



# **SNS COLLEGE OF TECHNOLOGY**

Vazhiampalayam, Coimbatore-35

**(An Autonomous institution)**

Accredited by **NBA-AICTE** and Re-Accredited by **NAAC-UGC with A+ Grade**

Approved by **AICTE**, New Delhi & Affiliated to **Anna University**, Chennai



## **DEPARTMENT OF CHEMISTRY**

**COURSE NAME : 19CHB101- CHEMISTRY FOR ENGINEERS**

**I YEAR / I SEMESTER**

**UNIT : 2. NANOCHEMISTRY**

**TOPIC : 5. NANOTUBES AND NANOCCLUSERS**

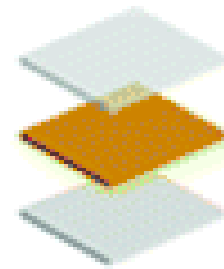


# CLASSIFICATION OF NANOPARTICLES

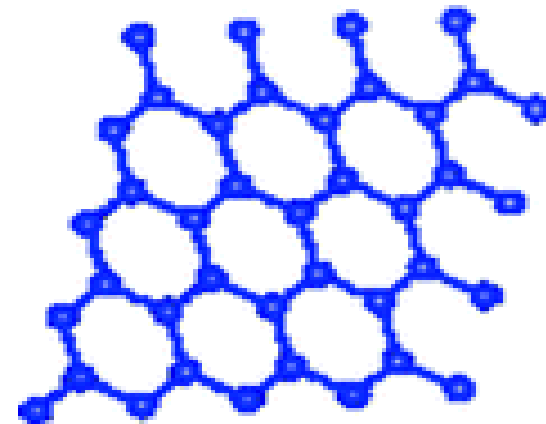


- Nano wires
- Nano rods
- Nano clusters
- Nano tubes

**2D**



**Nanosheets  
Nanoplates**

