Designation: D3275 – 18 (Reapproved 2023)

Standard Classification System for E-CTFE-Fluoroplastic Molding, Extrusion, and Coating Materials[1]

This standard is issued under the fixed designation D3275; 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 U.S. Department of Defense.

1. Scope

1.1 This classification system covers melt processible molding, extrusion, and coating materials of ethylene-chlorotrifluoroethylene (E-CTFE) fluoroplastics. The resin is a copolymer of ethylene and chlorotrifluoroethylene containing approximately 80 weight % of chlorotrifluoroethylene.

1.2 The values stated in SI units, as detailed in IEEE/ASTM SI-10, are to be regarded as standard.

1.3 The following precautionary statement pertains only to the test methods portion, Section 11 of this classification system. *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, health, and environmental practices and determine the applicability of regulatory limitations prior to use.*

NOTE 1—Although this classification system and ISO 20568-1 and ISO 20568-2 differ in approach or detail, data obtained using either are technically equivalent.

1.4 *This international standard was developed in accordance with internationally recognized principles on standardization established in the Decision on Principles for the Development of International Standards, Guides and Recommendations issued by the World Trade Organization Technical Barriers to Trade (TBT) Committee.*

2. Referenced Documents

2.1 *ASTM Standards:*[2]

D150 Test Methods for AC Loss Characteristics and Permittivity (Dielectric Constant) of Solid Electrical Insulation

D618 Practice for Conditioning Plastics for Testing

D638 Test Method for Tensile Properties of Plastics

D792 Test Methods for Density and Specific Gravity (Relative Density) of Plastics by Displacement

D883 Terminology Relating to Plastics

D1238 Test Method for Melt Flow Rates of Thermoplastics by Extrusion Plastometer

D1600 Terminology for Abbreviated Terms Relating to Plastics

D1708 Test Method for Tensile Properties of Plastics by Use of Microtensile Specimens

D2863 Test Method for Measuring the Minimum Oxygen Concentration to Support Candle-Like Combustion of Plastics (Oxygen Index)

D3892 Practice for Packaging/Packing of Plastics

D4591 Test Method for Determining Temperatures and Heats of Transitions of Fluoropolymers by Differential Scanning Calorimetry

IEEE/ASTM SI-10 Use of the International System of Units (SI): The Modern Metric System

2.2 *ISO Standards:*[3]

ISO 20568-1 Plastics—Fluoropolymer Dispersion and Moulding and Extrusion Materials—Part 1: Designation and Basis for Specification

ISO 20568-2 Plastics—Fluoropolymer Dispersion and Moulding and Extrusion Materials—Part 2: Preparation of Test Specimens and Determination of Properties

3. Terminology

3.1 *Definitions:*

3.1.1 Definitions of terms used in this classification system shall be in accordance with Terminology D883.

3.1.2 *lot, n*—one production run or a uniform blend of two or more production runs.

3.2 *Abbreviations:*

3.2.1 Abbreviations are in accordance with Terminology D1600.

[1] This classification system is under the jurisdiction of ASTM Committee D20 on Plastics and is the direct responsibility of Subcommittee D20.15 on Thermoplastic Materials

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[2] For referenced ASTM standards, visit the ASTM website, www.astm.org, or contact ASTM Customer Service at service@astm.org. For *Annual Book of ASTM Standards* volume information, refer to the standard's Document Summary page on the ASTM website.

[3] Available from American National Standards Institute (ANSI), 25 W. 43rd St., 4th Floor, New York, NY 10036, http://www.ansi.org.

***A Summary of Changes section appears at the end of this standard**

4. Classification

4.1 ECTFE materials are classified into groups in accordance with their physical appearance. The groups are further divided into classes based on melt flow rate. These classes are subdivided into grades as shown in the Table E-CTFE. An example of a material of this classification system is given as follows: ECTFE 01 1 1

