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Liming materials — Determination of size distribution by dry and wet sieving

Amendements minéraux basiques — Détermination de la distribution granulométrique par tamisage à sec ou à l'état humide

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Foreword

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The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular, the different approval criteria needed for the different types of ISO documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

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For an explanation of the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT) see www.iso.org/iso/foreword.html.

This document was prepared by Technical Committee ISO/TC 134, *Fertilizers, soil conditioners and beneficial substances*.

Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at www.iso.org/members.html.

Introduction

The dry sieving of powdered material containing individual particles can be carried out quite easily. This simple, quick and cheap method enables the determination of the particle size of water-soluble materials. Therefore, the dry sieving method should always be used first. However, the sieve apertures can become blocked by sample particles, a phenomenon known as blinding. Blinding is mainly caused by caking and the production of electrostatic charges, particularly on sieves with small apertures. Dry sieving of very wet material can also lead to blinding. These difficulties are not encountered with the wet sieving method, which is applicable to any kind of material such as powders (dry or wet), paste-like products or granules except those containing water-soluble constituents.

In order to ensure the comparability of results, all masses of size fractions are expressed as dry matter.

This document is based on EN 12948:2002.

Liming materials — Determination of size distribution by dry and wet sieving

1 Scope

This document specifies two methods for the determination of the particle size distribution of liming materials.

Method A (the dry sieving method) is applicable to all liming materials except wet and paste-like products. Method A is not applicable if blinding, caking, electrostatic charges or agglomeration occur after drying.

Method B (the wet sieving method) is applicable to products which are susceptible to blinding, caking, electrostatic charges or agglomeration after drying. Method B can be used to determine the primary particle size distribution of granulated products. Method B is not applicable to burnt lime and liming materials containing water-soluble constituents.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 565, *Test sieves — Metal wire cloth, perforated metal plate and electroformed sheet — Nominal sizes of openings*

ISO 3310-1, *Test sieves — Technical requirements and testing — Part 1: Test sieves of metal wire cloth*

ISO 8397:1988, *Solid fertilizers and soil conditioners — Test sieving*

ISO 14820-1, *Fertilizers and liming materials — Sampling and sample preparation — Part 1: Sampling*

EN 12048, *Solid fertilisers and liming materials — Determination of moisture content — Gravimetric method by drying at (105 ± 2) °C*

3 Terms and definitions

No terms and definitions are listed in this document.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

— ISO Online browsing platform: available at https://www.iso.org/obp

— IEC Electropedia: available at http://www.electropedia.org/

4 Principle

4.1 Suitable methods

Table 1 gives the recommended methods for different liming materials.

In case of different options, see remarks.

Table 1 — Suitable methods for size distribution determination

Material type	Presentation	Moisture	Water soluble	Size range on the market	Suitable method(s)			Remarks
	Powder/ Defined/ Granulated/ Suspension/ Screened	Dry/Wet	Yes/No/ Partially		Dry sieving (method A)	Wet sieving (method B)	Laser diffraction (not standardized)	
Limestone/ dolomite	Powder	Dry	No	0/10 µm to 0/63 µm	—	—	x	
	Powder	Dry	No	0/63 µm to 0/100 µm	x	—	x	
	Powder	Dry	No	0/100 µm to 0/5 mm	x	optional	—	
	Powder	Wet	No	0/100 µm to 0/5 mm	optional	x	—	after drying for dry sieving as received for wet sieving
	Defined	Dry	No	100 µm/x to y/5 mm	x	optional	—	
	Granulated	Dry	No	2/7 mm	x	—	—	before breakdown
	Granulated	Dry	No	0/63 µm to 0/1 mm (elementary particles)	x	optional 1	optional 2	1 and 2: after breakdown 2: up to 200 µm
	Suspension	Wet	No	0/10 µm to 0/250 µm	optional	—	x	fraction coarser than 100 µm
Chalk (soft material)	Powder	Wet	No	0/5 mm to 0/ 50 mm	—	x	—	as received
	Powder	Dry	No	0/63 µm to 0/1 mm	x	optional	—	
Burnt lime	Powder	Dry	Partially	0/1 mm to 0/3 mm	x	—	—	
	Screened	Dry	Partially	1/x mm to y/8 mm	x	—	—	
Hydrated lime	Powder	Dry	Partially	0/50 µm to 0/200 µm	x	—	optional	in alcohol
	Suspension	Wet	Partially	—	—	—	—	no need
BOF slags (blast oxygen furnace)	Powder	Dry	Partially	up to 1 mm	x	—	optional	in alcohol
	Powder	Wet	Partially	up to 4 mm	x	—	—	after drying

