SLOVENSKI STANDARD
SIST EN 14806:2005

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Embalaža – Predhodno vrednotenje razkroja embalažnih materialov v simuliranih pogojih kompostiranja z laboratorijskim sejalnim preskusom

Packaging - Preliminary evaluation of the disintegration of packaging materials under simulated composting conditions in a laboratory scale test

Verpackung - Vorbeurteilung des Auflösens von Verpackungsmaterial unter simulierten Kompostierungsbedingungen im Labormaßstab

Emballage - Evaluation préliminaire de la désintégration des matériaux d'emballage dans des conditions simulées de compostage dans le cadre d'un essai a l'échelle du laboratoire

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13.030.99	Drugi standardi v zvezi z odpadki	Other standards related to wastes
55.040	Materiali in pripomoļ ki za pakiranje	Packaging materials and accessories

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English Version

Packaging - Preliminary evaluation of the disintegration of packaging materials under simulated composting conditions in a laboratory scale test

Emballage - Evaluation préliminaire de la désintégration des matériaux d'emballage dans des conditions simulées de compostage dans le cadre d'un essai à l'échelle du laboratoire

Verpackung - Vorbeurteilung des Auflösens von Verpackungsmaterial unter simulierten Kompostierungsbedingungen im Labormaßstab

This European Standard was approved by CEN on 13 June 2005.

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Foreword

This European Standard (EN 14806:2005) has been prepared by Technical Committee CEN/TC 261 “Packaging”, the secretariat of which is held by AFNOR.

This European Standard shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by January 2006, and conflicting national standards shall be withdrawn at the latest by January 2006.

According to the CEN/CENELEC Internal Regulations, the national standards organizations of the following countries are bound to implement this European Standard: Austria, Belgium, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Slovakia, Slovenia, Spain, Sweden, Switzerland and United Kingdom.

Introduction

The method does not require special bioreactors and it is well suited to be run at laboratory scale in any general purpose laboratory. It requires the use of a standard, homogeneous synthetic waste. The synthetic waste components are dry, clean, safe products which can be stored in the laboratory without any problem neither of smell nor of health. The synthetic waste is of constant composition and devoid of any undesired packaging material, which could be erroneously identified as test material at the end of testing, altering the final evaluation. The bioreactors are small, the amount of synthetic waste to be composted is also very small (about 3 L) and, likewise, the amount of test material's specimens is very limited, with an overall simplification of the test procedures. The test method is not aimed at determining the biodegradability of packaging materials under composting conditions and does not cover environmental safety and ecotoxicity issues. Further testing is necessary for claiming compostability.

1 Scope

This laboratory scale test method using synthetic waste aims at simulating the environmental conditions found in industrial composting plants. Packaging materials exposed to this environment can be preliminary assessed for disintegrability. A negative result does not necessarily mean that the test material is not disintegrating under industrial composting conditions. This test does not replace the acceptance disintegration test as specified in EN 14045, in accordance with EN 13432.

2 Normative references

The following referenced documents are indispensable for the application of this European Standard. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

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

EN 13193:2000, *Packaging — Packaging and the environment — Terminology*.

3 Terms and definitions

For the purposes of this European Standard, the terms and definitions given in EN 13193:2000 and the following apply.

3.1
compost
organic soil conditioner obtained by biodegradation of a mixture consisting principally of vegetable residues, occasionally with other organic material and having a limited mineral content

3.2
compostability
potential of a material to be biodegraded in a composting process

3.3
composting
aerobic process designed to produce compost

3.4
disintegration
physical falling apart of a material into very small fragments

3.5
dry mass
mass of a sample measured after drying. It is expressed as a percentage of the mass of the wet sample

3.6
total dry solids
amount of solids obtained by taking a known amount of test material or compost and drying at about 105 °C to constant weight.

3.7
volatile solids
amount of solids obtained by subtracting the residue of a known amount of test material or compost after incineration at about (550 ± 10) °C from the total dry solids content of the same sample

NOTE The volatile-solids content is representative for the amount of organic matter present.

4 Principle

The test method evaluates the degree of disintegration of test materials at laboratory scale under conditions similar to an intensive aerobic composting process. The solid matrix used consists of a synthetic solid waste inoculated with compost derived from a composting plant. Specimens of the test material are co-composted with the synthetic solid waste. The degree of disintegration is determined, after a composting cycle, by sieving the final matrix through a 2 mm sieve in order to recover the not disintegrated residues of test material. The missing mass of the test material is considered as disintegrated and used to calculate the degree of disintegration.