TABLE E–CTFE

Group	Class	Description	Grade	Melt Flow Rate,[A,B] g/10 min	Specific Gravity,[C] 23/23°C	Tensile Strength,[D,E] min, MPa	Elongation,[E,F] min, %	Melting Point, °C,[G] min	Oxygen Index,[H] min, %	Dielectric Constant,[I] max, 10^6 Hz	Dissipation Factor,[J] max, 10^6 Hz
01 powder	1	Low melt flow rate	1	0.05–1.50	1.65–1.71	40	200	240	52	2.6	0.015
	2	Medium melt flow rate	1	1.51–6.0	1.65–1.71	40	200	240	52	2.6	0.015
	3	High melt flow rate	1	6.1–25	1.65–1.71	40	200	240	52	2.6	0.015
	0	Other	0								
02 pellet	1	Low melt flow rate	1	0.05–1.50	1.65–1.71	40	200	240	52	2.6	0.015
	2	Medium melt flow rate	1	1.51–6.0	1.65–1.71	40	200	240	52	2.6	0.015
	3	High melt flow rate	1	6.1–25	1.65–1.71	40	200	240	52	2.6	0.015
	4	Ultra Low melt flow rate	1	0.8–1.3	1.65–1.71	40	200	220	52	2.6	0.015
	0	Other	0								
00	0	Other	0								

[A] See 11.2 for test method for above parameters.
[B] See 11.2 for test method for group 2 class 4 grade 1 replace 2.16 kg mass with 5 kg mass.
[C] See 11.4 for test method for above parameters.
[D] See 11.5 for test method for above parameters.
[E] At 23 ± 2°C (73.4 ± 3.6°F).
[F] See 11.5 for test method for above parameters.
[G] See 11.3 for test method for above parameters.
[H] See 11.7 for test method for above parameters.
[I] See 11.6 for test method for above parameters.
[J] See 11.6 for test method for above parameters.

where:

01 = ECTFE powder
1 = low melt flow
2 = properties in accordance with Table E-CTFE (Grade 1)

4.1.1 To facilitate incorporation of future material, the other category for Group (00), Class (0) and Grade (0) are shown in Table E-CTFE.

5. Ordering Information

5.1 The purchase order or inquiry for these materials shall state the classification callout. For example, D3275 ECTFE 01 1 2.

6. General Requirements

6.1 The material covered by this classification system shall conform to the requirements prescribed in Table E-CTFE when tested by the procedures specified herein.

7. Detail Requirements

7.1 Test specimens prepared in accordance with Section 10 shall conform to the requirements prescribed for the particular class.

8. Sampling

8.1 Sampling must be statistically adequate to satisfy the requirements of 12.4.

9. Number of Tests

9.1 One set of test specimens as prescribed in Section 11 shall be considered sufficient for testing each sample. The average result of the specimens tested shall conform to the requirements of this classification system.

10. Specimen Preparation

10.1 *Test Specimens:*

10.1.1 Prepare test moldings 3.18 ± 0.3 mm (0.125 ± 0.012 in.) thick between two 0.38 to 0.51 mm (0.015 to 0.020 in.) thick chromium-plated ferrotype plates. Use a "picture frame" type compression molding chase with inner dimensions of 178 by 178 mm (7 by 7 in.) and having a thickness suitable to produce the required molded sheet. Use a charge of resin sufficient to provide the thickness sheet specified.

10.1.2 Place the mold chase on top of a chromium-plated ferrotype plate. Charge a quantity of resin sufficient to produce a 3.18 ± 0.30-mm (0.125 ± 0.012-in.) sheet in a diagonal pattern from corner to corner forming an "X" pattern. Place the other chromium-plated ferrotype plate on top of the resin charge and place the assembly in a compression molding press which has been heated to 264 ± 3°C (507 ± 5.4°F). Apply a pressure of 0.34 MPa (50 psi) and hold for 4 min. Increase pressure to 1.72 MPa (250 psi) and hold for 1 min followed by increasing the pressure to not less than 2.24 MPa (325 psi) and

holding for 5 min. Remove the chase assembly from the press and immediately quench it in an ice-water bath, vigorously agitating the chase. Remove the ferrotype plates, keeping the chase and molded sheet in the ice water bath until quenching is complete.

11. Test Methods

11.1 *Conditioning:*

11.1.1 For tests of specific gravity, tensile properties, oxygen index, and electrical properties, condition the molded test specimens in accordance with Procedure A of Practice D618, with the exception that only 4-h conditioning is required.

11.1.2 Conduct tests at the standard laboratory temperatures of 23 ± 2°C (73.4 ± 3.6°F) for determination of specific gravity, tensile properties, and electrical properties. Since the resin does not absorb water, the maintenance of constant humidity during testing is not necessary. Conduct tests for melt flow rate, oxygen index, and melting endotherm under ordinary laboratory conditions.

