MICROMERITIC

Dr. Shashi Kiran Misra
Assistant Professor
SCOP, CSJMU KANPUR

Micromeritics

It is the science and study of a small particle. It includes fundamental and derived properties of individual & collection of particle. Named by **Dalla Valle.**

Applications/Importance of Micromeritics:

- **Dissolution**: Increase in surface area by particles size reduction leads to increase in drug dissolution rate.
- **Appearance:** Color, Texture and particle size enhancement.
- **Flow ability**: Granulation technique convert powder into granule of uniform size, to increase flow property.
- **Compressibility**: Small Particle size – enhance compressibility.
- **Rheology**: More small particles – More particle-particle intration – Increase resistance to flow.
- **Weight Uniformity**:
- **Drug Release:** Small Particle size – enhance drug release.
- **Stability**: Small Particle size – enhance stability.
- **Adsorption:** Small Particle size – more surface area – enhance adsorption.
- **Mixing**: Small Particle size – enhance mixing.

Fundamental Properties of Powder:

Particle size & size distribution

- Particle volume.
- Particle number.
- Particle shape.
- Particle surface area.

Particle size range:

$0.5\mu m - 10\mu m$: Suspension & thin emulsion

$10\mu m - 15\mu m$: Flocculating suspension & porous emulsion

$15\mu m - 100\mu m$: Fine Powder

$150\mu m - 1000\mu m$: Coarse Powder

$1000\mu m - 3360\mu m$: Granules.

Particle size importance in pharmacy

- ***Physical property of powder***
- ***Flow property of powder***
- ***Rate of dissolution***
- ***Chemical property of powder***
- ***Rate of absorption***
- ***Elegance of pharmaceutical preparation***
- ***Stability of system.***
- ***Extraction and drying process***

Properties of powder

Fundamental properties

Individual particle.

Derived properties

Derived

From

Fundamental properties

Fundamental properties:-

1. Particle size and size distribution
2. Particle shape
3. Particle surface area
4. Particle weight
5. Particle number

Derived properties:-

1. Density of powders
2. Flow properties of powders
3. Porosity
4. Bulkiness

1.Particle size

Denoted in **micrometers**

One micrometer is equal to **10-3 mm or 10-6 m**

One millimicrometer is called one **nanometer (nm)**

One nanometer = **10-9 m or 10-6 mm or 10-3 µm**

1 m = 1000 mm

1 mm = 1000 µm

1 µm = 1000 nm

Particle size determination (PSD) Methods-

1. Optical Microscopy
2. Sieving Method
3. Sedimentation Method
4. Conductivity Method

1. <u>OPTICAL MICROSCOPY</u>

- Particle size in the range of 0.2 – 100 µm can be measured.
- This method gives number distribution which can be converted to weight distribution
- Optical microscope lens has limited resolving power
- Advanced microscopes have better resolving power and can measure size in nano range: Ultramicroscope, Electron microscope- Scanning Electron microscope (SEM), Transmission Electron microscope (TEM).

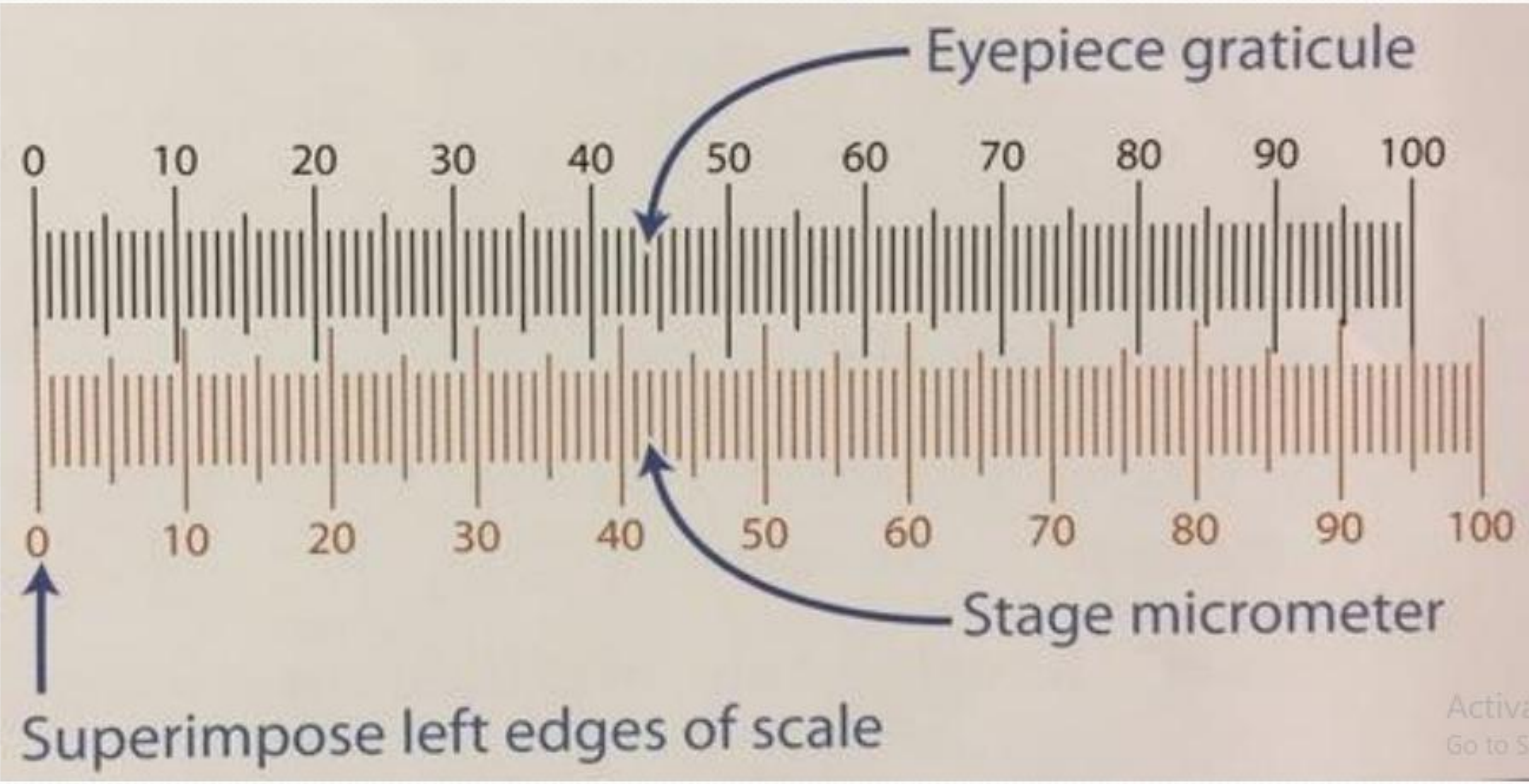
Application:

Particle size analysis in suspensions, aerosols, globule size analysis in emulsion.

Procedure:

- Eye piece of the microscope is fitted with a micrometer.
- This eye-piece micrometer is calibrated using a standard stage micrometer.
- The powder sample is dispersed in a suitable vehicle in which it does not dissolve and its properties are not altered.
- This sample is mounted on a slide and placed on the stage under the objective of microscope.
- Around 300-500 particles are visualized. Their diameter is noted and mean is computed.

Calibrated Using A Standard Stage Micrometer.



Advantages-

- One can view particles
- Any aggregates detected
- Contamination of particles detected
- Use of cover slip for arresting motion of particles
- Easy and simple

Disadvantages-

- Length and breadth can be detected but depth or thickness of particles cannot be measured
- Slow- time consuming , tedious, inaccurate Number of particles to be measured is more
- Large sample required