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GB/T 7762-2014

Replacing GB/T 7762-2003

Rubber, vulcanized or thermoplastic – Resistance to ozone cracking – Static Strain Test

硫化橡胶或热塑性橡胶　耐臭氧龟裂

静态拉伸试验

(ISO 1431-1:2004, Rubber, vulcanized or thermoplastic -Resistance to ozone cracking – Part 1: Static and dynamic strain testing, NEQ)

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Foreword

This Standard was drafted in accordance with the rules given in GB/T 1.1-2009.

This Standard replaces GB/T 7762-2003, Rubber, vulcanized or thermoplastic – Resistance to ozone cracking – Static Strain Test; compared with GB/T 7762-2003, the main technical differences of it are as follows:

-- it deletes the specification that oxygen is recommended when ozone is made with silent-discharge tube (see 5.2 of Edition 2003);

-- it uses GB/T 2941 to replace GB/T 9865.1 (see 6.1; 6.1 of Edition 2003);

-- it modifies the dimensions of the narrow test piece and adds the alternative dumb-bell test pieces in accordance with GB/T 528 (see 6.3; 6.3 of Edition 2003);

-- for products intended for use in damp climates, it modifies the requirements for its relative humidity during the test, from the original “the test shall be carried out at a relative humidity in the range 80% to 90%” into “the test shall be carried out at a relative humidity in the range 80% to 90%, if this is practicable” (see 8.3; 8.3 of Edition 2003).

-- it adds an optional elongation (25 ± 2)% (see 8.4); and

-- it adds an optional method for observation and evaluation of cracking: in accordance with relevant provisions of GB/T 11206-2009 (see 10.1).

This Standard was redrafted by reference to ISO1431-1:2004, Rubber, vulcanized or thermoplastic – Resistance to ozone cracking – Part 1: Static and dynamic strain testing. It is not equivalent to ISO 1431-1:2004.

This Standard was proposed by China Petroleum and Chemical Industry Federation.

This Standard shall be under the jurisdiction of the Subcommittee of General Test Methods of the National Standardization Technical Committee on Rubber and Rubber Products (SAC/TC 35/SC 2).

The drafting organizations of this Standard: Guangzhou Synthetic Materials Research Institute Co., Ltd., Guangzhou Huanan Rubber Tyre Co., Ltd., Aeolus Tyre Co., Ltd., Jiangsu Mingzhu Testing Machinery Co., Ltd., Guizhou Tyre Co., Ltd., Beijing Research and Design Institute of Rubber Industry, Zhongce Rubber Group Co., Ltd. and Guangzhou Industrial Rubber Products Research Institute Co., Ltd.

The main drafters of this Standard: Xie Yufang, Yi Jun, Liang Yaping, Luo Jiliang, Ren Shaowen, Liu Yuwan, Zhu Ming, Feng Ping, Xie Junfang, Li Jing, Xiang Chan and Zhao Yanfen.

This Standard shall be interpreted by the Secretariat of National Standardization

Technical Committee on Fasteners.

The previous editions replaced by this Standard are as follows:

-- GB/T 7762-1987 and GB/T 7762-2003.

Rubber, vulcanized or thermoplastic – Resistance to ozone cracking – Static Strain Test

WARNING 1 – Persons using this Standard should be familiar with normal laboratory practice. This Standard 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 ensure compliance with any national regulatory conditions.
WARNING 2 – Attention is drawn to the highly toxic nature of ozone. Efforts should be made to minimize the exposure of workers at all times. It is usually recommended that 0.1 part of ozone per million parts of air of the surrounding atmosphere by volume be regarded as an absolute maximum concentration whilst the maximum average concentration should be appreciably lower. Unless a totally enclosed system is being used, an exhaust vent to remove ozone-laden air is advised.

1 Scope

This Standard specifies procedures intended for use in estimating the resistance of vulcanized or thermoplastic rubbers to cracking when exposed, under static tensile strain, to air containing a definite concentration of ozone and at a definite temperature in circumstances that exclude the effects of direct light.