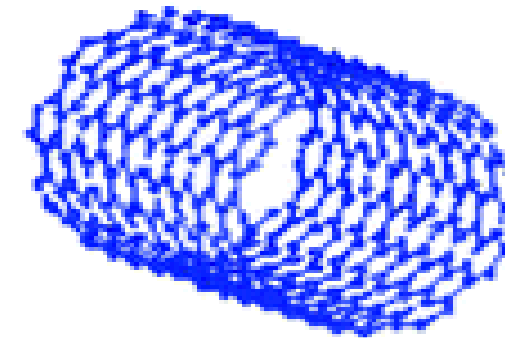


**Graphene**

**1D**

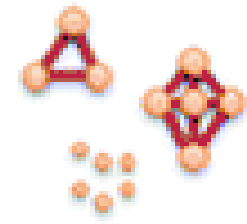


**Nanorods  
Nanofibers  
Nanotubes**

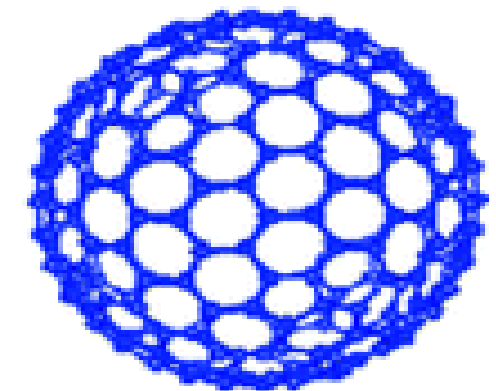


**Nanotube**

**0D**



**Spheres  
Clusters**



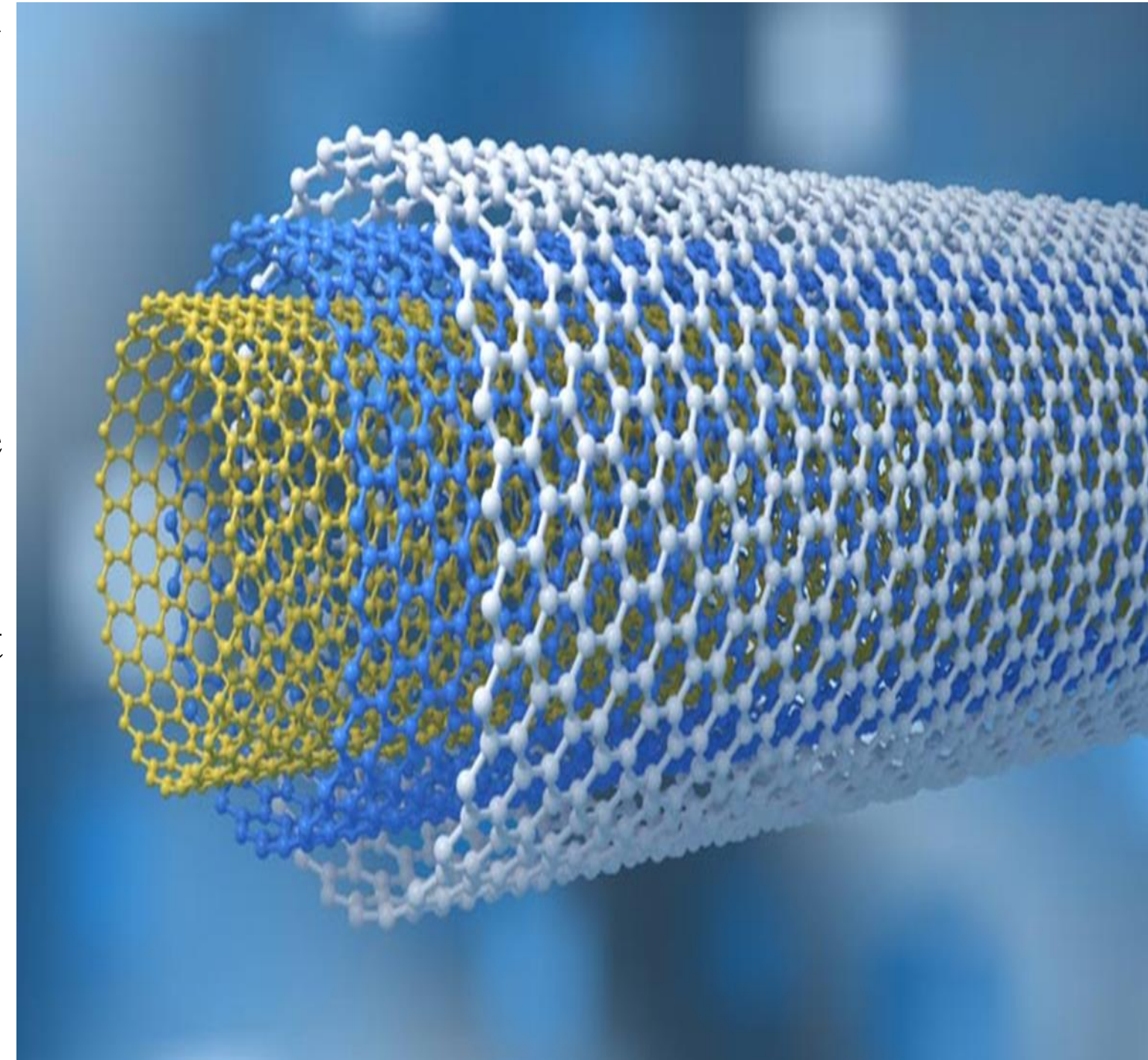
**Fullerene**



# NANOTUBES



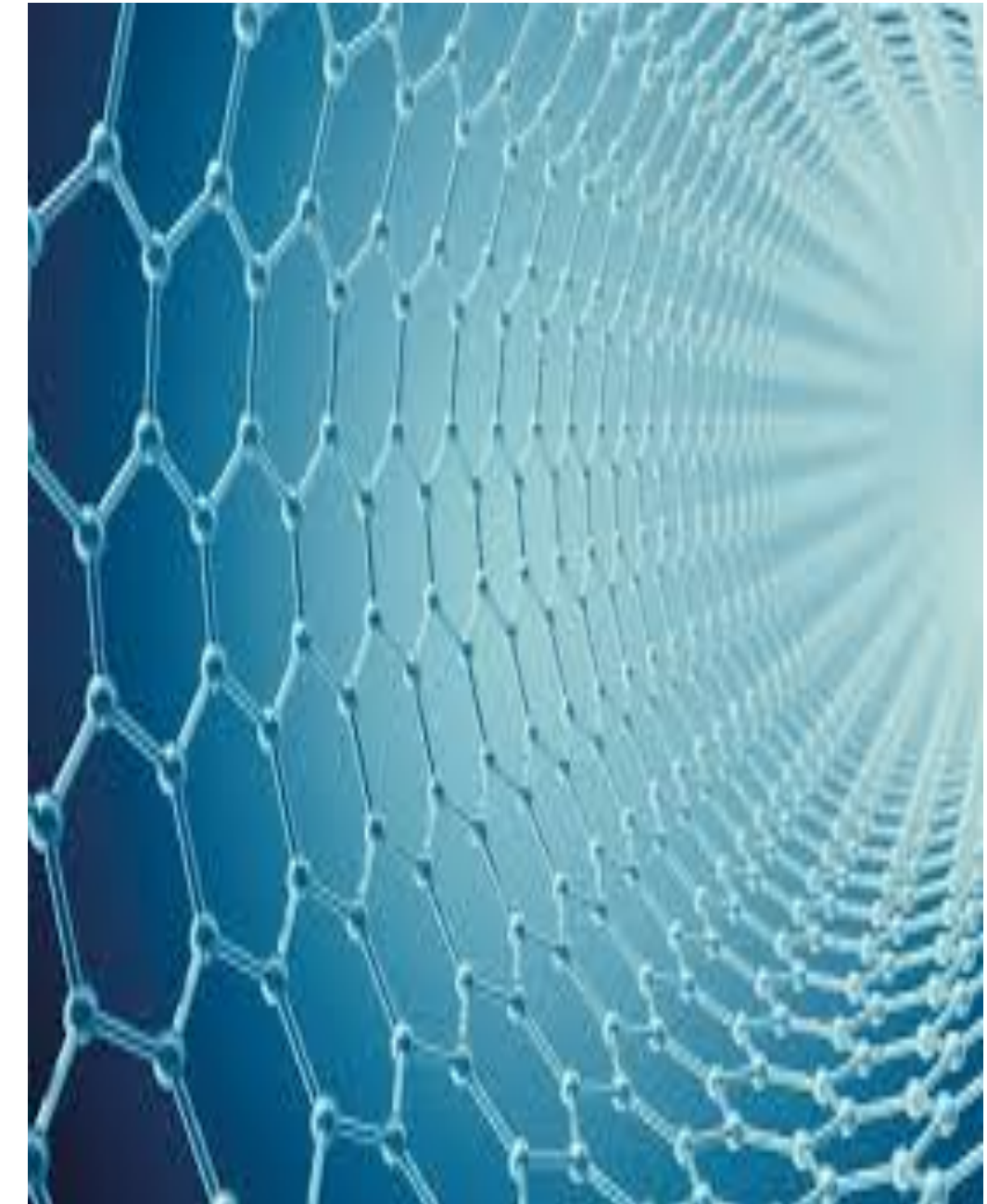
- Nano Tubes are tubular form of C with 1-3 nm dia & a length of few nm – Micron.
- Each C atoms are linked by covalent bond.
- **Carbon Nano Tube**
- A CNT is a cylindrical C structure that has hexagonal graphite molecules attached at the edges.
- It look like a powder or black soot, rolled-up sheets of graphene that form hollow strands with walls that are only one atom thick.
- Nanotubes, which are allotropic forms carbon like graphite, diamond, buckminsterfullerene & nanotubes





# NANOTUBE

- They grown in a laboratory, are strong & exhibit many thermal and electrical properties that are desirable to chip makers.
- CNT have the potential to be used as semiconductors, for example, potentially replacing silicon in a wide variety of computing devices.
- Nanotubes can be characterized by their number of concentric cylinders, cylinder radius and cylinder length.
- Some nanotubes have a property called chirality, an expression of longitudinal twisting..

