INTERNATIONAL STANDARD

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Urine-absorbing aids for incontinence — Test methods for characterizing polymer-based absorbent materials —

Part 3: Determination of particle size distribution by sieve fractionation

Aides pour absorption d'urine — Méthodes d'essai pour caractériser les matériaux absorbants à base de polymères —

Partie 3: Détermination de la distribution granulométrique des particules au moyen du fractionnement par tamisage

Reference number
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Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 3.

Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

Attention is drawn to the possibility that some of the elements of this part of ISO 17190 may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights.

International Standard ISO 17190-3 was prepared by Technical Committee ISO/TC 173, *Technical systems and aids for disabled or handicapped persons*, Subcommittee SC 3, *Aids for ostomy and incontinence*.

ISO 17190 consists of the following parts, under the general title *Urine-absorbing aids for incontinence — Test methods for characterizing polymer-based absorbent materials*:

— *Part 1: Determination of pH*

— *Part 2: Determination of amount of residual monomers*

— *Part 3: Determination of particle size distribution by sieve fractionation*

— *Part 4: Determination of moisture content by mass loss upon heating*

— *Part 5: Gravimetric determination of free swell capacity in saline solution*

— *Part 6: Gravimetric determination of fluid retention capacity in saline solution after centrifugation*

— *Part 7: Gravimetric determination of absorption under pressure*

— *Part 8: Gravimetric determination of flowrate*

— *Part 9: Gravimetric determination of density*

— *Part 10: Determination of extractable polymer content by potentiometric titration*

— *Part 11: Determination of content of respirable particles*

ISO 17190 is intended to be used in conjunction with ISO 17191, *Urine-absorbing aids for incontinence — Airborne polyacrylate superabsorbent material in the workplace — Determination of the content in respirable dust by sodium atomic absorption spectrometry*.

Annex A of this part of ISO 17190 is given for information only.

Introduction

ISO 17190 consists of a series of test methods originally developed by *European Disposables and Nonwovens Association (EDANA)*. These test methods have been incorporated without technical changes into one International Standard consisting of eleven parts.

These test methods have been in practical use for several years, and have proven to be reliable with respect to common criteria of quality of test methods (validity, repeatability, etc.). They are applicable to polyacrylate superabsorbent materials, which occur in hygiene products, including urine-absorbing aids for incontinent persons. The test methods are addressed to the *material* exclusively. They are not intended to be used, and are not applicable for use with finished manufactured urine-absorbing aids.

Urine-absorbing aids for incontinence — Test methods for characterizing polymer-based absorbent materials —

Part 3:
Determination of particle size distribution by sieve fractionation

1 Scope

This part of ISO 17190 specifies a method for measuring particle size distributions from 45 µm to 850 µm of cross-linked polyacrylate (PA) superabsorbent powders.

In general, this method is expected to be applicable to powdered polymeric superabsorbent materials that are free-flowing at temperatures between 15 °C and 35 °C.

2 Normative reference

The following normative document contains provisions which, through reference in this text, constitute provisions of this part of ISO 17190. For dated references, subsequent amendments to, or revisions of, any of these publications do not apply. However, parties to agreements based on this part of ISO 17190 are encouraged to investigate the possibility of applying the most recent edition of the normative document indicated below. For undated references, the latest edition of the normative document referred to applies. Members of ISO and IEC maintain registers of currently valid International Standards.

ISO 5725-2, *Accuracy (trueness and precision) of measurement methods and results — Part 2: Basic method for the determination of repeatability and reproducibility of a standard measurement method*

3 Principle

A defined amount of superabsorbent powders is split into specific particle size fractions upon passing through a sequence of standard sieves. Each fraction is weighed and the value reported as a percentage of the total amount of material.

4 Apparatus

4.1 Analytical balance, capable of weighing, to the nearest 0,01 g, masses up to 300 g.

4.2 Beaker, glass or plastic, of 150 ml capacity.

4.3 Sieve shaker, type Retsch VE 1000 or equivalent, capable of holding five standard sieves of 200 mm diameter, with bottom receiving pan, grounded for avoiding static electricity.

