



# **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 : 23CHT101- ENGINEERING CHEMISTRY**

**I YEAR / I SEMESTER**

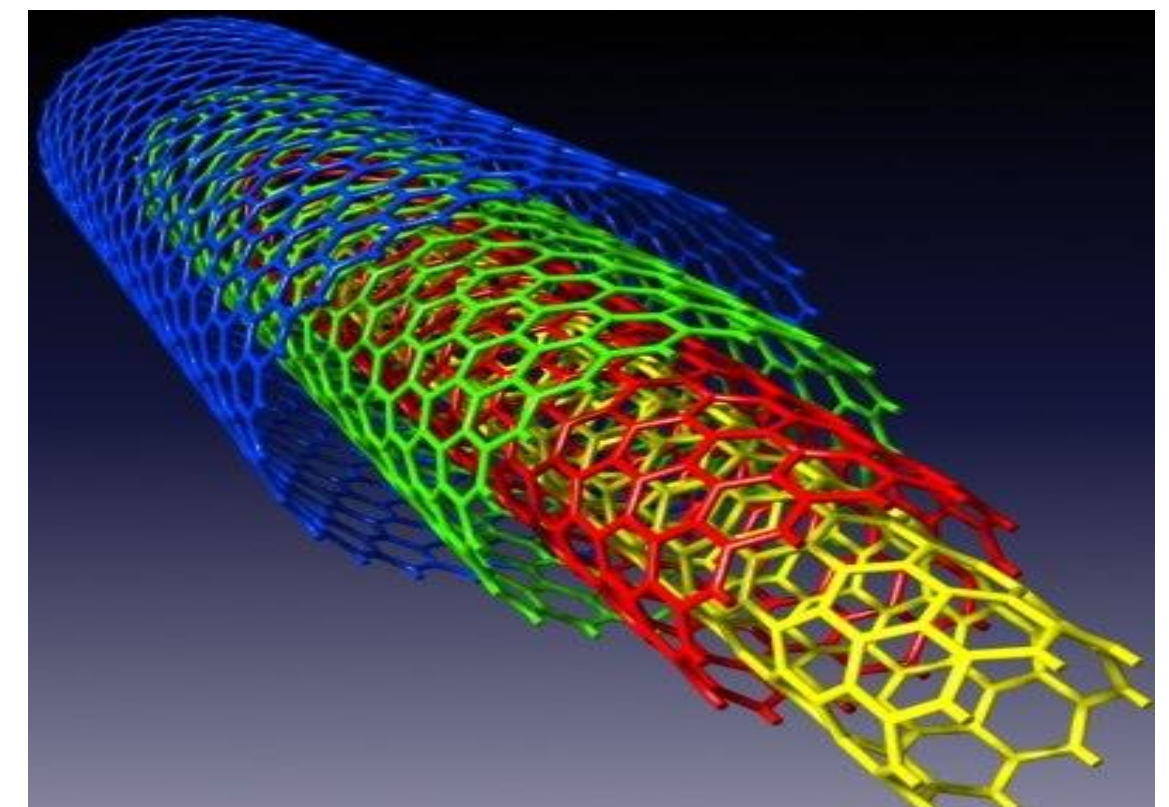
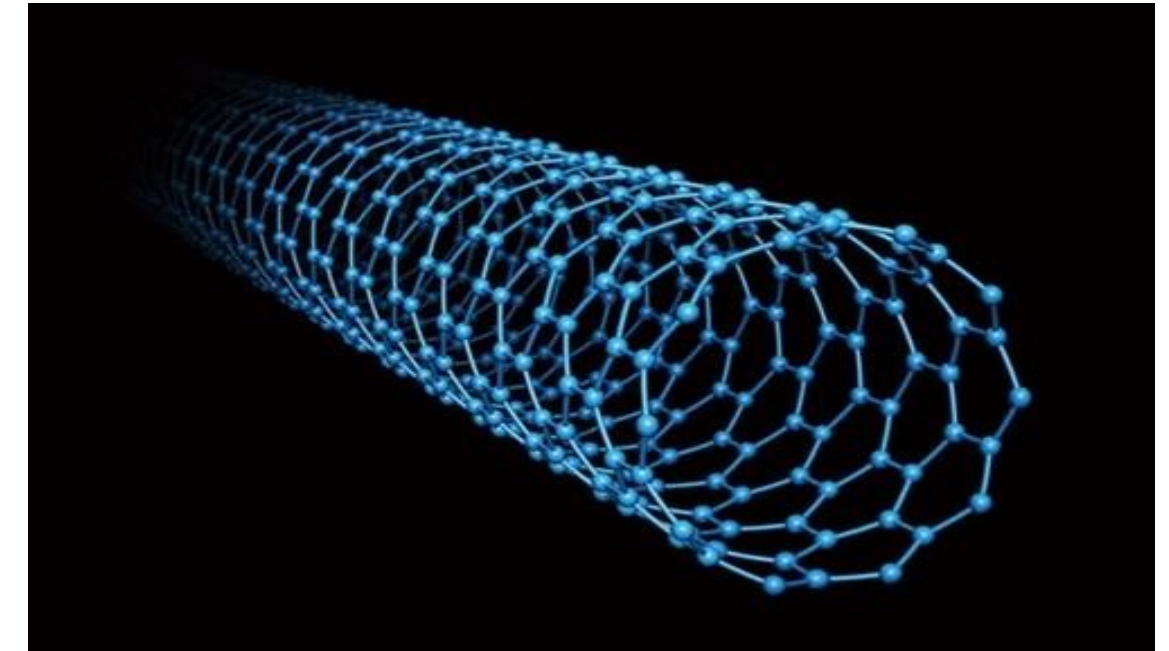
**UNIT : 3. NANOMATERIALS**