11.2 *Melt Flow Rate*—Determine the melt flow rate in accordance with Test Method D1238 modified by use of corrosion-resistant alloy for the barrel lining, orifice, and piston tip.

11.3 *Melting Endotherm Peak*—Determine the melting endotherm peak in accordance with Test Method D4591. For instruments capable of digital data processing of the melting endotherm curve, the peak maximum, as determined by the point on the curve for which the tangent has zero slope, will be reported as the melting point. Additionally, the heat of fusion and recrystallization will be reported directly from the display of the data processing equipment provided that the instrument has been calibrated with a standard material as defined in Test Method D4591.

11.3.1 The use of other thermal techniques, such as differential thermal analysis (DTA), capable of measuring the melting endotherm peak and giving equivalent results, is allowed.

11.4 *Specific Gravity*—Cut two specimens from the compression molded sheet and test in accordance with Test Methods D792.

11.5 *Tensile Properties*—Determine the tensile properties in accordance with Test Method D638 with the following exceptions:

11.5.1 Use the test specimen and die identified in Test Method D1708 and shown in Fig. 1. The initial jaw separation shall be 22.2 ± 0.13 mm (0.875 ± 0.005 in.), and the speed of testing shall be 51 mm/min (2 in./min). Clamp the specimens with essentially equal lengths in each jaw. Determine the elongation from the chart, expressing it as a percentage of the initial jaw separation.

11.6 *Dielectric Constant and Dissipation Factor*—Determine the dielectric constant and dissipation factor on three specimens, each 50.8 mm (2 in.) in diameter in accordance with Test Methods D150. Testing shall be at 60 Hz and 10^6 Hz.

11.7 *Oxygen Index*—Determine the oxygen index in accordance with Test Method D2863.

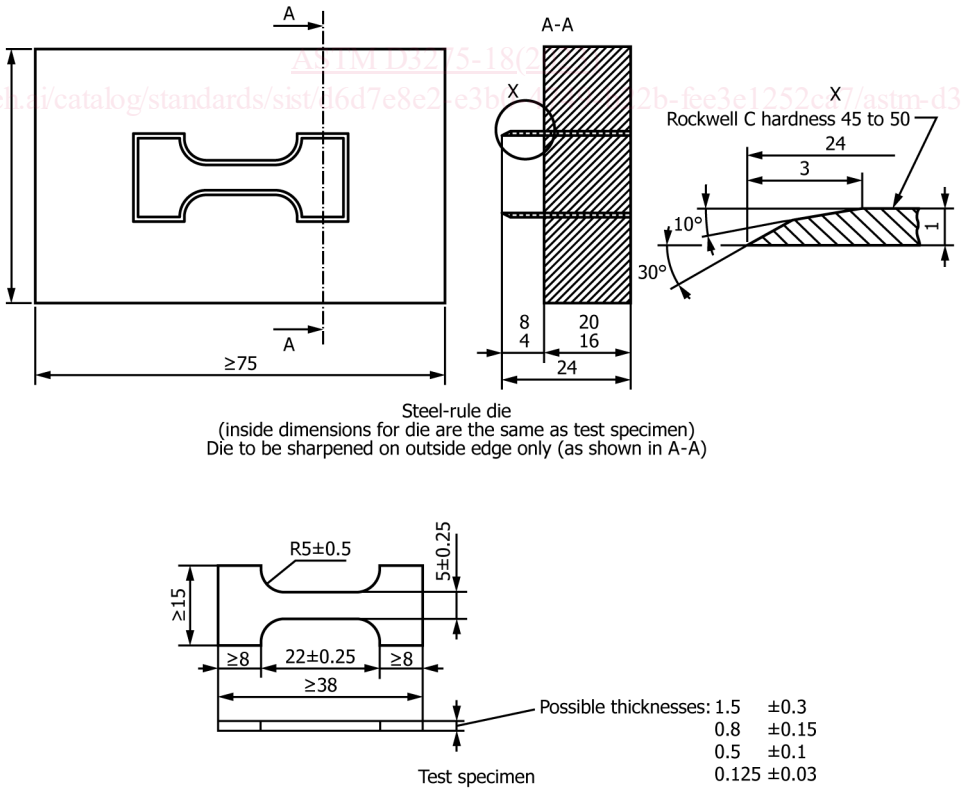

FIG. 1 Test Specimen and Die