

ICS 61.060



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

GB/T 26713-2025

**Footwear - Chemical tests - Determination of dimethyl fumarate
(DMFu)**

鞋类 化学试验方法 富马酸二甲酯(DMFu)的测定
(English Translation)

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Foreword

This document was drafted in accordance with the rules provided in GB/T 1.1-2020 Directives

for Standardization - Part 1.Rules for the Structure and Drafting of Standardizing Documents.

This document serves as a replacement for GB/T 26713-2011 Footwear - Chemical Tests - Determination of Dimethyl Fumarate (DMF). In comparison with GB/T 26713-2011, apart from structural adjustments and editorial modifications, the main technical changes are as follows.

- a) The "Principle" is modified (see Chapter 4; Chapter 3 of Version 2011);
- b) The "Reagents and Materials" is modified (see Chapter 5; Chapter 4 of Version 2011);
- c) The "Instruments and Equipment" is modified (see Chapter 6; Chapter 5 of Version 2011);
- d) The sampling requirements are modified (see Chapter 7; 6.1 of Version 2011);
- e) The test steps are modified (see Chapter 8; Chapter 6 of Version 2011);
- f) The blank test is deleted (see Chapter 7 of Version 2011);

g) The determination of recovery rate, result expression, lower limit of detection and precision are deleted (see Chapter 9, Chapter 10, Chapter 11 and Chapter 12 of Version 2011);

h) The "Test Report" is added (see Chapter 10).

This document modifies and adopts ISO 16186.2021 Footwear - Critical Substances Potentially Present in Footwear and Footwear Components - Determination of Dimethyl Fumarate (DMFU).

In comparison with ISO 16186.2021, this document makes the following structural adjustments.

---5.1 is added, 5.2 ~ 5.7 correspond to 5.1 ~ 5.6 of ISO 16186.2021;

---6.1 is added, 6.2 ~ 6.11 correspond to 6.1 ~ 6.10 of ISO 16186.2021;

---Appendix A, Appendix B and Appendix C respectively correspond to Appendix C, Appendix A and Appendix B of ISO 16186.2021.

The technical differences between this document and ISO 16186.2021, and the causes for the differences are as follows.

---The target object-stock solution preparation method is modified (see 5.7.3 and 5.7.4), and the dimethyl fumarate-working solution preparation method is added (see 5.7.5) to increase the operability;

Footwear - Chemical Tests - Determination of Dimethyl Fumarate (DMFu)

WARNING---the use of this document may involve hazardous materials, operations, and equipment. This document does not address all safety or environmental issues associated with its use. Before applying this document, it is the responsibility of the user of this document to take appropriate measures to ensure the safety and health of personnel and the environment and to determine the applicability of regulatory limitations.

1 Scope

This document describes the method for the determination of dimethyl fumarate (DMFu) content by gas chromatography-mass spectrometry (GC-MS) or gas

chromatography-tandem

mass spectrometry (GC-MS/MS).

This document is applicable to all types of footwear and footwear components except metal components.

2 Normative References

The contents of the following documents constitute indispensable clauses of this document through the normative references in the text. In terms of references with a specified date, only

versions with a specified date are applicable to this document. In terms of references without a

specified date, the latest version (including all the modifications) is applicable to this document.

GB/T 12810 Laboratory Glassware - Capacity Methods Testing and Use of Volumetric Instruments (GB/T 12810-2021, ISO 4787.2010, NEQ)

3 Terms and Definitions

This document does not have terms and definitions that need to be defined.

4 Principle

In an ultrasonic water bath at 60 °C, use acetone (see solvent precautions in Appendix A) to

extract the sample. In this step, two different procedures can be used, depending on the material

being tested.

a) The "standard steps" without purification and concentration of the extract can be used for samples with simple matrix effects, such as textiles, synthetic leather and artificial leather;

7 Sampling

The specimen is a single material type (made of textiles, leather, polymers or other organic materials) and is separately tested.

Cut the homogeneous material sample into pieces with a side length of 3 mm ~ 5 mm.

NOTE 1: considering the detection limit and quantification limit, a maximum of 3 specimens (of equal mass) of the same type of material can be simultaneously tested.

NOTE 2: desiccant may be the source of DMFu contamination in shoes. Desiccant samples are directly sampled and tested.

8.1 Standard Steps

Weigh-take (1.0 ± 0.1) g of sample into a glass bottle (6.3), record the mass to an accuracy of 1

mg, add 0.1 mL of internal standard - working solution (5.7.2) and 9.9 mL of acetone (5.2) solution, and seal it. At (60 ± 5) °C, extract in an ultrasonic water bath (6.4) for (60 ± 5) min.

WARNING---since there may be pressure in the bottle, before cooling, DO NOT open the glass bottle.

After cooling to below 27 °C, pour out the solution and, if necessary, use a nitrogen blower (6.11) to gently concentrate it to 1.0 mL.

Filter the solution with a polytetrafluoroethylene membrane filter (6.5).

Transfer the extract to a GC sample bottle (6.6) and seal it with a cap.

8.2.1 Extraction

Weigh-take (1.0 ± 0.1) g of sample into a glass bottle (6.3), record the mass to an accuracy of 1

mg, add 0.1 mL of internal standard - working solution (5.7.2) and 9.9 mL of acetone (5.2) solution, and seal it. At (60 ± 5) °C, extract in an ultrasonic water bath (6.4) for (60 ± 5) min.

8.2.2 Purification

After cooling to below 27 °C, transfer 5 mL of the extract to a conical tube and use a nitrogen

blower (6.11) to gently concentrate it to about 0.2 mL.

Add n-hexane (5.3) to the concentrate to 1 mL.

Through the following procedures, purify the extract on an activated magnesium silicate solid

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