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Subject: Physical Pharmaceutics-II<sup>SM</sup>  
(BP-403T)

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**LNCT**<sup>SM</sup>  
GROUP OF COLLEGES  
"WORKING TOWARDS BEING THE BEST"

Unit: IV / Topic: 02

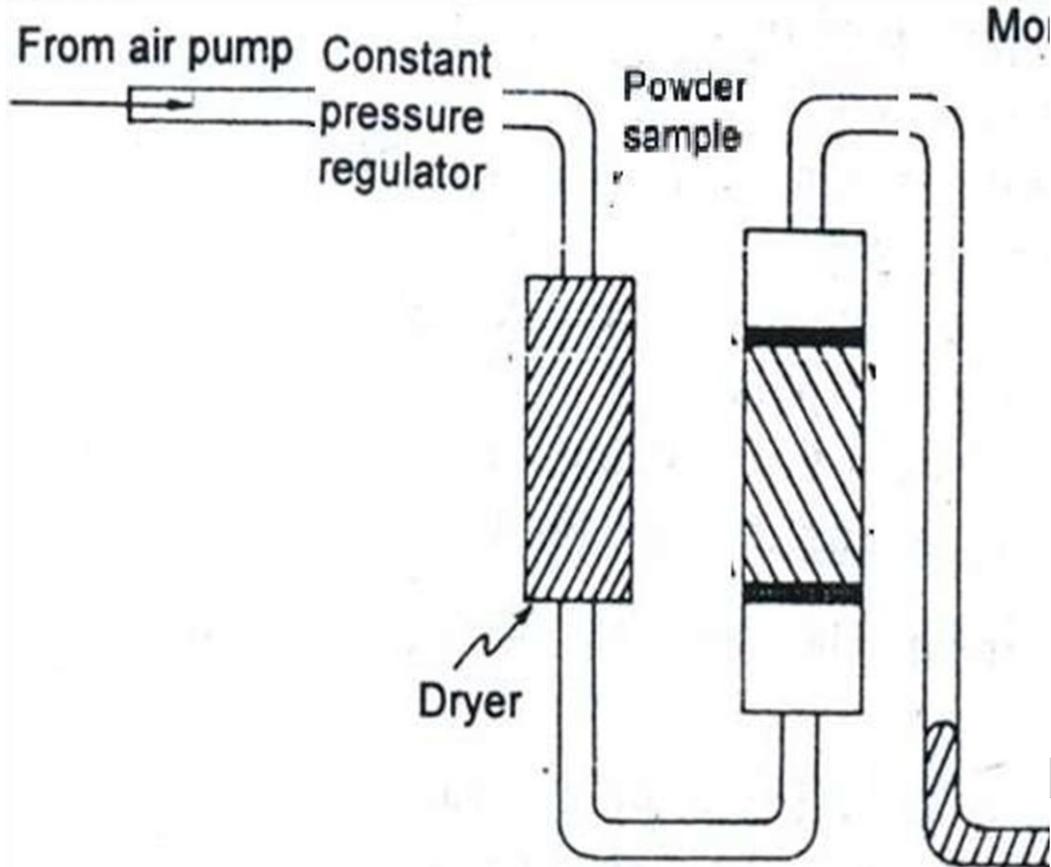
**Micromeritics: Surface Area Determination**

**1. Adsorption method:**

- Surface area is most commonly determined based on Brunauer-Emmett-Teller (BET) theory of adsorption.
- Most substances adsorb a monomolecular layer of gas under certain conditions of partial pressure of gas and temperature.
- The adsorption process is carried out at liquid nitrogen temperatures - 196°C.
- Once surface adsorption has reached equilibrium, the sample is heated at RT and Nitrogen gas is desorbed. Its volume is measured.
- As each N<sub>2</sub> mol. occupies fixed area, one can compute surface area of pre-weighed sample.

**2. Air Permeability method:**

- Powder is packed in sample holder
- Packing appears as series of capillaries
- Air is allowed to pass through the capillaries at constant pressure
- Resistance is created as air passes through capillaries thus causing pressure drop.
- Greater the surface area greater the resistance
- Air permeability is inversely proportional to the surface area .



- **Surface area** of a powder can be calculated using particle size data obtained from any suitable method.
- Specific surface area i.e. surface area per unit weight ( $S_w$ ) or unit volume ( $S_v$ ) can be estimated as follows:
  - $S_v = \frac{\text{surface area of particles}}{\text{volume of particles}}$
  - $S_v = \frac{\text{no. of particles} \times \text{surface area of each particle}}{\text{no. of particles} \times \text{volume of each particle}}$

*Surface area is an important parameter as the bioavailability of certain drugs is dependant on surface area. eg. Bephenium (anthelminitic), Griseofulvin (anti- fungal)- if the surface area is less than specified, the absorption decreases.*

## DERIVED PROPERTIES OF POWDERS

Size or diameter of powder property of a particle.

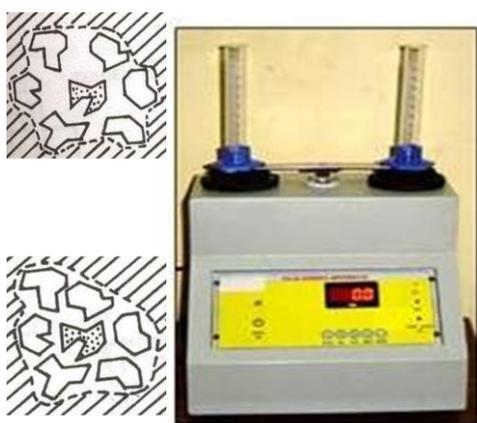
- Volume, density, porosity etc. are the properties derived from fundamental properties. e.g. Volume can be calculated from the diameter of the particle ( $\frac{4}{3} \pi r^3$ ).
- However, derived properties can also be calculated without the use of fundamental properties.

## DENSITY

- **Apparent bulk density-** is determined by pouring presieved (40#) bulk drug into a graduated cylinder via a funnel and note the volume as is (g/ml) *without subjecting to any external force.*
- **Tapped density:** The cylinder is subjected to fixed no. of taps on a mechanical tapper apparatus (approx. 100) until the powder bed has reached minimum. (useful for determining the appropriate size for capsule formulation) .

**Bulk density**

= Mass of the powder / Bulk volume



**Tapped bulk density**

= Mass of the powder / Tapped Bulk volume

### APPLICATIONS

- Decides the size of the capsule based on bulk and tapped volume of a given sample
- Higher the bulk volume, lower the bulk density and bigger the size of the capsule.
- Helps to decide proper size of a container or packing material.

### RGPV QUESTIONS

S.No	Questions	Year	M.Marks
1.	How will you determine the surface area of powder?	2018	8
2.	Write derived properties of powder.	2019	7