SeDeM diagram expert system: powder characterization

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ABSTRACT

This protocol describes the methodology to determine the experimental values of the 12 SeDeM parameters.

EXTERNAL LINK

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PROTOCOL STATUS

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GUIDELINES

Bulk density (Da): The method is described in Section 2.9.34 of Eur. Ph. (Ph Eur, 2011) Tapped density (Dc): The method is described in Section 2.9.34 of Eur. Ph. (Ph Eur, 2011) The volume taken is the value obtained after 2500 strokes using a settling apparatus with a graduated cylinder (voluminometer).

Inter-particle porosity (Ie) of the powder mixture (Font, 1962) is calculated from the following equation: Ie=Dc-Da/Dc×Da

Carr index (IC%) (Córdoba et al, 1996; Rubinstein, 1993; Torres & Camacho, 1991; Wong, 1990). The method is described in Section 2.9.34 of Eur. Ph. (Ph Eur, 2011) This is calculated from Da and Dc as: IC=(Dc-Da/Dc)100
Cohesion index (Icd): This index is determined by compressing the powder, preferably in an eccentric press. 3.5% of the following mixture is added to the mix: talc 2.36%, Aerosil® 200 0.14% and magnesium stearate 1.00%. The mean hardness (N) of the tablets is calculated.

Hausner ratio (IH) (Ph Eur, 2011; Rubinstein, 1993). The method is described in Section 2.9.34 of Eur Ph (Ph Eur, 2011). This is calculated from Da and Dc as: IH=Dc/Da

Angle of repose (α) (Rubinstein, 1993, Muñoz, 1993). The method is described in Section 2.9.36 of Eur Ph (Ph Eur, 2011). This is the angle of the cone formed when the product is passed through a funnel with the following dimensions: height 9.5 cm, upper diameter of spout 7.2 cm, internal diameter at the bottom, narrow end of spout 1.8 cm. The funnel is placed on a support 20 cm above the table surface, centred over a millimetre-grid sheet on which two intersecting lines are drawn, crossing at the centre. The spout is plugged and the funnel is filled with the product until it is flush with the top end of the spout when smoothed with a spatula. Remove the plug and allow the powder to fall onto the millimetre sheet. Measure the four radii of the cone base with a slide calliper and calculate the mean value (r). Measure the cone height (h). Deduce α from tan(α)=h/r.

Flowability (t″): The method is described in Section 2.9.16 of Eur. Ph (Ph Eur, 2011). It is expressed in seconds and tenths of a second per 100 grams of sample, with a mean value of three measurements.

Loss on drying (%HR): This is measured by the method described in 2.2.32 in Eur. Ph (Ph Eur, 2011). The sample is dried in an oven at 105 °C ± 2 °C, until a constant weight is obtained.

Hygroscopicity (%H): Determination of the percentage increase in sample weight after being kept in a humidifier at a relative humidity of 76% (±2%) and a temperature of 22°C± 2°C for 24 h.

Percentage of particles measuring <50 µm (%Pf): Particle size is determined by means of the sieve test following the General method 2.9.12 of Eur. Ph. (Ph Eur, 2011). The value returned is the % of particles that pass through a 0.05-mm sieve when vibrated for 10 min at speed 10 (CISA vibrator).

Homogeneity index (Iθ): This is calculated according to the General method 2.9.12 of Eur. Ph (Ph Eur, 2011). To determine particle size by means of the sieve test, the grain size of a 100g sample is measured by subjecting a sieve stack to vibration for 10 min at speed 10 (CISA vibrator). The sieve sizes used are 0.355 mm, 0.212 mm, 0.100 mm and 0.05 mm. The percentage of product retained in each sieve is calculated and the amount that passes through the 0.05mm sieve is measured. The percentage of fine particles (<50 µm) (%Pf) was calculated as described above. Note that if this percentage is higher than that calculated in the complete sieve test, it is because some of the particles become adhered to the product retained in the sieves during the grain-size test, and the percentage of <50 µm particles found may be lower than the true figure. The following equation is then applied to the data obtained.

$$I\theta = \frac{Fm}{100 + (dm - \mathrm{dm\text{-}1})\mathrm{Fm\text{-}1} + (\mathrm{dm}{+}1 - dm)\mathrm{Fm}{+}1 + (dm - \mathrm{dm\text{-}2})\mathrm{Fm\text{-}2} + \\ +(\mathrm{dm}{+}2 - dm)\mathrm{Fm}{+}2 \ldots + (dm - \mathrm{dm\text{-}n}) + (dm + \mathrm{dm}{+}n)\mathrm{Fm}{+}n}$$

Where: Iθ, Relative homogeneity index. Particle-size homogeneity in the range of the fractions studied; Fm, percentage of particles in the majority range; Fm−1, percentage of particles in the range immediately below the majority range; Fm+1, percentage of particles in the range immediately above the majority range; n, order number of the fraction studied under a series, with respect to the major fraction; dm, mean diameter of the particles in the major fraction; dm−1, mean diameter of the particles in the fraction of the range immediately below the majority range; dm+1, mean diameter of the particles in the fraction of the range immediately above the majority range.