



Standard Test Method for Rubber Deterioration—Surface Ozone Cracking in a Chamber¹

This standard is issued under the fixed designation D 1149; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon (ε) indicates an editorial change since the last revision or reapproval.

This standard has been approved for use by agencies of the Department of Defense.

1. Scope

1.1 This test method covers the estimation of the resistance of vulcanized rubber to cracking when exposed to an atmosphere containing ozone. The rubber specimens are kept under a surface tensile strain, and the ozone content or partial pressure in the test chamber is maintained at a fixed value.

1.2 The values stated in SI units are to be regarded as the standard. The values in parentheses are for information only.

1.3 *This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use.* For a specific hazard statement, see Note 1 and 6.1.

NOTE 1—**Warning:** Ozone is a hazardous chemical.

2. Referenced Documents

2.1 ASTM Standards:

D 518 Test Method for Rubber Deterioration—Surface Cracking²

D 1171 Test Method for Rubber Deterioration—Surface Ozone Cracking Outdoors or Chamber (Triangular Specimens)²

D 1349 Practice for Rubber—Standard Temperatures for Testing²

D 4575 Test Methods for Rubber Deterioration—Reference and Alternative Method for Determining Ozone Level in Laboratory Test Chambers²

3. Summary of Test Method

3.1 Rubber specimens are prepared from tensile sheets vulcanized between protective aluminum foil or polyester film. Specimens are conditioned at the temperature of test for a controlled time.

3.2 These specimens, under a surface of tensile strain, are exposed in a chamber containing a known, controlled concen-

tration of ozone in air, at a controlled prescribed temperature. The partial pressure or concentration of the ozone can be varied. The specimens are examined at intervals and their condition is recorded.

NOTE 2—Refer to Test Methods D 4575 for the reference and optional alternative methods for the measurement of the ozone partial pressure in laboratory test chambers.

4. Significance and Use

4.1 In service, rubbers must resist the deterioration that ozone cracking produces. This test method provides methods for estimating this performance feature of rubbers. Such test methods can be used for producer-consumer acceptance, referee purposes, and product development.

4.2 The test method may not give results correlating exactly with outdoor exposure tests, since the results are highly dependent on specific conditions. However this test method has been developed to improve this correlation. Conditions that influence accelerated tests are ozone content, relaxation of stress, temperature, and degree of bloom of additives. Additional conditions that influence outdoor tests include the amount of sunshine and rainfall.

4.3 In rubber compounds where ozone resistance has been imparted by the use of waxes or chemical agents, it is important that the specified conditioning of the test specimens before exposure and the temperature of that exposure approximate that of the projected use. The composition and hence the performance of the protective film formed by the diffusion of these materials to the surface of the specimen is a sensitive function of time and temperature.

5. Ozone Test Apparatus

5.1 *Test Chamber*—Requirements for an acceptable ozone test chamber are sufficient air-ozone throughput rate, sufficient internal circulation, and sufficient internal volume. A secondary requirement is that of controlling the temperature within acceptable limits. An acceptable ozone test chamber can be custom-made in a particular laboratory or one of the commercial manufactured chambers which are available may be used. The ozone test chambers shall conform to the following requirements:

5.1.1 The test chamber shall be constructed of a material

¹ This test method is under the jurisdiction of ASTM Committee D-11 on Rubber and is the direct responsibility of Subcommittee D11.15 on Degradation Tests.

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² *Annual Book of ASTM Standards*, Vol 09.01.