

ISO/TC 61/SC 9

Secretariat: KATS

Voting begins on:
2023-08-24

Voting terminates on:
2023-10-19

Plastics — Determination of residual styrene monomer in polystyrene (PS) and impact-resistant polystyrene (PS-I) by gas chromatography

Plastiques — Détermination du styrène monomère résiduel dans le polystyrène (PS) et le polystyrène résistant au choc (PS-I) par chromatographie en phase gazeuse

[iteh standards
\(https://standards.iteh.ai\)](https://standards.iteh.ai)
Document Preview

[ISO 2561](#)

<https://standards.iteh.ai/catalog/standards/sist/caf247cc-9def-48b4-9e63-c366ad5d651b/iso-2561>

RECIPIENTS OF THIS DRAFT ARE INVITED TO SUBMIT, WITH THEIR COMMENTS, NOTIFICATION OF ANY RELEVANT PATENT RIGHTS OF WHICH THEY ARE AWARE AND TO PROVIDE SUPPORTING DOCUMENTATION.

IN ADDITION TO THEIR EVALUATION AS BEING ACCEPTABLE FOR INDUSTRIAL, TECHNOLOGICAL, COMMERCIAL AND USER PURPOSES, DRAFT INTERNATIONAL STANDARDS MAY ON OCCASION HAVE TO BE CONSIDERED IN THE LIGHT OF THEIR POTENTIAL TO BECOME STANDARDS TO WHICH REFERENCE MAY BE MADE IN NATIONAL REGULATIONS.



Reference number
ISO/FDIS 2561:2023(E)

iTeh Standards
(<https://standards.iteh.ai>)
Document Preview

ISO 2561

<https://standards.iteh.ai/catalog/standards/sist/caf247cc-9def-48b4-9e63-c366ad5d651b/iso-2561>



COPYRIGHT PROTECTED DOCUMENT

© ISO 2023

All rights reserved. Unless otherwise specified, or required in the context of its implementation, no part of this publication may be reproduced or utilized otherwise in any form or by any means, electronic or mechanical, including photocopying, or posting on the internet or an intranet, without prior written permission. Permission can be requested from either ISO at the address below or ISO's member body in the country of the requester.

ISO copyright office
CP 401 • Ch. de Blandonnet 8
CH-1214 Vernier, Geneva
Phone: +41 22 749 01 11
Email: copyright@iso.org
Website: www.iso.org

Published in Switzerland

Contents

	Page
Foreword	iv
1 Scope	1
2 Normative references	1
3 Terms and definitions	1
4 Principle	1
5 Reagents and materials	1
5.1 Internal standard.....	2
5.2 Solvent.....	2
5.3 Precipitator.....	2
5.4 Aromatic hydrocarbons.....	2
5.5 Carrier gases and fuel gases for gas chromatograph.....	2
6 Apparatus	2
6.1 General.....	2
6.2 Gas chromatograph.....	2
6.3 Data processor.....	3
6.4 Sample injection syringe.....	3
6.5 Analytical balance.....	3
6.6 Volumetric flasks.....	3
6.7 Headspace Vials.....	3
7 Preparation of sample	3
8 Procedure	3
8.1 General.....	3
8.2 Preparation of internal-standard solution.....	3
8.3 Preparation of sample solution for sample introducing option A.....	3
8.4 Preparation of sample solution for sample introducing option B.....	3
8.5 Preparation of sample solution for sample introducing option C.....	4
8.6 Preparation of calibration solutions.....	4
8.6.1 General.....	4
8.6.2 Calibration solutions for sample introducing option A.....	4
8.6.3 Calibration solutions for sample introducing option B.....	4
8.6.4 Calibration solution for sample introducing option C.....	4
8.7 Gas-chromatographic procedure.....	5
8.7.1 Gas-chromatograph operating conditions.....	5
8.7.2 Recording the gas chromatograms of sample solutions and calibration solutions.....	6
8.7.3 Evaluation of the gas-chromatographic peaks.....	6
9 Expression of results	7
9.1 Calculation of results from a calibration graph.....	7
9.2 Acceptability of results and measurement sensitivity.....	8
10 Test report	8
Annex A (informative) Examples of typical test conditions	9
Annex B (informative) Correlation between mass of aromatic hydrocarbon in calibration solution and concentration of aromatic hydrocarbon in sample solution for typical calibration solutions	13

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.

