



Standard Test Method for Accelerated Life Test of Electrical Grade Magnesium Oxide as Used in Sheathed-Type Electric Heating Elements¹

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^{ε1} NOTE—Section 13 was added editorially in October 1997.

1. Scope

1.1 This test method covers the accelerated life testing of electrical grade magnesium oxide (MgO) under conditions involving thermal cycling to an elevated temperature. The test determines both the rate at which electrical insulation impedance (Note 1) or test current through the insulation changes with time and the time span resulting in complete failure of a test cell incorporating the sample under test.

NOTE 1—At test temperatures, capacitive and inductive reactance are negligible, and therefore impedance values are considered essentially resistive.

1.2 *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 specific safety precaution, see 9.4.1.

1.3 The values stated in acceptable metric units are to be regarded as the standard.

2. Referenced Documents

2.1 ASTM Standards:

B 344 Specification for Drawn or Rolled Nickel-Chromium and Nickel-Chromium-Iron Alloys for Electrical Heating Elements²

D 2755 Test Method of Sampling and Reduction to Test Weight of Electrical Grade Magnesium Oxide³

3. Summary of Test Method

3.1 The specimen of magnesium oxide is loaded into a test cell, which is formed into an operative heater of specific construction. The test cell is thermally cycled by internal heating under conditions designed to accelerate deterioration and promote failure in a period of several months. Electrical resistance of the insulation is measured periodically. The total

length of time the test cell operates before failure occurs is recorded as its life.

4. Significance and Use

4.1 The insulating quality of the magnesium oxide at high temperature and during the life span of a heating unit is a most significant aspect of the material to the user. Accordingly, a means is specified for determining the insulating quality in a relatively short time, with magnesium oxide being the only intended variable.

5. Apparatus

5.1 *Loading Machine*, vibratory-type, with suitable loading devices.⁴

5.2 *Rolling Machine*, capable of roll reducing to 6.35 mm (0.250 in.) diameter through five passes of 7.62 mm (0.300 in.), 7.24 mm, (0.285 in.), 6.86 mm, (0.270 in.), 6.60 mm (0.260 in.), and 6.35 mm (0.250 in.), with no subsequent sizing rolls.⁵

5.3 *Fusion or Spot Welding Machine*.

5.4 *Variable A-C Power Source*, (approximately 124 V) with voltage-regulation to ± 1 V and meter for measuring.

5.5 *Variable A-C Test Voltage*, supply of approximately 600 V max.

5.6 *Voltmeter*, A-C, 1000 Ω /V, 600 V full-scale deflection.⁶

5.7 *Thermocouple*, ANSI Type K, No. 26 B&S gage, 0.408 mm (0.0159 in.) in diameter with appropriate potentiometer.

5.8 *Milliammeter*, A-C rectifier type 0-10 ma full scale deflection.

5.9 *Voltage Divider*, Rheostat, 50W, 500 Ω .

6. Materials

NOTE 2—To reduce the number of variables from one test to another, it

⁴ A suitable loading machine is a three-station Oakley loader, manufactured by Oakley Industries, Inc., 7315 N. Linder Ave., Skokie, IL.

⁵ A suitable rolling machine is an Oakley rolling machine, manufactured by Oakley Industries, Inc., 7315 Linder Ave., Skokie, IL. Although roll reducing is preferred, swaging is optional. Suggested sizes of reduction are 7.62 mm (0.300 in.) 7.24 mm (0.285 in.), 6.86 mm (0.270 in.), 6.60 mm (0.260 in.), and 6.35 mm (0.250 in.) If swaging is used, the sheath tube length must be increased about 3 % and the helix resistance increased about 4 %. A suitable swaging is a Size 4 Torrington machine manufactured by the Torrington Co., 59 Field St., Torrington, CT.

⁶ A suitable voltmeter is a type DP2X manufactured by the General Electric Co.

¹ This method is under the jurisdiction of ASTM Committee D-9 on Electrical and Electronic Insulating Materials and is the direct responsibility of Subcommittee D09.14 on Electric Heating Unit Insulation.

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² *Annual Book of ASTM Standards*, Vol 03.04.

³ *Annual Book of ASTM Standards*, Vol 10.02.