4.4 Standard sieves, 200 mm diameter stainless steel sieves, with pore sizes of 45 µm, 150 µm, 300 µm, 600 µm and 850 µm, with bottom receiving pan and top lid.

4.5 Brush, for example made of camel's hair, for cleaning of standard sieves.

5 Sampling

CAUTION — Use respiratory protection, dust mask or fume hood, when handling sample amounts greater than 10 g.

In order to guarantee that a representative sample is taken from the bulk material contained in a large bag or a silo truck, remove the top layer (approximately 20 cm). Take a test sample of about 500 g with a scoop. Place it in a 1-litre airtight container within 3 min after sampling.

Keep the test samples in a closed container and allow them to equilibrate to the ambient laboratory temperature before removing a test portion to run the test. The preferred test conditions are (23 ± 2) °C and (50 ± 10) % relative humidity. If these conditions are not available, test at ambient conditions and report the temperature and relative humidity.

Before taking a test portion out of the container to run the test, rotate the container three to five times so as to obtain a homogeneous product. Allow the container to sit 5 min before opening the lid and removing the test portion.

6 Procedure

6.1 Make sure the sieves (4.4) are dry. Hold each one up against the light, and check it for damage and cleanliness. Replace any damaged sieves. Remove residual particles using a brush (4.5).

6.2 Weigh, to the nearest 0,01 g, the bottom pan (see 4.3) and each empty sieve and record their mass, m_s.

6.3 Place the sieves in the right order on the shaker (i.e. finest at the bottom and coarsest at the top).

6.4 Weigh, to the nearest 0,1 g, a 100 g test portion of superabsorbent powder test sample into the beaker (4.2), m_1.

6.5 Quantitatively transfer the weighed sample to the top sieve on the sieve tester.

6.6 Place the lid on the sieves and secure them in accordance with the manufacturer's instructions.

6.7 Make sure the equipment has an electrical ground connection to avoid static electricity.

6.8 Set the sieve shaker controls as follows.

— Intensity (70 ± 2) % (settings for the Retsch VE 1000 shaker)

— Amplitude 1,0 mm

— Shaking time 10 min

6.9 Start the shaker. After a 10-min period of shaking, carefully remove and weigh, to the nearest 0,01 g, each sieve and the bottom pan, m_2.

7 Calculation

Calculate the percentage of each fraction, w, as follows:

$$w = \frac{m_2 - m_s}{m_1} \times 100$$

where

m_2 is the mass, expressed in grams, of the sieve plus retained fraction of absorbent polymer (6.9);

m_s is the mass, expressed in grams, of the empty sieve (6.2);

m_1 is the mass, expressed in grams, of the sample (6.4).

8 Precision

The data for the repeatability and reproducibility limits of this method are the result of interlaboratory tests carried out in 1997 by EDANA and are given in annex A.

The absolute difference between two single test results obtained under repeatability test conditions in accordance with ISO 5725-2 shall not exceed the repeatability limit r in more than 5 % of cases:

r = 0,09 %

The absolute difference between two single test results obtained under reproducibility test conditions in accordance with ISO 5725-2 shall not exceed the reproducibility limit R in more than 5 % of cases:

R = 0,20 %

If the repeatability and reproducibility test criteria are not met, the test shall be repeated twice, each in duplicate, after ensuring that the original sample is thoroughly mixed. If these criteria are still not met, report the results as unusual, then diagnose the source of error, for example by verifying correct operation of the instruments and testing a portion of a material with a known value.

9 Test report

The test report shall include the following information:

a) the name and address of the testing institution;

b) the type of polymer-based absorbent materials, including all technical details and source information required for the complete identification of the sample;

c) a reference to this part of ISO 17190, i.e. ISO 17190-3;

d) the sieve shaker model;

e) the results for each particle size fraction remaining on the sieves and the bottom pan of each test portion, expressed as a mass fraction in percent of the weighed material to the nearest 0,1 %, and the average for duplicate determinations;

f) any unusual features noted during the determination or if the reproducibility and/or repeatability criteria were not met (see clause 8);

g) any deviations from the procedure or any procedures regarded as optional.