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A 2 a - Powder Bulk Density

GEA NIRO® Method No. A 2 a

Revised: January 2024

1. Definition

The bulk density of a powder is the weight of the powder divided by the volume it occupies, normally expressed as g/ml or kg/l.

2. Scope

The method is to be used for milk powders and all other dried milk products.

3. Principle

Samples are filled into a stainless steel cylinder, weighed and tapped in a Stampf-volumeter. The results of bulk density must be identified as loose, tapped 100 times or tapped 1250 times.

4. Apparatus

4.1 Balance - sensitivity 0.1 mg.

4.2 Stainless steel cylinder with detachable top, as shown in Fig. 1. The volume of the lower cylinder is exactly 100 cm^3.

4.3 Stampf-volumeter, e.g. made by Engelsmann, Germany (Fig.2).

4.4 Brush

5. Reagents

None.

6. Procedure

6.1 Weigh the cylinder without the top cylindrical part.

6.2 Put the top on the cylinder and carefully fill up to the rim with powder using a spoon. Avoid shaking or tapping the cylinder.

6.3 Remove the top and scrape off powder until it is flush with the rim of the cylinder. Care should be taken not to compress or vibrate the cylinder. Brush off excess powder from the outside edge of the cylinder.

6.4 Weigh the full cylinder (w_1). The weight of the powder indicates "*loose/poured bulk density" (0x)*.

6.5 Repeat point 6.2 and tap the cylinder 100 times in the Stampf-volumeter. If necessary fill up with more powder.

6.6 Repeat point 6.3 and weigh (w_2). The weight of the powder indicates "*tapped powder bulk density" (100x)*.

6.7 Repeat point 6.2 and tap further 1150 times in the Stampf-volumeter.

6.8 Repeat point 6.3 and weigh (w_3). The weight of the powder indicates "*tapped to the extreme powder bulk density" (1250x)*.

7. Calculation

The results are expressed as:

- Loose/poured bulk density - tapped 0 times.
- Tapped bulk density - tapped 100 times.
- Tapped to the extreme bulk density - tapped 1250 times.

$$\text{Bulk density} = \frac{w_x}{100}$$

w_x = weight of powder in g

100 = volume of cylinder in cm^3

Calculate the result to 2 decimal places.

8. Reproducibility

± 0.03 g/ml for loose bulk density.

± 0.01 g/ml for tapped 100 and 1250 times.

Unless other is stated, bulk density is made as single determination.

9. Remarks

1. Bulk density depends on water content and particle size. Avoid adsorption or desorption of water before determination.
3. To obtain reliable results, make sure the powder is at room temperature when analysing.

10. Further literature

- GEA Niro Research Laboratory
- IDF Standard 134A:1995 - Dried milk and dried milk products - Determination of bulk density.
- Svarovsky L., Powder Testing Guide: Methods of measuring the physical properties of bulk powders. ISBN 1851661379, Elsevier Science (1987).

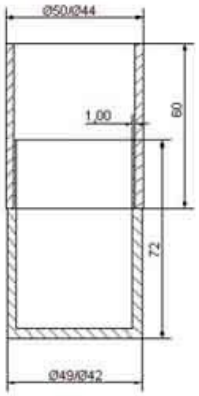

Fig. 1 Stainless steel cylinder

Fig. 2 Stampf-volumeter