



International  
Standard

**ISO 7270-2**

**Rubber — Analysis by pyrolytic gas-  
chromatographic methods —**

Part 2:

**Determination of styrene/  
butadiene/isoprene ratio**

*Caoutchouc — Méthodes d'analyse par pyrolyse et  
chromatographie en phase gazeuse —*

*Partie 2: Détermination du rapport styrène/butadiène/isoprène*

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## 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](http://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 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](http://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](http://www.iso.org/iso/foreword.html).

This document was prepared by Technical Committee ISO/TC 45, *Rubber and rubber products*, Subcommittee SC 2, *Testing and analysis*.

This third edition cancels and replaces the second edition (ISO 7270-2:2012), of which it constitutes a minor revision.

The main changes are as follows:

- the Normative references have been updated;
- the CAS numbers of the chemicals have been added.

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](http://www.iso.org/members.html).

# Rubber — Analysis by pyrolytic gas-chromatographic methods —

## Part 2:

## Determination of styrene/butadiene/isoprene ratio

**WARNING 1** — Persons using this document should be familiar with normal laboratory practice. This document does not purport to address all of the safety problems, if any, associated with its use. It is the responsibility of the user to establish appropriate safety and health practices and to determine the applicability of any other restrictions.

**WARNING 2** — Certain procedures specified in this document can involve the use or generation of substances, or the generation of waste, that could constitute a local environmental hazard. Reference should be made to appropriate documentation on safe handling and disposal after use.

### 1 Scope

This document specifies a pyrolytic gas-chromatographic method for the determination of the styrene/butadiene/isoprene ratio in copolymers, or blends of homopolymers and/or copolymers, in raw rubbers or in unvulcanized or vulcanized compounds. It is applicable to copolymers/terpolymers consisting of styrene, butadiene and isoprene, and blends of these polymers.

NOTE 1 The use of this document pre-supposes sufficient working knowledge of the principles and techniques of gas chromatography for the analyst to perform the operations described and interpret the results correctly.

NOTE 2 The styrene/butadiene/isoprene ratio determined by this test method is affected by the presence of resin and by a high level of sulfur.

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### 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 1407:2023, *Rubber — Determination of solvent extract*

### 3 Terms and definitions

No terms and definitions are listed in this document.

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

Calibration curves are first prepared by pyrolysing samples with known styrene/butadiene/isoprene ratios and analysing the pyrolysis products by gas chromatography to determine the percentage content of each

component [styrene (CAS Registry Number<sup>®1)</sup> 100-42-5), butadiene (CAS 106-99-0) and isoprene (CAS 78-79-5)], relative to the total of the three components.

Samples of unknown composition are then pyrolysed, and the pyrolysis products are analysed under the same conditions. The styrene/butadiene/isoprene ratio in these samples is determined from the calibration curves.

## 5 Reagents

All reagents shall be of analytical grade.

### 5.1 Solvents for extraction purposes.

The following solvents are suitable:

- acetone (CAS 67-64-1);
- methanol (CAS 67-56-1);
- methylethylketone (CAS 78-93-3).

### 5.2 Carrier gas:

- nitrogen (CAS 7727-37-9);
- or
- helium (CAS 7440-59-7).

**5.3 Gas for flame-ionization detector:** hydrogen (CAS 1333-74-0) plus purified compressed air (CAS 132259-10-0).

## 6 Apparatus

### 6.1 Extraction apparatus

As specified in ISO 1407.

### 6.2 Pyrolysis/gas chromatography system

#### 6.2.1 General

The apparatus utilized to obtain pyrograms consists of four parts: the pyrolysis device, the gas chromatograph, the gas-chromatographic column and the data-handling equipment.

#### 6.2.2 Pyrolysis device

The following types of pyrolysis device are suitable:

- micro-furnace pyrolyser;
- Curie-point pyrolyser;
- platinum-filament pyrolyser.

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1) CAS Registry Number<sup>®</sup> is a trademark of the American Chemical Society (ACS). This information is given for the convenience of users of this document and does not constitute an endorsement by ISO of the product named. Equivalent products may be used if they can be shown to lead to the same results.