5 Synthetic solid waste

A synthetic waste, whose composition is described in Table 1, is needed in order to perform the test.

Table 1 — Composition of synthetic solid waste

Material	dry mass %
Sawdust	40
rabbit-feed	30
compost	10
starch	10
saccharose	4
cornseed oil	4
urea	2
Total	100

Sawdust of untreated wood shall be used. The sawdust shall be sieved with a 5 mm sieve before application.

NOTE Wood from deciduous trees should preferably be used.

The rabbit-feed shall be a commercial product based on alfalfa (Medicago sativa) and vegetable-meals. If a product with a different composition is used, it shall be mentioned in the test report. The protein content of the rabbit-feed shall be of about 15 % and the cellulose content of about 20 %.

Well aerated compost from a properly operating aerobic composting plant should be used as the inoculum. The compost inoculum should be homogeneous and free from large inert objects such as among others glass, stones or pieces of metal. Remove them manually and then sieve the compost on a screen of about 0,5 cm – 1 cm. It is recommended that compost from a plant composting the organic fraction of solid municipal waste is used in order to ensure sufficient diversity of micro-organisms. If such a compost is not available, compost from plants treating of farmyard waste or mixtures of garden waste and solid municipal solid waste may be used. The compost shall not be older than 4 months.

Synthetic waste is manually prepared by mixing the different components listed in Table 1. The allowed tolerance on the mass measurements of the synthetic waste components, water included, is of 5 %. Water is then added to the mixture to adjust its final water content to about 55 % by weight in total. This operation should be performed before start-up. The synthetic waste shall have a carbon:nitrogen (C/N) ratio preferably comprised between 20-30. The urea concentration can be changed to adjust the C/N value to the prefixed range. In this case the concentration of the other components shall be proportionally adjusted in order to bring the total sum to 100.

6 Composting reactor

The composting reactor is a box made with a suitable inert material which does not affect the composting process, having preferably the following dimensions: 30 cm × 20 cm × 10 cm (l, w, h). In the series the container chosen shall not vary more than 5 % in dimensions. The box shall be provided with a lid assuring a tight closing to avoid an excessive evaporation. Additionally the closing between box and lid may be sealed with an adhesive tape. In the middle of the two 20 cm wide sides, a hole of 5 mm in diameter shall be applied at a height of about 6,5 cm from the bottom. The two holes provide gas exchange between the inner atmosphere and the outside environment.

NOTE Attention should be paid not to cover the holes with the adhesive tape, or in any other way.

Other containers with a volume between 5 L and 20 L may also be used, provided that it is preliminary verified that unfavourable anaerobic conditions are not produced. The container should be closed in a way to avoid excessive drying out of the content. At the same time openings shall be provided in order to enable gas exchange and ensure aerobic conditions throughout the composting phase.

7 Procedure

7.1 Sample preparation

The test material shall be cut in order to get specimens with the fixed dimensions defined in Table 2, based on the test material's thickness.

The mass of the specimens is determined in material dried to constant mass. The drying technique used at this stage shall also be used at the end of the test for assessing the final mass of specimens (see 10.2).

Table 2 — Dimension of the specimens to be used in the disintegration test

Thickness of the test material mm	Dimension of specimens mm
≤ 5	25 × 25 × original thickness
> 5	15 × 15 × thickness ≤ 15

7.2 Start-up of the test

At least two reactors are prepared for each test material. The specimen of the test materials are mixed with 1 Kg of wet synthetic waste. The mass of the specimens shall comprise between 5 g and 20 g per reactor, according to the volume occupied by the specimens. The ratio between the specimen mass and the wet synthetic waste mass shall be, therefore, in the range 0,5 % – 2 %. The mass of the specimens effectively added to each reactor is recorded. The mixture is spread on the bottom of the reactor forming a homogeneous layer. The mixture should not be pressed, to support the gas exchange also with the inner parts of the bed.

