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Rubber — Determination of crystallization effects by hardness measurements

Caoutchouc — Détermination des effets de la cristallisation au moyen de mesurages de dureté

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Foreword

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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).

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights. Details of any patent rights identified during the development of the document will be in the Introduction and/or on the ISO list of patent declarations received (see www.iso.org/patents).

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 45, *Rubber and rubber products,* Subcommittee SC 2, *Testing and analysis.*

This fourth edition cancels and replaces the third edition (ISO 3387:2012), which has been technically revised.

The main changes compared to the previous edition are as follows.

— The normative references have been updated in Clause 2.

— How to select method and how to make measurement have been explained in more detail in 9.1.

— Information about original hardness measurement has been revised in 9.2.

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.

Rubber — Determination of crystallization effects by hardness measurements

1 Scope

This document specifies a test based on hardness measurements for determining the progressive stiffening of rubber with time, caused by crystallization. It is limited to materials having an initial hardness at a test temperature of from 10 IRHD to 85 IRHD.

The method is applicable to raw, unvulcanized (compounded) and vulcanized rubber. It is mainly of interest for rubber with a marked crystallization tendency at temperatures experienced in cold climates, such as chloroprene and natural rubber.

The method is not applicable to fast-crystallizing materials which crystallize to a considerable degree within the timespan of 15 min used for conditioning at test temperature.

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 48-2:2018, *Rubber, vulcanized or thermoplastic — Determination of hardness — Part 2: Hardness between 10 IRHD and 100 IRHD*

ISO 18899:2013, *Rubber — Guide to the calibration of test equipment*

ISO 23529, *Rubber — General procedures for preparing and conditioning test pieces for physical test methods*

3 Terms and definitions

No terms and definitions are listed in this document.

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 http://www.electropedia.org/

4 Principle

One or the other of the following measurements is made on a test piece stored at the desired temperature:

a) the increase in hardness after a specified storage time;

b) the time required for a specified increase in hardness to occur.

5 Apparatus

5.1 Cold chamber, in accordance with ISO 23529, capable of being maintained within ±2 °C of the specified temperature and using a gaseous heat-transfer medium.

All final handling and measurements shall be made within the cold chamber while the test temperature remains within the permissible limits. This can be done by providing suitable equipment which permits manipulation of materials within the chamber from the outside (for example, by means of handholes and gloves through the door or wall of the cabinet).

5.2 Hardness gauges, in accordance with ISO 48-2. Lubricants, if used, shall be of a type not causing friction in the instrument at the test temperature.

The hardness gauge used in this test procedure is normally conditioned and operated inside the cold chamber. Alternatively, a special device may be used where the body of the hardness gauge is placed outside the cold chamber and connected with the indenter in the cold chamber by means of a rod with low heat-conductive capacity, and constructed to avoid the introduction of additional friction.

5.3 Tweezers or tongs, for handling the test pieces.

5.4 Gloves, for handling the test equipment.

5.5 Heated press, for the preparation of raw and unvulcanized (compounded) test pieces.

6 Calibration

The apparatus shall be calibrated in accordance with the schedule given in Annex A.

7 Test pieces

7.1 Dimensions

Tests may be carried out on test pieces of different thicknesses. These do not necessarily give the same values of hardness readings. Tests intended to be comparable shall be made on test pieces of the same thickness.

The upper and lower surfaces of the test piece shall be flat, smooth and parallel to one another. The standard test piece shall be 8 mm to 10 mm thick. Non-standard test pieces may be either thicker or thinner, but in no case shall the test piece be thinner than 4 mm for hardness between 35 IRHD and 85 IRHD, or thinner than 6 mm for hardness between 10 IRHD and 35 IRHD. The lateral dimensions of both standard and non-standard test pieces shall be such that no test is made at a distance from the edge of the test piece less than the appropriate distance shown in Table 1.