



**NATIONAL STANDARD OF THE
PEOPLE'S REPUBLIC OF CHINA**

GB/T 24128-2018

**Plastics -- Assessment of the effectiveness of fungistatic
compounds in plastics formulations**

Issued on: December 28, 2018

Implemented on: November 1, 2019

Issued by: SAMR; SAC

Table of Contents

Foreword	3
Introduction	5
1 Scope	6
2 Normative References	6
3 Terms and Definitions	7
4 Principle	7
5 Instruments and Materials	7
6 Test Sample	11
7 Preparation of Specimen	11
8 Test Procedures	12
9 Assessment of Fungi Growth	13
10 Description of Results	14
11 Precision and Bias	14
12 Test Report	14
Bibliography	16

1 Scope

This Standard specifies a test method for determining the antifungal effectiveness of fungistat used in plastic formulations to protect susceptible ingredients such as plasticizers and stabilizers.

This method can verify whether a certain plastic product can effectively prevent the erosion of fungi.

The antifungal effect is evaluated by visual inspection.

This Standard applies to films or sheets made of plastics up to 10mm thick. In addition, porous materials such as foamed plastics can also be tested by using this method when made into the above forms.

The fungistat must have certain dissolution properties in the matrix.

Different from ISO 846, this Standard does not spray fungi spore suspension on the surface of the sample, but covers a layer of spore-containing agar. This shall better disperse the spores and provide the moisture necessary for spore germination on plastic surface that is normally hydrophobic.

2 Normative References

The following documents are essential to the application of this document. For the dated documents, only the versions with the dates indicated are applicable to this document; for the undated documents, only the latest version (including all the amendments) is applicable to this document.

ISO 291:2008 Plastics - Standard Atmospheres for Condition and Testing

3 Terms and Definitions

For the purposes of this Document, the following terms and definitions apply.

3.1 Plastic susceptible to fungal attack

Plastic that contains in its formulation one or more nutrients that support fungal growth.

3.2 Fungistat

Compound that prevents fungal growth on a material that is normally susceptible to fungal attack.

4 Principle

Expose the surface of the specimen to the fungi spore suspension; and disperse the spores in a thin layer of agar medium without adding carbon source on the surface of the test sample, which can ensure uniform dispersion of the spores and appropriate water supply.

Plastics without adding fungistat shall lead to the germination and initial growth of fungi spores.

When there are components that are easily attacked by fungi in the plastic and no effective fungistat is added in the formulation, fungi spores shall further grow on and around the surface of the specimen and produces spores.

Plastics containing fungistat shall inhibit spore germination and initial growth on and around the specimen surface. The fungistat can dissolve into the agar surrounding the specimen, resulting in a larger bacteriostatic ring that inhibits spore germination and growth.

Although the bacteriostatic ring is not used as the evaluation index of the test results, it can still show the antibacterial effect of the fungistat.

5.1 Instruments

Sterilize all glassware and other instruments that come into contact with media and/or reagents (except sterile instruments) by one of the following methods:

Method A: use an autoclave (see 5.1.2), sterilize at 121°C for at least 15min;

Method B: use a dry heat sterilizer (see 5.1.2), sterilize at 180°C for at least 30min, sterilize at 170°C for at least 1h, or sterilize at 160°C for at least 2h;

Method C: use a membrane filtration system with a pore size of 0.45µm.

5.1.1 Incubator, the temperature can be maintained at 24 degrees C $\pm$ 1 degrees C, and the relative humidity can

be maintained at 85% or above.

5.1.2.2 For dry heat sterilization, the thermal oven shall maintain a temperature specified in

Method B.

5.1.2.3 Membrane filtration sterilization, a membrane filtration device with the pore size

specified in Method C.

5.1.11 Standard pipettes, with standard volume of 1.0mL and 15.0mL, calibrated automatic

pipettes.

5.2 Medium and reagents

All reagents shall be analytically pure and/or suitable for use in microbiological assays.

5.2.1 Water

The used water shall be distilled or deionized water with a conductivity of less than 1µS/cm.

5.2.2 Malt extract agar (MEA)

Malt extract: 30.0g;

Soy peptone: 3.0g;

5.3.1.3 *Paecilomyces varioti*: CGMCC3.4253 or CBS628.66;

5.3.1.4 *Penicillium funiculosum*: CGMCC3.3875 or ATCC9644;

5.3.1.5 *Trichoderma longibrachiatum*: CGMCC3.4291 or ATCC13631.

Other test fungus (such as *Aspergillus terreus*, *Aureobasidium pullulans*) can be added

according to product use and needs, and all used strains shall be listed in the test report.

NOTE: CGMCC is the China General Microbiological Culture Collection Center; ATCC is the American Type Culture Collection; and CBS is the Centraalbureau voor Schimmecultures.

5.3.2 Culture conditions

In 5.3.1.1 and 5.3.1.3 to 5.3.1.5, the strain shall be cultured on the slant of malt extract agar (5.2.2) in a test tube; and culture at 24 degrees C $\pm$ 1 degrees C for 14 days ~ 21 days.

In 5.3.1.2, the strain shall be cultured on Chaetomium globosum agar (5.2.3) medium; and culture at 24 degrees C $\pm$ 1 degrees C for 14 days ~ 21 days.

Cultures for storage shall be kept on agar slants, preferably lyophilized or cryopreserved.

6.1 Shape and size

Sterilize the slicer that meets the requirements; and cut out a circular piece with a diameter of 1cm ~ 4cm or a square piece with a side length of 1cm ~ 4cm from each test sample as required.

The thickness of the specimen shall not exceed 10mm.

6.2 Number of specimens

At least 3 specimens are prepared for each test sample for test evaluation.

7.1 Cleaning

Hold the test sample with tweezers; wash it repeatedly (with a brush if necessary) and store it in a clean container and dry it naturally. Use tweezers for all subsequent processing to avoid sample contamination.

7.2 Labeling and storage

Labels or markers may interact with the plastic during testing; so store samples separately in airtight containers (such as culture dishes) at room temperature; label the container rather than the sample.

8.1 Test temperature

Prepare and adjust the state of the sample according to the Class-2 atmospheric conditions [temperature 23 degrees C $\pm$ 2 degrees C and relative humidity (50 $\pm$ 10) %] in ISO 291:2008.