This Standard applies to rubber, vulcanized or thermoplastic.

NOTE Great caution is necessary in attempting to relate standard test results to service performance since the relative ozone resistance of different rubbers can vary markedly depending on the conditions, especially ozone concentration and temperature. In addition, tests are carried out on thin test pieces deformed in tension and the significance of attach for articles in service can be quite different owing to the effects of size and of type and magnitude of the deformation. Explanatory notes on the natural ageing under ozone cracking are given in Annex A.

2 Normative references

The following referenced documents are indispensable for the application of this document. For dated references, only the edition dated applies to this document. For undated references, the latest edition of the referenced document (including any amendments) applies to this Standard.

GB/T 528-2009, *Rubber, vulcanized or thermoplastic – Determination of tensile stress-strain properties* (ISO 37:2005, IDT)

b) silent-discharge tube.

Air used for generation of ozone or for dilution shall first be purified by passing it over activated charcoal and shall be free from any contaminants likely to affect the ozone concentration, the estimation of the ozone concentration or the cracking of the test pieces.

NOTE Theoretically, nitrogen oxides can be generated when air is used to make ozone with silent-discharge tube, which interferes the test, but this interference will not occur under low ozone concentration as specified by standard.

The temperature of the source shall be kept constant to within ± 2°C.

The ozonized air shall be fed from the source into the chamber via a heat exchanger to adjust its temperature to that required for the test and shall also be brought to the specified relative humidity.

5.3 Means of adjusting the ozone concentration

When an ultra-violet lamp is used, the ozone concentration can be controlled by adjusting either the voltage applied to the tube or the input-gas flow rate, or by shielding part of the tube from the UV light. When a silent-discharge tube is used, the ozone concentration can be controlled by adjusting the voltage applied to the generator, the dimensions of electrodes, or the oxygen or diluent-air flow rate. The adjustments shall be such that they will maintain the concentration within the tolerances given in 8.1. In addition, after each occasion that the test chamber opened for insertion or inspection of test pieces, the ozone concentration shall return to the test concentration within 30 min. The concentration of the ozone entering the chamber shall at no time exceed the concentration specified for the test.

5.4 Means of determining the ozone concentration

A means of sampling the ozonized air from the vicinity of the test pieces in the chamber and a means of estimating the ozone content are specified in ISO 1431-3. If required, the methods given in Annex B can also be a reference.

5.5 Means of adjusting the gas flow

A mechanism shall be provided that is capable of adjusting the average velocity of the flow of ozonized air in the test chamber to a value of not less than 8 mm/s and preferably to a value between 12 mm/s and 16 mm/s, calculated from the measured gas flow rate in the chamber divided by the effective cross-sectional area of the chamber normal to the gas flow. In tests intended to be comparable, the velocity shall not vary by more than ± 10%. The gas flow rate is the volume throughout of ozonized air in unit time, and this shall be sufficiently high to prevent the ozone concentration in the chamber being significantly reduced owing to ozone destruction by the test pieces. The rate of destruction will vary depending on the rubber being used, the test conditions and other details of the test. As a general guide, it is recommended that the

into adjacent rubbers.

It is recommended that aluminium foil be placed between test pieces and sheets of different compositions, but other methods which prevent migration of additives can also be used.

Samples and test pieces shall be stored in the dark, in an essentially ozone-free atmosphere, during the period between vulcanization and testing; the storage temperature shall normally be a standard laboratory temperature (see GB/T 2941-2006), but other, controlled, temperatures can be used if appropriate for particular applications. The same storage conditions shall also be used, as far as possible, for products. For evaluations intended to be comparative, the storage time and conditions shall be the same.

For thermoplastic rubbers, conditioning and storage shall begin immediately after shaping.

7.2 Conditioning in the strained state

After stretching, the test pieces shall be conditioned for a period of between 48 h and 96 h in an essentially ozone-free atmosphere in the dark; the temperature for this conditioning shall normally be a standard laboratory temperature (see GB/T 2941-2006), but other temperatures can be used if appropriate for particular applications. The test pieces shall not be touched or otherwise disturbed in any way during the conditioning period. For tests intended to be comparative, the conditioning time and temperature shall be the same.