**TOPIC : 3.CHEMICAL VAPOUR DEPOSITION**



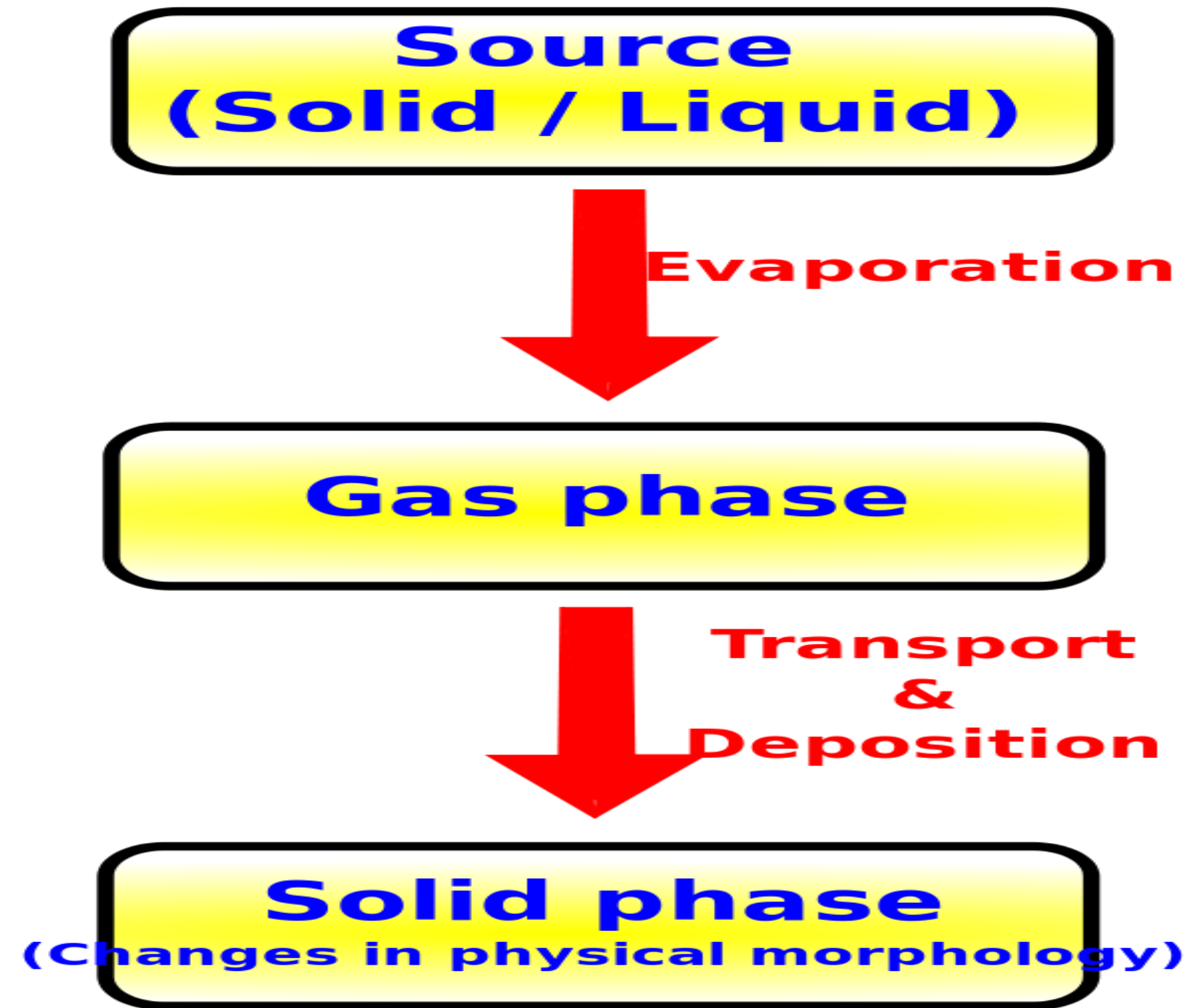
# Why CVD?