Key

x: preferred method

optional: may be used

—: not applicable

Table 1 *(continued)*

Material type	Presentation	Moisture	Water soluble	Size range on the market	Suitable method(s)			Remarks
	Powder/ Defined/ Granulated/ Suspension/ Screened	Dry/Wet	Yes/No/ Partially		Dry sieving (method A)	Wet sieving (method B)	Laser diffraction (not standardized)	
Sugar factory lime	Powder	Dry	No	very fine particles	x	—	x	
	Powder	Wet	No	very fine particles	x	—	x	after drying
	Suspension	Wet	No	very fine particles	—	—	x	
Ashes	Powder	Dry	Partially	up to 5 mm	x	—	—	
	Powder	Wet	Partially	up to 5 mm after preliminary sieving	x	—	—	after drying
	Granulated	Dry	Partially	2/7 mm	x	—	—	
Key x: preferred method optional: may be used —: not applicable								

In some countries, very fine materials (finer than 50 µm) can be found (such as calcium carbonate suspensions).

For such products, measurement by sieving is not suitable:

Fine particles block the sieve holes and the results cannot be considered as representative.

In this situation, only the laser granulometry measurement is suitable.

However, this measurement is not standardized because the results (xx percent passing yy mm) depend on a material matrix and on a device calculation algorithm which is specific to each device provider. Usually, for laser granulometry, particles are dispersed in water. When the product is totally or partially water soluble, alcohol should be used but in such a case (as burnt or hydrated lime), the agricultural product reactivity is much better than for insoluble products (carbonates) and fineness generally does not matter.

4.2 Method A (dry sieving)

Dry sieving of a liming material with one or more test sieves by hand or using a mechanical sieving machine.

4.3 Method B (wet sieving)

Dispersion of agglomerated or granulated liming materials with tap water.

Wet sieving of the dispersed liming materials under continuous water spraying by hand or using a mechanical sieving machine. Drying of the different fractions retained on the sieves.

5 Apparatus

Usual laboratory apparatus and, in particular, the following.

5.1 Balance, capable of weighing to the nearest 0,01 g.

5.2 Mechanical shaker (sieving machine), capable of imparting both horizontal and vertical motion to material inside a stack of sieves, fitted with a lid with a water intake and a receiver with a water outlet when used for method B.

Hand sieving may be carried out instead of mechanical sieving.

5.3 Stainless steel woven wire test sieves, conforming to ISO 3310-1 and of nominal aperture sizes covering the granulometry range of the product.

5.4 Stopwatch.

5.5 Soft brush.

5.6 Oven, capable of being controlled at (105 ± 2) °C.

6 Sampling

Sample the liming material in accordance with ISO 14820-1.

7 Procedure

7.1 Test portion

The whole laboratory sample shall be divided in equal test portions of at least 100 g. The size of the test portions will vary according to the coarseness of the laboratory sample and shall be in accordance with ISO 8397:1988, Table 1, subject to a minimum of 100 g.

7.2 Method A (dry sieving)

7.2.1 Preparation of test portions

Dry wet samples if blinding of the sieves is likely to occur during the sieving.

Dry the wet sample in an oven (5.6) at (105 ± 2) °C for a period of time specified in EN 12048.

Check whether agglomeration occurs after drying by carrying out a preliminary sieving test.

Use method B if agglomeration occurs.

7.2.2 Determination

WARNING — When sieving burnt or hydrated lime products, precautions shall be taken to avoid inhalation and skin contact with the product. Operations should be carried out under a fume hood and appropriate gloves should be worn.

7.2.2.1 Carry out at least two single determinations on separate test portions prepared from the same laboratory sample.

7.2.2.2 Select a maximum of seven test sieves (5.3) from the range of principal sizes listed in ISO 565 to cover the range of particle size expected.

Assemble the sieves in ascending order of aperture size on top of the receiver.

Weigh the test portion (7.1) to the nearest 0,01 g per 100 g of test portion, place it on the top sieve and fit the cover.

7.2.2.3 Place the sieve or the assembled stack of sieves on the mechanical shaker (5.2) and shake for exactly 10 min [use a stopwatch (5.4)].

7.2.2.4 If a stack of sieves is used, remove the sieves from the stack and weigh the quantity retained on each sieve and in the receiver to the nearest 0,01 g. Remove particles caught in the mesh of the sieve by brushing the reverse side of the sieve.

7.2.2.5 If only one sieve is used, discard the undersize fraction that has passed through the sieve. Repeat the sieving process for exactly 1 min. If more than 0,2 g passes through the sieve, repeat the procedure as many times as necessary. Remove particles caught in the mesh of the sieve by brushing the reverse side of the sieve. Weigh the oversize fraction.

7.3 Method B (wet sieving)

7.3.1 General

Use an additional test portion to determine the moisture content in accordance with EN 12048.

Prior to measurement, check that the tap water pH is higher than 6,4 to avoid possible reaction of fine particles of carbonates.