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Standard
Test Method

Evaluating Elastomeric Materials in Carbon Dioxide Decompression Environments

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Foreword

This standard test method was prepared to serve as a tool in the evaluation of elastomeric materials for use in the oil field and other energy-related areas where carbon dioxide (CO_2) gaseous environments are encountered. This standard presents information on testing in CO_2 environments under pressures greater than atmospheric pressure at room temperature.[(1)] It is intended for use by anyone investigating the use of elastomeric materials in CO_2 environments where pressures are low but greater than atmospheric. This standard details a low-pressure, low-temperature comparative test. By using the specified test conditions, data from separate laboratories that perform this test method may be compared.

No other technical organization is known to have issued a comparable standard test method. This method is useful in conducting research and development of elastomeric materials.

This standard was originally prepared in 1992 by Work Group T-1G-17e of Task Group T-1G-17, a component of Unit Committee T-1G, "Protective Coatings, Elastomers, and Other Nonmetallic Materials for Oilfield Use." It was reaffirmed in 1998 by T-1G and reaffirmed in 2003 and 2012 by Specific Technology Group (STG) 33, "Oil and Gas Production—Nonmetallics and Wear Coatings (Metallic)." This standard is published by NACE International under the auspices of STG 33.

In NACE standards, the terms *shall*, *must*, *should,* and *may* are used in accordance with the definitions of these terms in the *NACE Publications Style Manual.* The terms *shall* and *must* are used to state a requirement, and are considered mandatory. The term *should* is used to state something good and is recommended but is not considered mandatory. The term *may* is used to state something considered optional.

(1) Refer to NACE Standard TM0297[1] for high-temperature testing.

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Contents

Section 1: General

1.1 This standard establishes a test method to measure the effect on elastomeric materials of rapid depressurization from elevated pressures in dry CO_2 environments. It is designed for testing O-rings or other test specimens of elastomeric materials. This test method is not applicable to the testing of cellular rubber or porous materials.

1.2 This standard recommends procedures for the preparation of test specimens, the test equipment to be used, the test procedures to be followed, and the reporting of test results. The results are determined by monitoring changes in physical and mechanical properties as well as changes in appearance after exposure to the selected test media.

1.3 In view of the wide range of service conditions, this test method is intended only to be a means of initial material evaluation and comparison. No attempt or implication is made to establish any pass/fail criteria for elastomeric materials tested by this method. The change in properties of an elastomeric material is indicative of its resistance to a specific environment. This test method can be regarded only as a relative measure of the resistance of an elastomeric material under the conditions of this particular test, and does not necessarily have any direct relation to service performance. The precision of this test method and reproducibility within and among laboratories has not been established. The significance of the results can be determined only by each laboratory for its particular application. The user of this test method is encouraged to establish statistical significance of the data resulting from this method.

1.4 SAFETY PRECAUTIONS: This test involves the use of high-pressure CO_2. The appropriate safety precautions for working with high-pressure gases should be observed. One source of safety information is CGA[(2)] P-1.[2]

Section 2: Definitions

2.1 ASTM[(3)] D1566[3] provides definitions of technical terms used in this standard.

Section 3: Test Media

3.1 It is usually desirable to evaluate elastomeric materials in the specific environments to which they will be exposed in service. However, to provide a basis for the evaluation and comparison of different elastomeric materials, a standard industrial-grade CO_2 (99% minimum purity) environment shall be used in this test.

Section 4: Test Conditions

4.1 Test Temperature

4.1.1 The test shall be performed at room temperature, 25 ± 5 °C (77 ± 9 °F).

4.2 Test Pressure

4.2.1 The test shall be performed at a gauge pressure of 5.2 ± 0.3 MPa (750 ± 50 psig).

4.3 Test Exposure Period

4.3.1 The standard test exposure period shall be 24 ± 1 hour.

4.3.2 The test exposure period shall be defined as the period elapsed from the time the test pressure and test temperature are established until the test pressure is discontinued or released.

(2) Compressed Gas Association (CGA), 4221 Walney Rd., Chantilly, VA 20151.
(3) ASTM International (ASTM), 100 Barr Harbor Dr., West Conshohocken, PA, 19428-2959.