8 Test conditions

8.1 Ozone concentration

The test shall be carried out at one of the following ozone concentrations, expressed in volume fraction:

-- 250 ppb ± 50 ppb (25 pphm ± 5 pphm)

-- 500 ppb ± 50 ppb (50 pphm ± 5 pphm)

-- 1 000 ppb ± 100 ppb (100 pphm ± 10 pphm)

-- 2 000 ppb ± 200 ppb (200 pphm ± 20 pphm)

Unless otherwise specified, the test shall be carried out at an ozone concentration of 500 ppb ± 50 ppb (50 pphm ± 5 pphm). If a lower concentration is required for testing rubbers known to be used at low ambient ozone concentrations, an ozone concentration of 250 ppb ± 50 ppb (25 pphm ± 5 pphm) is recommended. If highly resistant polymers are being tested, a concentration of 1 000 ppb ± 100 ppb (100 pphm

anything when carrying out the examination.

Cracking on surfaces which have been cut or buffed shall be ignored.

The following three alternative procedures for exposure of test pieces are permissible.

9.2 Procedure A

Unless otherwise specified, strain the test pieces at 20% elongation, condition them in accordance with 7.2, and examine them after 72 h in the test chamber for the development of cracking (an alternative elongation and an alternative exposure period may be given in the appropriate material specification).

9.3 Procedure B

Strain the test pieces at one or more of the elongations given in 8.4 and condition them in accordance with 7.2. If only one elongation is used, this shall be 20%, unless otherwise specified. Examine the test pieces after 2 h, 4 h, 8 h, 24 h, 48 h, 72 h and 96 h and, if necessary, at suitable intervals thereafter in the test chamber and note the time until the first appearance of cracks at each elongation.

NOTE Examination after 16 h may also be desirable, even though it is not convenient in practice.

9.4 Procedure C

Strain the test pieces at no fewer than four of the elongations given in 8.4 and condition them in accordance with 7.2. Examine the test pieces after 2 h, 4 h, 8 h, 24 h, 48 h, 72 h and 96 h and, if necessary, at suitable intervals thereafter in the test chamber and note the time until the first appearance of cracks at each elongation so that the threshold strain can be estimated.

10 Expression of results

10.1 Procedure A

Report the results as “no cracking” or “cracking”. If cracking has occurred and an estimate of the degree of cracking is required, a description of the cracks (for example, the appearance of the individual cracks, the number of cracks per unit area and the average length of the 10 largest cracks) can be given, or a photograph of the cracked test piece can be taken. The methods for observation and evaluation of cracking are specified in GB/T 11206-2009.

10.2 Procedure B

Take the time to the first appearance of cracks as the measure of ozone resistance at the specified strain.

2 first observation with cracking

3 no cracking

NOTE For the example shown, the threshold strain at 48 h = 10%.

Figure 4 – Presentation of results in graphical form

11 Test report

The test report shall include the following information:

a) sample details:

1) a full description of the sample and its origin;

2) compound identification;

3) the method of preparation of the test pieces, for example whether moulded or cut;

b) test method:

1) a reference to this Standard;

2) the procedure used (A, B or C);

3) the type of test piece and its dimensions;

4) whether a rotating carrier was used;

c) test details:

1) the ozone concentration and the method of estimation;

2) the temperature and humidity of testing;

3) the maximum strain(s) on the test pieces;

4) the duration of the test;

5) details of any non-standard procedures;

d) test results:

1) the number of test pieces tested at each strain;

2) for procedure A, whether cracking occurred (if required, the nature of any cracking can also be given);

3) for procedure B, the time to the first appearance of cracks for each elongation;

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Contact: Wayne Zheng, Sales@ChineseStandard.net

Linkin: https://www.linkedin.com/in/waynezhengwenrui/

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