- Bottom up method
- Low cost method
- Purity of nanomaterials are high
- Used for generating carbon nanotubes
- Single walled and multi walled nanotubes are produced by this method



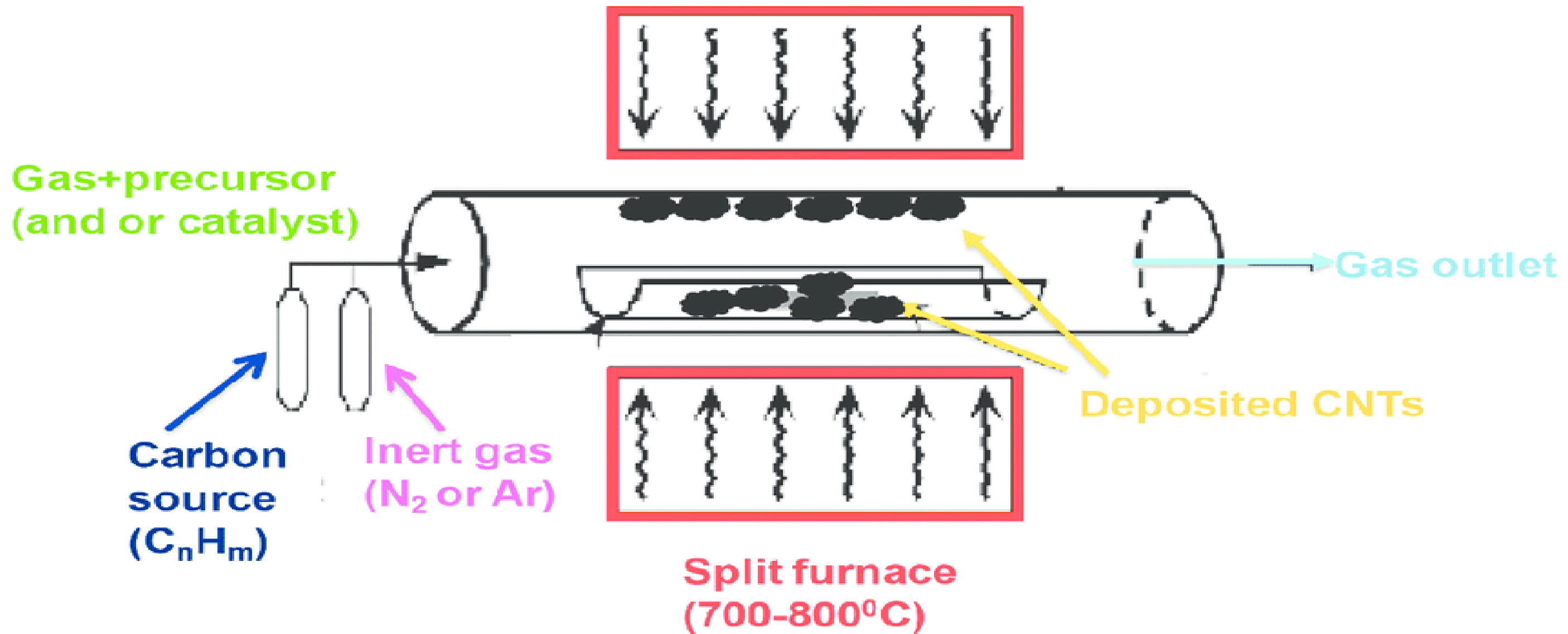


# OUTLINE OF CVD PROCESS





# CHEMICAL VAPOUR DEPOSITION

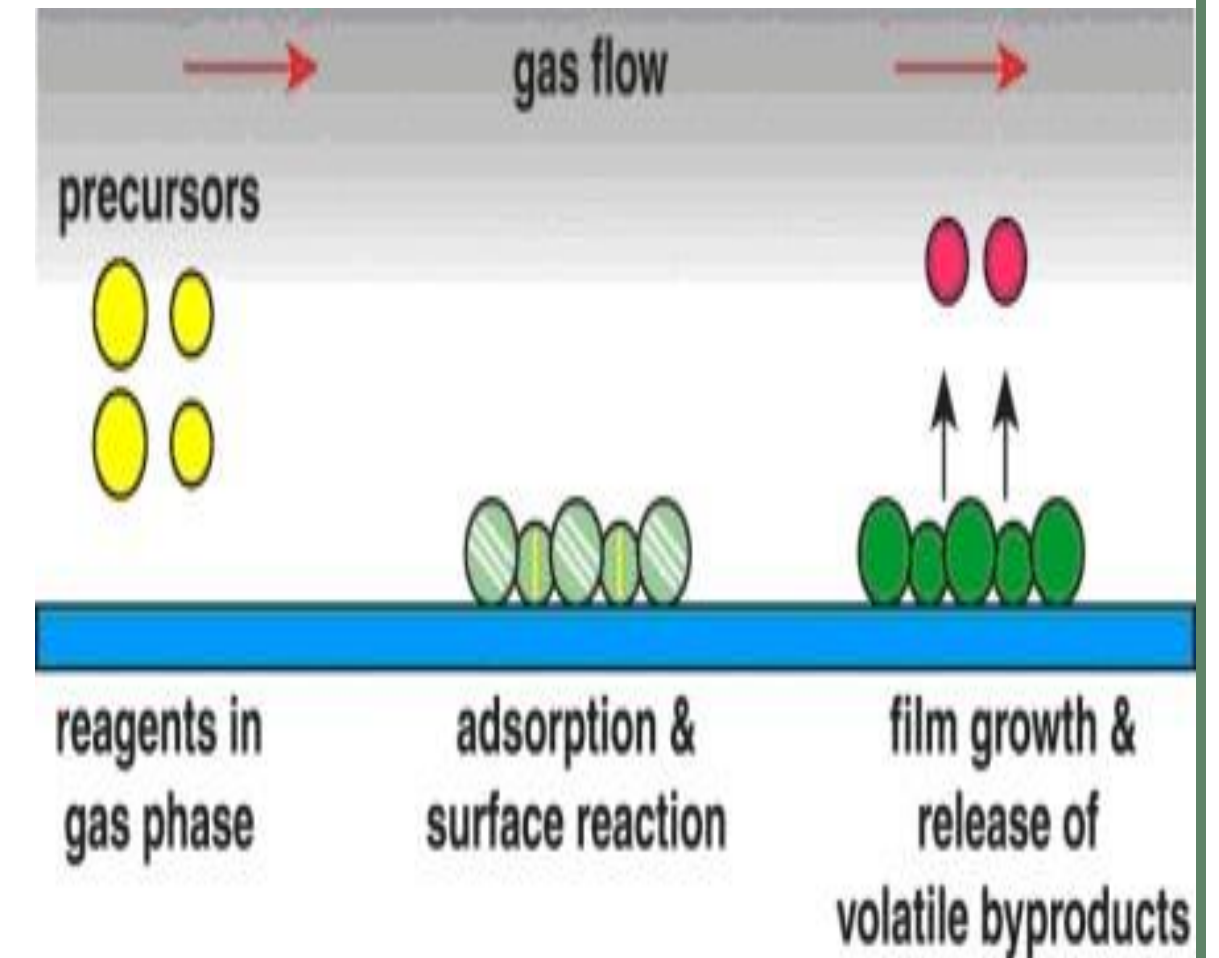




# PROCESS



- Formation of nanomaterials from the gas phase at elevated temperatures
- Solid materials are converted into gas phase and deposited as nanomaterials
- Consists of high temperature vacuum furnace
- Has a provision for maintaining the inert atmosphere
- The solid substrate contains catalyst such as Fe, Co and Ni supported on MgO or Al<sub>2</sub>O<sub>3</sub>
- Hydrocarbons such as methane, ethylene, acetylene and nitrogen gas are connected to the furnace
- Carbon atoms are produced by decomposition of hydrocarbons at 1000°C, Condenses and forms as nanotubes on the surface of solid surface