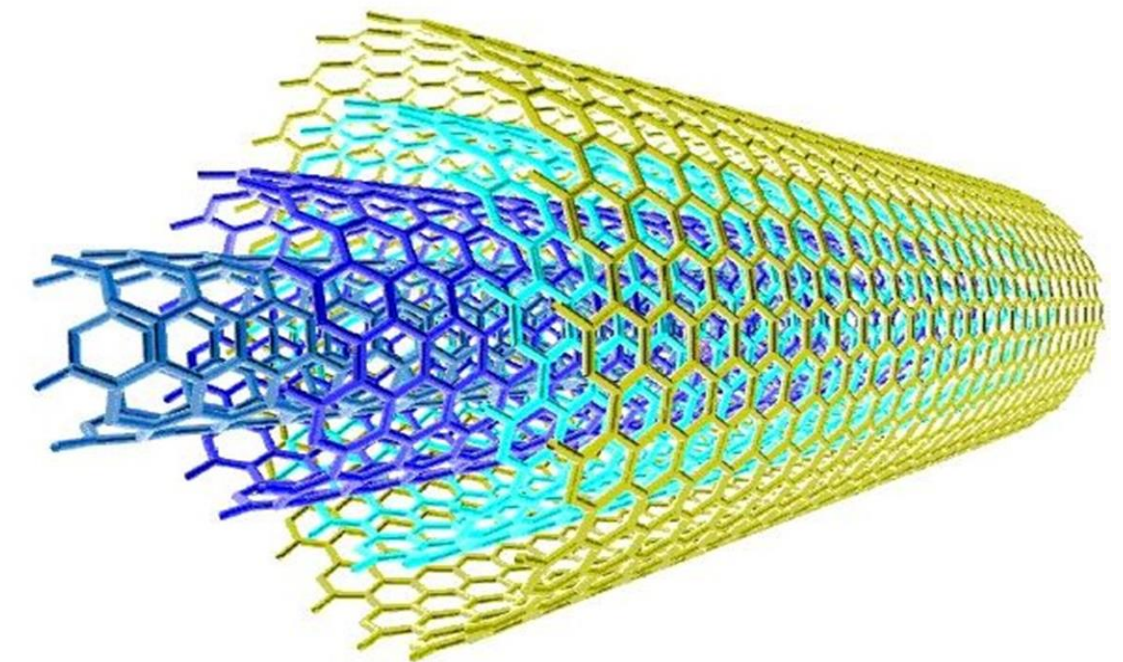
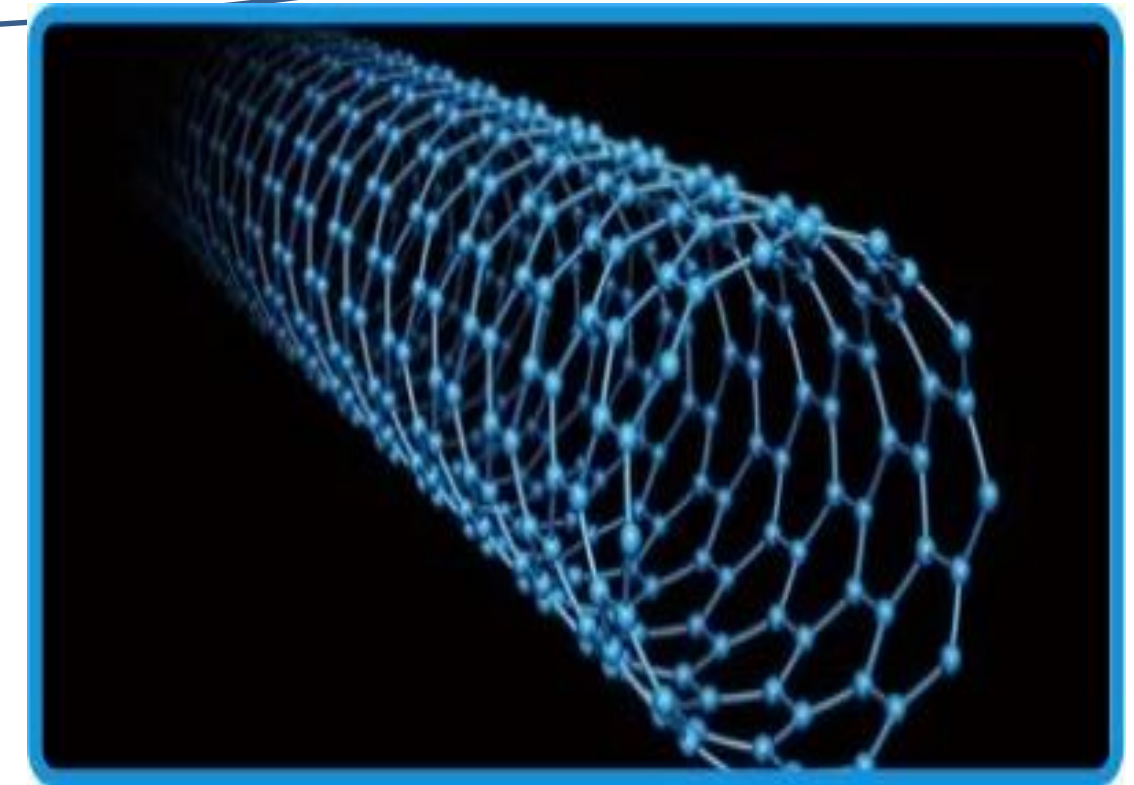




