



International
Standard

ISO 21257

**Plastics — Polymer polyols for use
in the production of polyurethanes
— Determination of the residual
acrylonitrile and styrene monomer
content by gas chromatography**

*Plastiques — Polyols polymères pour la production de
polyuréthanes — Détermination de la teneur résiduelle en
monomères d'acrylonitrile et de styrène par chromatographie en
phase gazeuse*

**Second edition
2024-10**

Reference number
ISO 21257:2024(en)

Full document details: ISO 21257-2024

© ISO 2024  **Documents**
Document Sharing Hub



COPYRIGHT PROTECTED DOCUMENT

© ISO 2024

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
Introduction	v
1 Scope	1
2 Normative references	1
3 Terms and definitions	1
4 Principle	1
5 Reagents and materials	1
6 Apparatus	2
7 Preparation of calibration solution and sample solution	3
7.1 General	3
7.2 Method A for using OT column	3
7.2.1 Preparation of internal standard solution	3
7.2.2 Preparation of calibration solutions	3
7.2.3 Preparation of sample solution	3
7.3 Method B for using packed column	3
7.3.1 Preparation of internal standard solution	3
7.3.2 Preparation of calibration solutions	4
7.3.3 Preparation of sample solution	4
8 Procedure	4
8.1 Gas chromatographic procedure	4
8.2 Measurement of sample solutions and calibration solutions	5
8.3 Evaluation of gas chromatographic peak	5
9 Expression of the results	6
9.1 Preparation of the calibration curve	6
9.2 Calculation of results from a calibration graph	7
9.3 Calculation of results from a single-point calibration	8
9.4 Acceptability of results and measurement sensitivity	8
10 Precision	8
11 Test report	9
Annex A (informative) Typical analytical conditions	10
Annex B (informative) Typical examples of GC chromatogram	12
Annex C (informative) Precision	14
Bibliography	15

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 document 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 12, *Thermosetting materials*.

This second edition cancels and replaces the first edition (ISO 21257:2018), of which it constitutes a minor revision. The changes are as follows:

- the title has been changed to plural form to read: "Plastics — Polymer polyols for use in the production of polyurethanes — Determination of the residual acrylonitrile and styrene monomer content by gas chromatography";
- in [7.2.1](#), [7.2.2](#), [7.2.3](#), [7.3.1](#), [7.3.2](#) and [7.3.3](#), "to the nearest 1 mg" have been changed to "to the nearest 0,1 mg";
- in [8.3 Table 4](#), the table title has been changed to "[Table 4](#) — Typical retention times of acrylonitrile, styrene, internal standard and solvent with typical operating conditions in [Annex A](#)".

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.

Introduction

Polymer polyols are defined as very fine and stable dispersions of solid, vinylic polymers (for example, acrylonitrile/styrene copolymers are typical) in liquid polyether polyols.

Polymer polyol is used to improve the physical properties of seat cushions, especially hardness. Because the toxicity of acrylonitrile and styrene is high, it is important to establish an analytical method to determine residual amounts of these reactants.

The importance of residual toxicity has increased with the use of polyurethane foam, etc. which comes in contact with food and skin. This document is intended to help manufacturers evaluate the safety of their products.

Plastics — Polymer polyols for use in the production of polyurethanes — Determination of the residual acrylonitrile and styrene monomer content by gas chromatography

1 Scope

This document specifies a method for the determination of the residual acrylonitrile monomer and styrene monomer in polymer polyols by gas chromatography.

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 648, *Laboratory glassware — Single-volume pipettes*

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 terminology 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

The polymer polyol sample is dissolved in a suitable solvent. This sample solution is then analysed using gas chromatography with internal standardization. The amounts of residual acrylonitrile monomer and styrene monomer are determined from peak areas using a previously established calibration curve.

NOTE Because of the high molecular weight of substances which are part of the polymer polyol, and because these are injected directly into the chromatograph, injector contamination can occur which leads to erroneous results.

Monitor the condition of the chromatographic parts and clean or replace as necessary.

An injector liner packed with glass wool has been used to improve vaporization and ease of cleaning.

5 Reagents and materials

5.1 Solvent, use analytical-grade methanol, N, N-dimethylformamide, tetrahydrofuran, dipropylene glycol monomethyl ether or toluene.

Other solvents can also be used if suitable results are obtained for the retention time, thermal stability and separation performance.