D	2D	3D
 <p data-bbox="275 1025 588 1090">Fullerene</p>	 <p data-bbox="746 1025 1332 1090">Carbon Nanotube</p>	 <p data-bbox="1505 1025 1829 1090">Graphene</p>	 <p data-bbox="2160 1011 2466 1076">Graphite</p>

Nanotechnology in computers

- The silicon transistors in your computer may be replaced by transistors based on **carbon nanotubes**.
- A carbon nanotube is a molecule in form of a hollow cylinder with a diameter of around a nanometer which consists of pure carbon.
- **Nanorods** is a upcoming technology in the **displays techniques** due to less consumption of electricity and less heat emission.
- Size of the microprocessors are reduced to greater extend.
- Researchers at North Carolina State University says that growing arrays of magnetic nanoparticles, called **nanodots**.

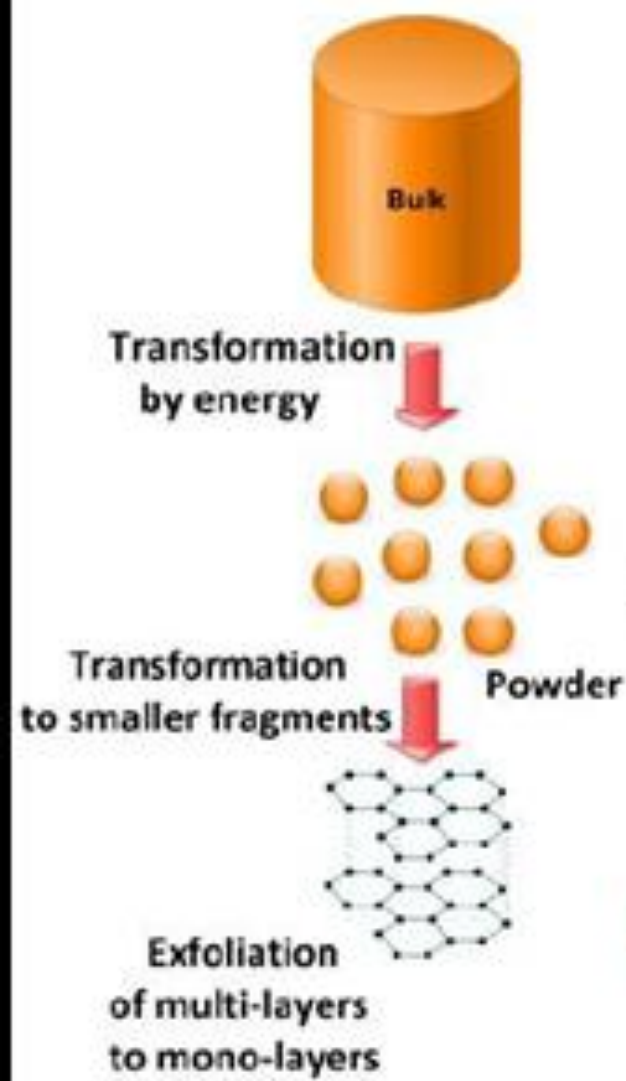


Bottom-up vs Top-down approach

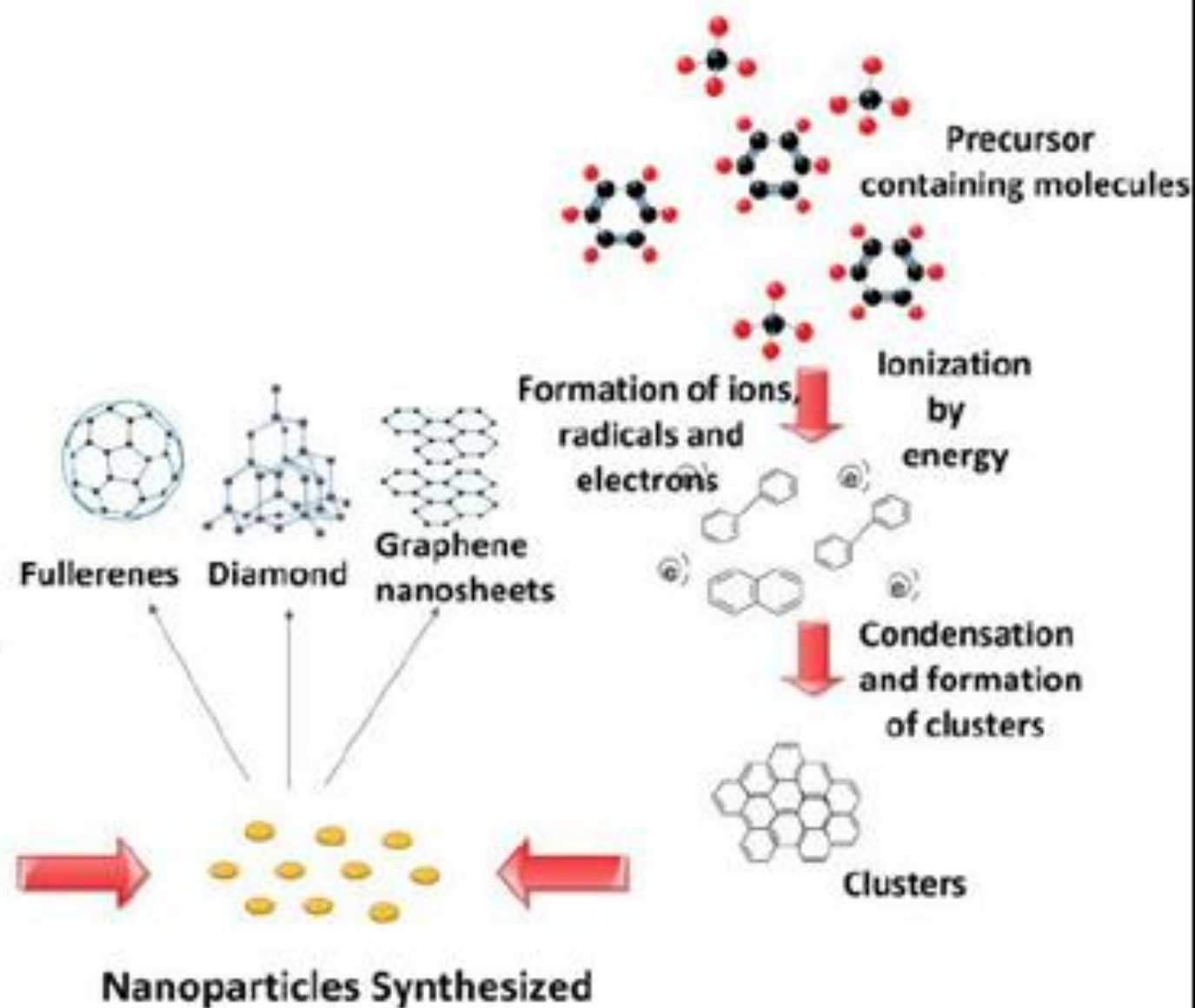
There are two approaches for the manufacturing of nanomaterials:

- The “**top-down**” approach, which involves the breaking down of large pieces of material to generate the required nanostructures from them.
- The “**bottom-up**” approach, which implies assembling single atoms and molecules into larger nanostructures.

Top-Down Approach



Bottom-Up Approach



Thank
You