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).

ISO draws attention to the possibility that the implementation of this document may involve the use of (a) patent(s). ISO takes no position concerning the evidence, validity or applicability of any claimed patent rights in respect thereof. As of the date of publication of this document, ISO had not received notice of (a) patent(s) which may be required to implement this document. However, implementers are cautioned that this may not represent the latest information, which may be obtained from the patent database available at www.iso.org/patents. ISO shall not be held responsible for identifying any or all such patent rights.

Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

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 61, *Plastics*, Subcommittee SC 9, *Thermoplastic materials*.

This fourth edition cancels and replaces the third edition (ISO 2561:2012), which has been technically revised.

The main changes-are as follows:

- adding headspace injection as another sample introducing option for gas chromatography.

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.

Plastics — Determination of residual styrene monomer in polystyrene (PS) and impact-resistant polystyrene (PS-I) by gas chromatography

1 Scope

This document specifies a method for the determination of the residual styrene monomer in polystyrene (PS) and impact-resistant polystyrene (PS-I) by gas chromatography. It can also be used for the simultaneous determination of other volatile aromatic hydrocarbons in PS and PS-I.

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 472, *Plastics — Vocabulary*

ISO 1042, *Laboratory glassware — One-mark volumetric flasks*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 472 apply.

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 <https://www.electropedia.org/>

4 Principle

PS or PS-I sample is dissolved in solvent containing an internal standard. To obtain separation of styrene and other volatile materials, gas chromatography method is employed, in which three sample introducing options are available:

- Option A: a small volume of the polymer solution is injected directly into a gas chromatograph.
- Option B: a small volume of the supernatant solution remaining after precipitation of polymer by addition of a precipitator is injected into a gas chromatograph.
- Option C: a small volume of vapor of the polymer solution under thermal equilibrium is injected into a gas chromatograph.

5 Reagents and materials

Use only reagents of recognized analytical grade, unless otherwise specified.

5.1 Internal standard

The internal standard shall be selected based on consideration of the retention times of the materials contained in the polymer sample and solvent. Recommended candidates are n-butylbenzene, cyclopentanol, 1,2,4-trimethylbenzene and 1,4-diethylbenzene of sufficient purity for analytical use.

5.2 Solvent

Use dimethylformamide, butanone, dichloromethane, or tetrahydrofuran. Tetrahydrofuran is used only for method A. Only dimethylformamide is used in method C.

5.3 Precipitator

Use 2,2,4-trimethylpentane or ethanol.

5.4 Aromatic hydrocarbons

Use styrene and other aromatic hydrocarbons such as ethylbenzene, cumene or α -methylstyrene, if required. Styrene shall be checked for self-polymerization before use. The criterion for acceptance is that the mixture of styrene and ethanol of the same volume shall be clear. When determining the content of other aromatic hydrocarbons in the sample, other aromatic hydrocarbons such as ethylbenzene, cumene or α -methylstyrene shall be used.

5.5 Carrier gases and fuel gases for gas chromatograph

Hydrogen, helium or nitrogen, according to the type of detector used, shall be used as carrier gas. Use hydrogen and air as fuel gases. If detectors are used which require carrier gases and fuel gases other than those mentioned, the carrier gases and fuel gases shall be specified.

WARNING — Strict observance of safety regulations is essential when using hydrogen.

6 Apparatus

ISO 2561

<https://standards.iteh.ai/catalog/standards/sist/caf247cc-9def-48b4-9e63-c366ad5d651b/iso-2561>

6.1 General

Normal laboratory equipment and the following apparatus are required. Typical operating conditions are described in [Annex A](#).

6.2 Gas chromatograph

6.2.1 Injection port. Use an injection port for liquid samples or gas samples. When using a capillary column, an injection port with splitter may be applicable.

6.2.2 Headspace sampler. only used in method C, including backflush capability, thermostated sample tray, and associated accessories fulfil these requirements while providing for automatic sequential sampling of headspace vapors.

6.2.3 Column. The column diameter and length, as well as the packing material and stationary phase shall be selected based on consideration of column resolution and calibration curve linearity. Both packed columns and capillary columns are acceptable. Capillary columns are recommended in the light of accuracy.

6.2.4 Detector. Use a suitable detector.

NOTE The most commonly used detector is a hydrogen flame ionization detector (FID).