# TYPES OF NANOTUBES

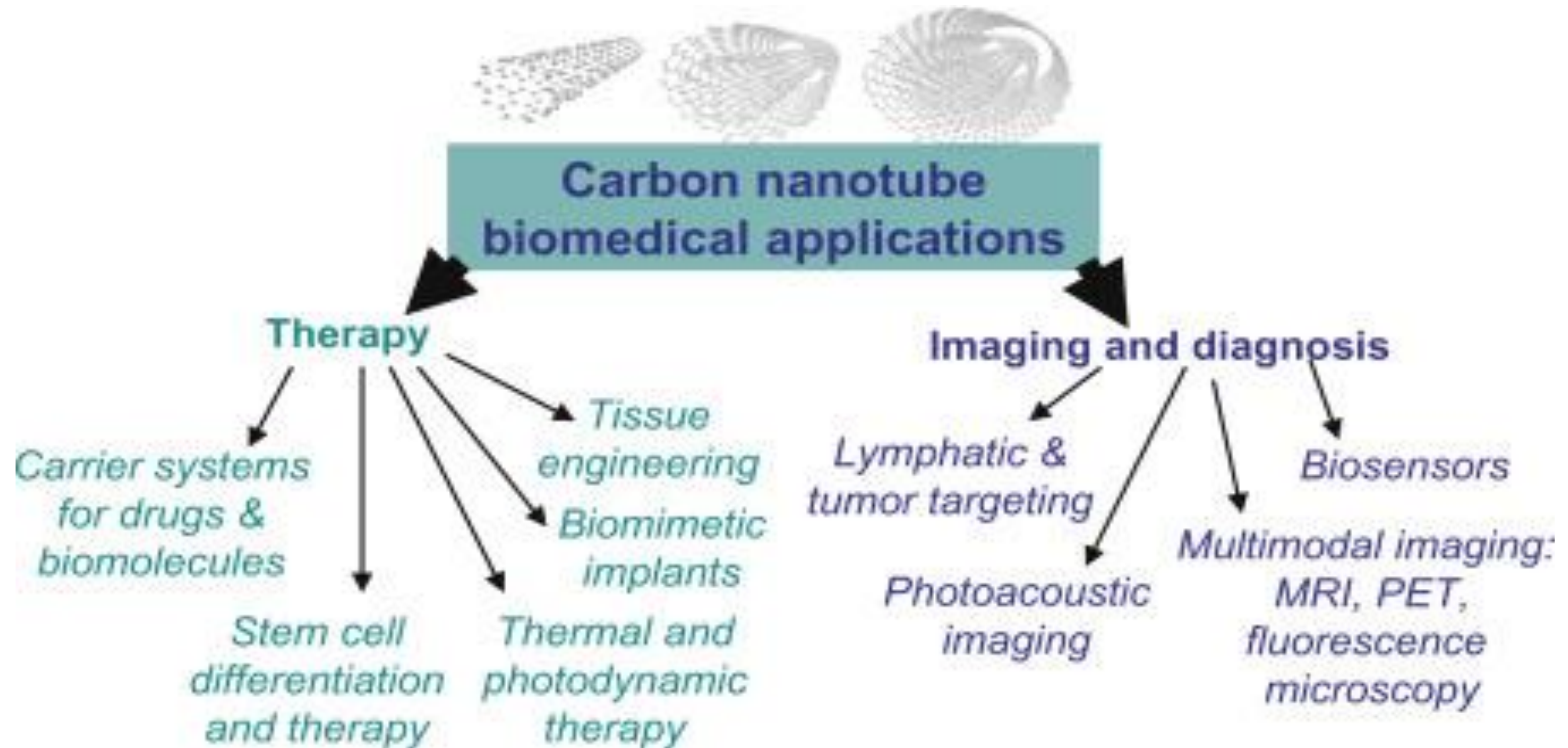
## Types of CNT

- Singled walled (SWCNT)
- Multi walled (MWCNT)
- SWCNT
- It consists 1 sheet of graphite cylinder
- Multi walled (MWCNT)
- It consists of multilayer of graphite rolled themselves to form a tube shape