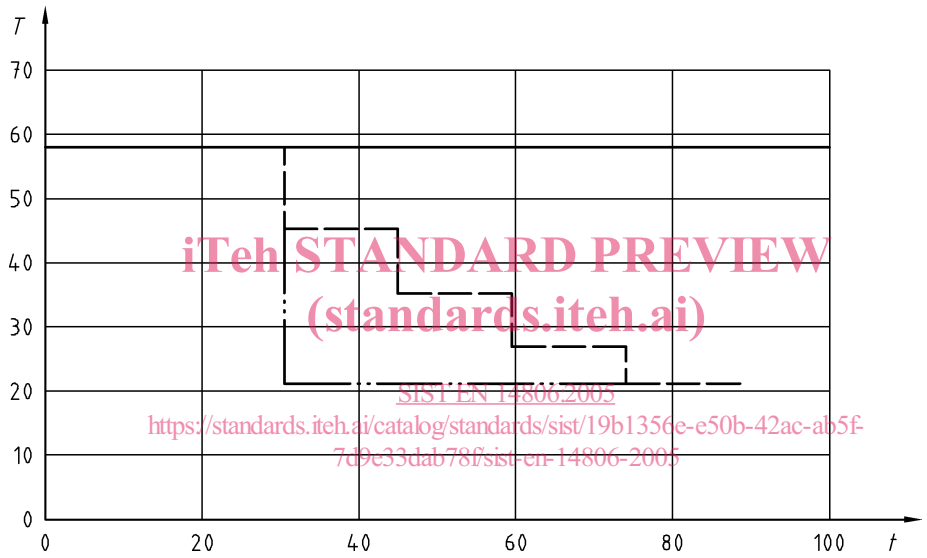
NOTE It could be useful to run in parallel a blank reactor, with no test material, as a means of controlling the evolution of the composting reaction.

7.3 Temperature profile

Each reactor is closed, weighed, and placed into an oven with air circulation maintained at a constant temperature of (58 ± 2) °C. Optionally, after 30 days the temperature can be lowered. The range of temperature allowed is between room temperature (21 °C) and 58 °C. The maximum test duration is 90 days. The diagram in Figure 1 shows possible temperature profiles, as an example. After 28 days 25 g of fertile soil or compost may be added to each reactor as a re-inoculation. After soil addition, the content is gently mixed. The nature of soil or compost shall be indicated in the final report.

NOTE It is known that a higher microbial activity towards ligno-cellulose is reached at temperatures between (35 - 40) °C. Therefore, when testing ligno-cellulosic materials it is suggested to shift the test temperature to these values after the first month until the end of the test.

The temperature of the air-circulation oven shall be recorded for the whole test period. Alternatively, a thermometer with the indication of the maximum and minimum temperature can be used. Temperature shall be controlled periodically. The test may be interrupted after 45 days.



Key

T Temperature °C

t Time (days)

Profile A

Profile B

Profile C

Figure 1

The test temperature is 58°C (profile A). Optionally, after 1 month, temperature may be decreased to lower values, in the range between 21 °C -58 °C. Profile B shows the sharpest temperature decrease allowed and profile C is an example of a temperature profile varying stepwise within the allowed range.

7.4 Moisture control

In order to perform a proper composting process, the moisture shall be controlled periodically. The optimal amount of water is obtained when the matter under composting is wet but it is not present as free water, i.e. it has not reached the saturation of the water absorbing capability.

NOTE The operator can control this condition by squeezing the composting matter, which should exude a small amount of water.

7.5 Mixing

The composting matter shall be mixed periodically. Aeration and mixing is not only important to distribute water after addition (see 7.4) but also to aerate the composting matter.

A procedure to aerate the composting matter and maintain sufficient water content is suggested in Table 3. The gross mass of the reactor filled with the mixture is determined in the beginning of the composting process. Periodically the reactor is weighed and, if needed, the initial mass restored, totally or in part, adding water according to the directions of Table 3.

8 Monitoring the composting process

8.1 Odour

During the composting process it is possible to detect a precise succession of specific odours. Within the first two-three days the synthetic waste has an acidic smell, which gradually declines to shift into an ammonia smell, starting from day 5 – day 10 and lasting about 10 days. Then, no particular odours or an earth-like one is detected. Record in the test report any possible variation from this scheme.

8.2 pH

A sequence can be also easily followed by checking the pH of the composting matter by using pH universal indicator papers. Strips of pH indicator are moistened with some compost. The pH shall shift from initial acidic values (about 6) to basic ones (about 8 to 9) during the first 10 days - 15 days to become neutral-basic (about 7 to 8) at the end of the test. Record in the test report any possible variation from this scheme.

8.3 Visual inspection

The visual appearance of the composting matter changes during the first two weeks. Mycelia growing on the composting matter can be visible during the first week. The colour of the synthetic waste which is initially light -yellow- because of the high sawdust concentration, turns into brown within 10 days. Record in the test report any possible variation from this scheme.