9. WEEK

PARTICULE SIZE AND DETERMINATION METHODS

WHAT IS PARTICULE?

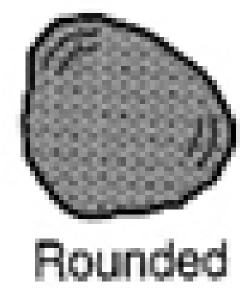
It is a molecule aggregate with no upper limit.

In other words; homogeneous or heterogeneous porosity composed of one or more of the substances, or non-porous structure with a size of 0.5-2000 μm.

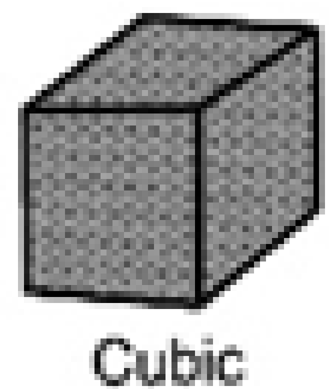
Basic particle shapes are:

- Spherical particles: This type of powder is easy to flow.

- Straight-edge oblang particles: Such powders also tend to flow easily.

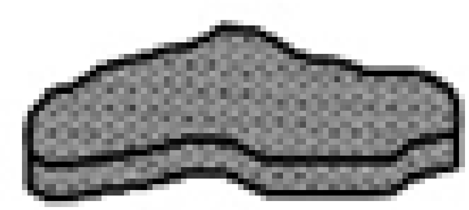


- Sharp edged particles such as cube in geometric structure : This powder type shows a more difficult flow characteristic than the first two powder types.

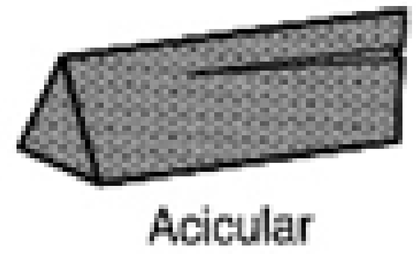


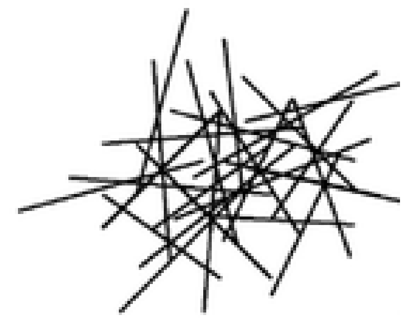
- Unevenly shaped interlocking particles: In this type of particles, the particles form bridges between themselves and therefore have a more difficult flow characteristic.

- Flat particles such as two-dimensional non-uniform flakes: Such dust particles have a more difficult flow characteristic because they can bridge easily with each other. In other words, they are moderately fluent.



- <u>Needle-shaped particles </u>: Because these types of dust particles are very easy to bridge each other, such dusts flow extremely hard. When evaluated in terms of particle form, it is the powder group which has the worst fluidity than all the powder types.





An amorphous particle can not be defined as a geometric principle. Although there is a certain volume and surface area, it is not possible to specify a diameter that can accurately determine these properties.

That is why;

The sizes of the amorphous particles are defined by the diameter of a spherical particle showing the same characteristics.
With these methods, the amorphous particles can be given different sizes.

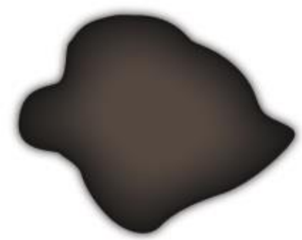
The longer the particles are from the globe, the greater the difference.

“Shape Factor"

$$f = 4\pi \frac{a}{p^2}$$

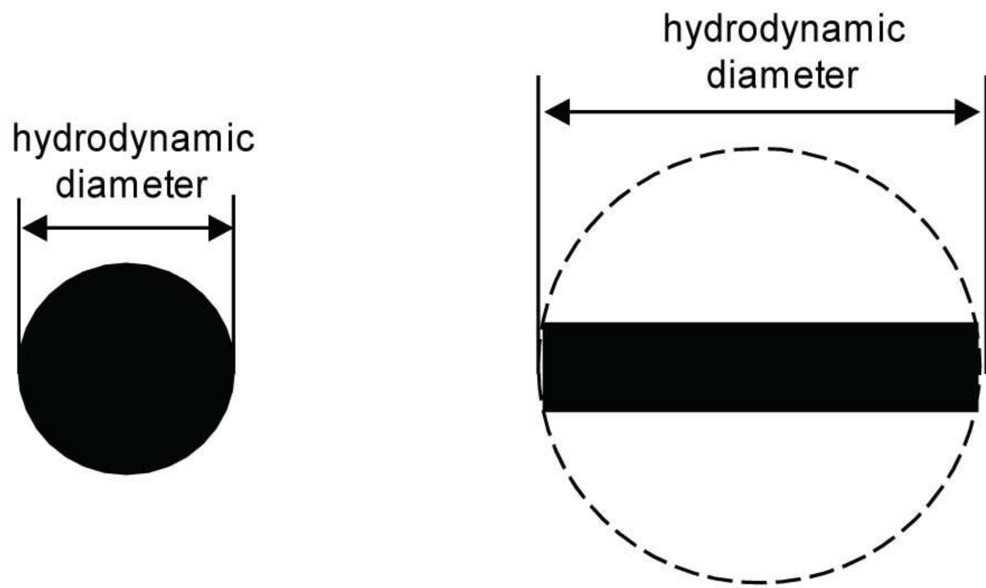
Where f is the shape factor,
a is the area, and
p is the perimeter.

Perimeter: 65
Area: 252



$$\frac{4\pi \,.\, \text{Area}}{(\text{Perimeter})^2} = \text{Shape Factor} \qquad \frac{4\pi \,.\, 252}{(65)^2} = 0.75$$

That is, the sizes of non-spherical, non-uniformly shaped particles are expressed by one of the defined diameters.



The main diameter defined are;

- Volume diameter (d_v)
- Surface (Area) diameter (d_s)
- Volume area diameter (d_{vs})
- Free fall diameter (d_f)
- Stokes diameter (d_{st})
- Projection area diameter(d_a)
- Sieve diameter (d_A)
- Feret diameter (d_F)
- Martin diameter (d_M)

Particle Size Distribution:

Most of the pharmaceutical powders are composed of particles of different particle sizes and different spherical shapes from the globally. For this reason, it is very difficult to calculate the particle size and distribution of the powders.

Common to all methods used to determine the size of the powder particles is the analysis of a sample taken from the dust and the result is usually expressed by one of the defined diameters. The result from this analysis gives information about the entire powder mass.