# APPLICATIONS OF NANOTUBES



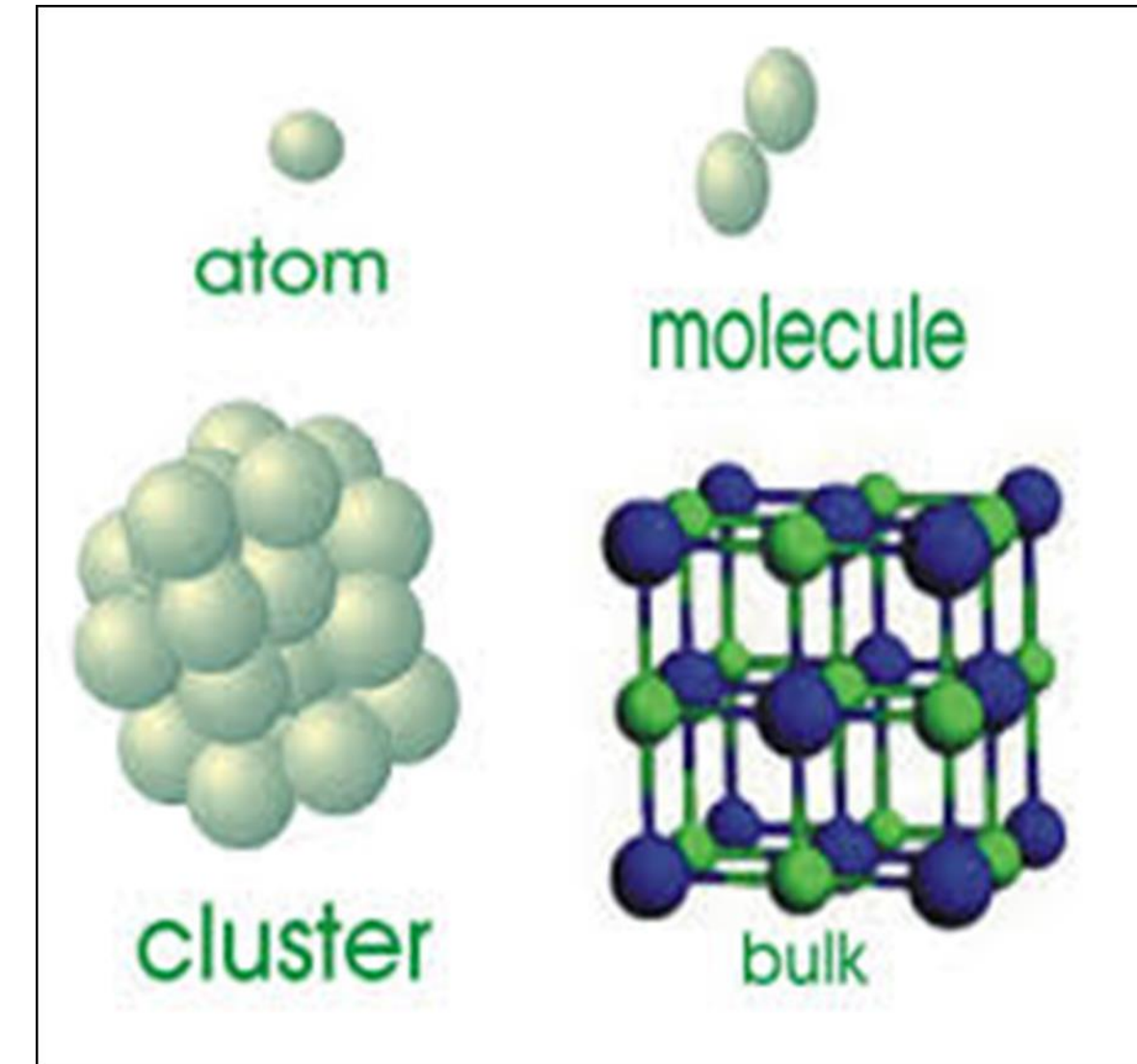




# NANOCLUSTERS



- Zero dimensional
- Size ranges from 0.1 nm -10 nm
- They are fragment of solid comprising somewhere between few atoms – 1000 of atoms.
- It is a grouping of a number of nanoparticles.
- Bonded together by forces like metallic, ionic ,hydrogen and weak vanderwaals force