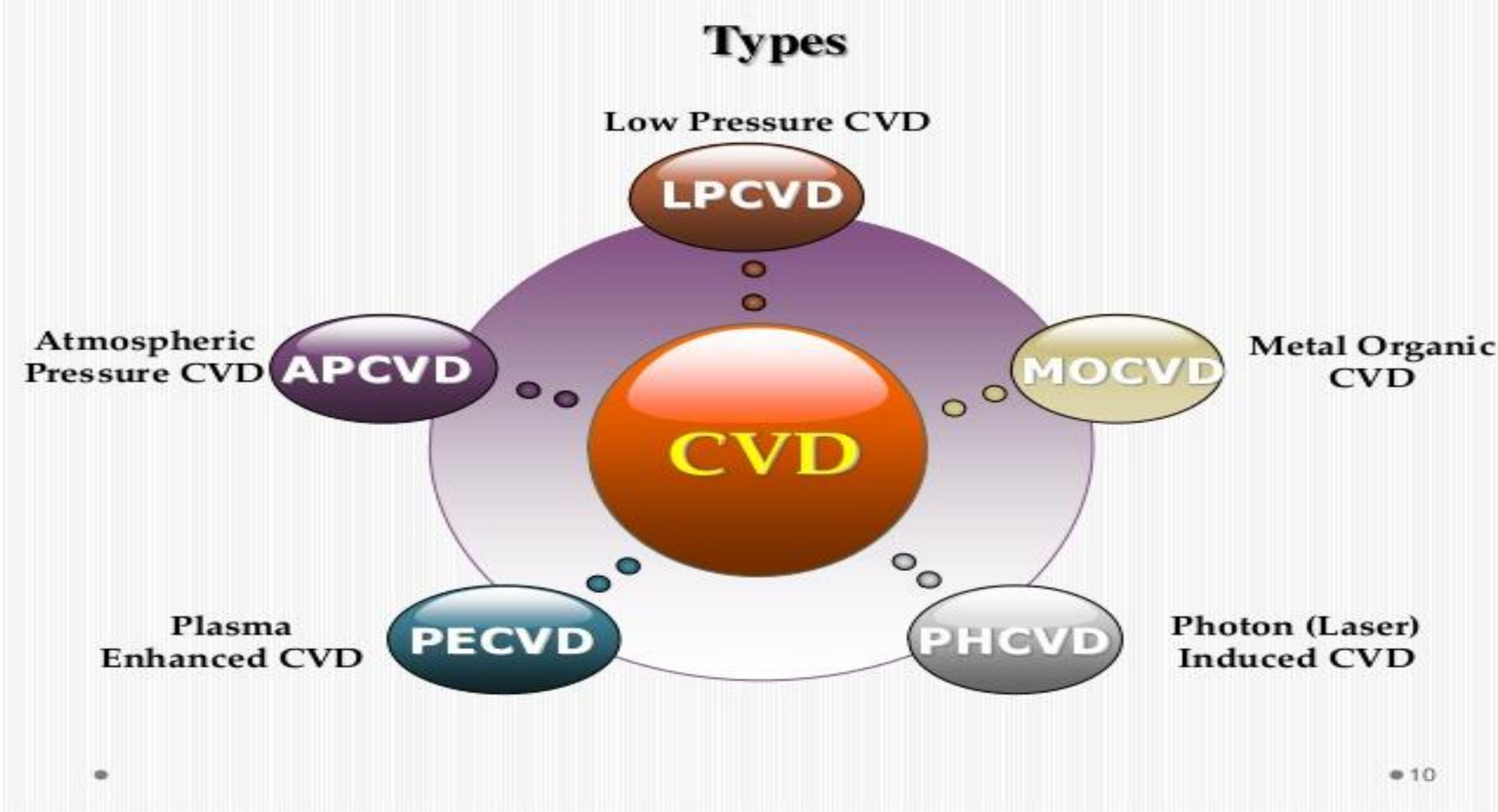


# ACTIVITY





# TYPES OF CVD





# MERITS AND DEMERITS OF CVD

- Merits
- High purity nanomaterials are produced
- Low cost
- Mainly used for carbon nanotubes preparation
- Demerits
- Requires high temperature
- Complex process
- Toxic gases can be released during the process
- Not ecofriendly in nature





# APPLICATIONS OF CVD

## Nuclear

- Protection of nuclear fuel cans
- Corrosion protection for sensors
- Thermocouple shielding
- Protective tiles for fusion reactors

## Electronic

- THT switches
- Solar panel contacts
- Protection and contact layers for silicium / SiC / SOI wafers

## Aeronautic and defence

- Coating of turbine blades
- Coating of missile or rocket nozzles (HEAT)
- Protection for space shuttle tiles
- Thermal protection of composites

## Metallurgy

- Crucibles for high purity deposition
- Thin and thick tubes
- Thermocouple shielding
- High temperature heating elements



# ASSESSMENT



**1. Which one of the following can be synthesized by CVD process?**

a. CNT b. Ag-NPs c. Nanocomposites d. Zinc nano rods

**2. Draw the outline of CVD process.**



# 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 Publising Company Pvt. Ltd. 2017.

**THANK YOU**