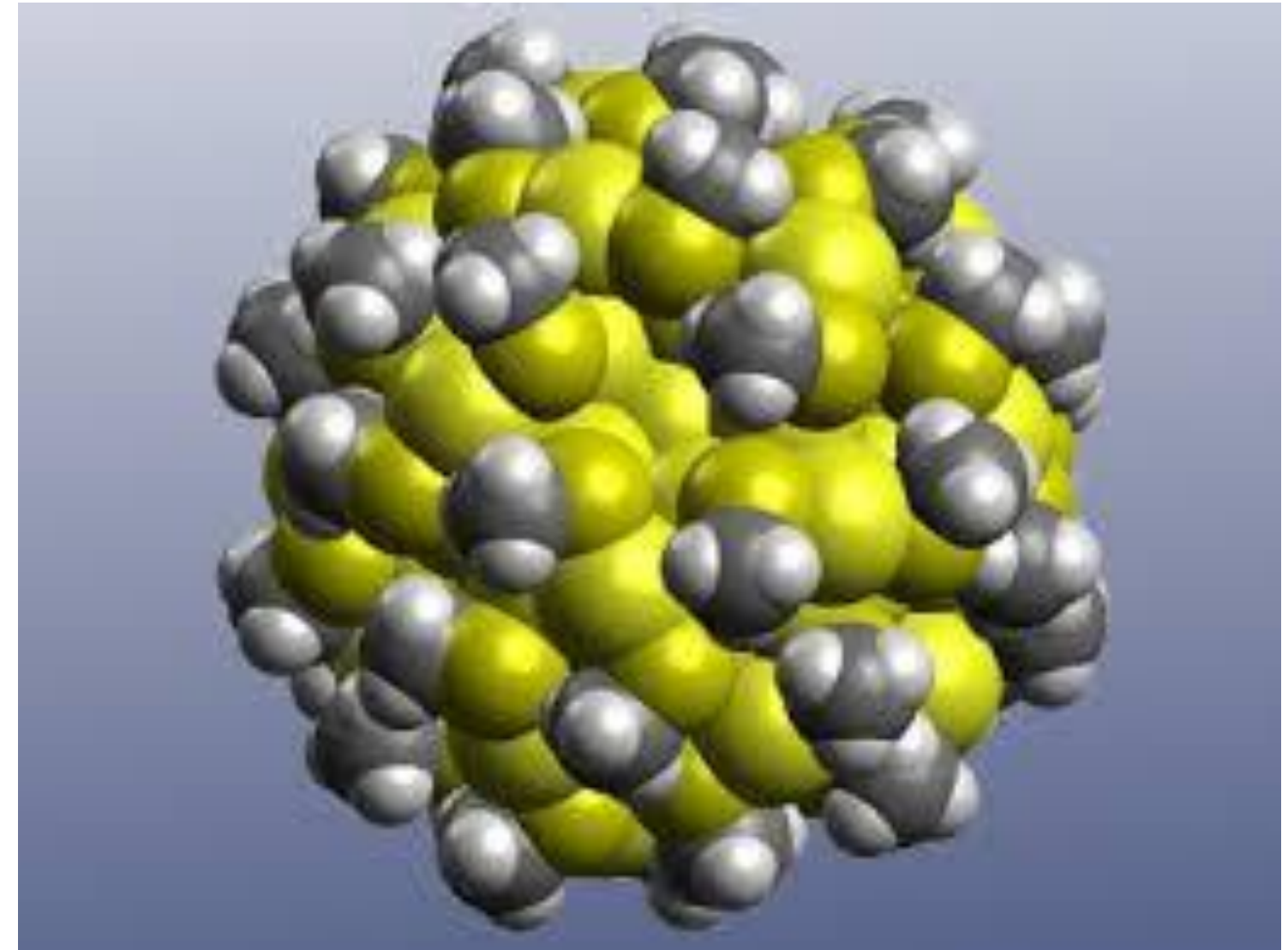






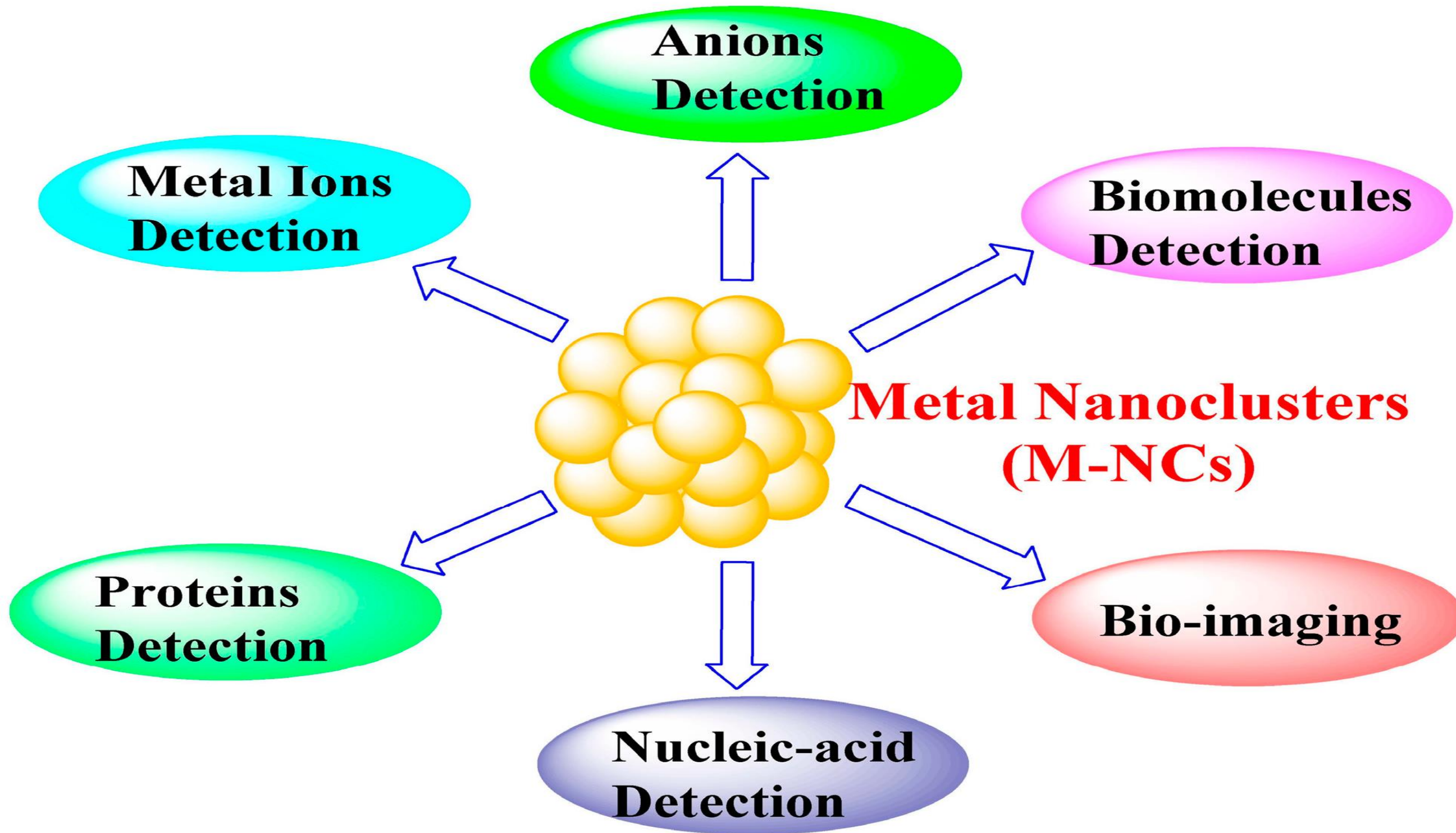
# PROPERTIES OF NANOCCLUSERS

- Properties depends upon composition and size
- More confined electronic structure
- Melting point is low than bulk material





# APPLICATIONS OF NANORODS





# ASSESSMENT



1. List out any two applications of nanotubes.

2. Paste the image of carbon nanotube



# SUMMARY



## REFERENCES

1. Dr. V. Veeraiyan, "Engineering Chemistry-II" VRB Pub. Co. Ltd, Chennai. 2016..
2. Wiley, "Engineering Chemistry", John Wiley & Sons. Inc, USA.
3. P.C. Jain & Monicka Jain, "Engineering Chemistry", Dhanapat Rai Publishing Company Pvt. Ltd. 2017.

**THANK YOU**