Designation: D7471 – 19

Standard Specification for CPT-Fluoropolymer Molding and Extrusion Materials[1]

This standard is issued under the fixed designation D7471; 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.

1. Scope*

1.1 This specification covers copolymers of chlorotrifluoroethylene, perfluoroalkoxy, and tetrafluoroethylene and are suitable for extrusion, compression, and injection molding.

1.2 This specification does not cover blended materials and does not cover recycled materials.

1.3 The values stated in SI units as detailed in IEEE/ASTM SI-10 are to be regarded as the standard. The values given in parentheses are for information only.

1.4 The following safety hazards caveat pertains only to the test method portion, Section 11, of this specification. *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.

1.5 *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]

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

D3418 Test Method for Transition Temperatures and Enthalpies of Fusion and Crystallization of Polymers by Differential Scanning Calorimetry

D3892 Practice for Packaging/Packing of Plastics

E177 Practice for Use of the Terms Precision and Bias in ASTM Test Methods

IEEE/ASTM SI-10 Use of the International System of Units (SI): The Modem 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 *General*—The terminology given in Terminology D883 is applicable to this specification.

3.2 *Definitions:*

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

3.3 *General*—The abbreviated terms given in Terminology D1600 are applicable to this specification.

4. Classification

4.1 This specification covers one type of fluoropolymer supplied in pellet form classified according to their melting point. The resins of each type are divided into four grades according to their melt flow rate.

[1] This specification 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

4.2 An one-line system shall be used to specify materials covered by this specification. The system uses predefined cells to refer to specific aspects of this specification, as illustrated as follows:

Specification
Standard Number : Type : Grade : Special
Block : : : Notes
: : : ,:

Example: Specification D7471 - 09, I2

For this example, the line callout shall be, Specification D7471 – 09, I2 and shall specify a fluoropolymer that has all of the properties listed for that type and grade in the appropriate specified properties, or tables, or both, in the specification identified. A comma is used as the separator between the standard number and the type. Separators are not needed between the group and grade.[4]

5. General Requirements

5.1 The material shall be of uniform composition and so prepared as to conform to the requirements of this specification.

5.2 The material described in this specification shall be free of foreign matter to such a contamination level as shall be agreed upon between the purchaser and the seller.

6. Performance Requirements

6.1 The average test result of the lot shall conform to the requirements prescribed in Table 1 when tested by the procedures specified herein. Table 1 lists those tests of specific gravity and tensile properties requiring a specimen molded as described in Section 8.

7. Sampling

7.1 The materials shall be sampled in accordance with an adequate statistical sampling program.

[4] See the ASTM Form and Style Manual, available from ASTM Headquarters.

TABLE 1 Detail Requirements

Type	I			
Grade	1	2	3	4
Specific gravity,				
min:	2.12	2.12	2.12	2.12
max:	2.17	2.17	2.17	2.17
Melting point, °C,				
min:	235	235	235	235
max:	255	255	255	255
Flow rate, g/10 min,				
min:	>1[A]	>4[A]	>7[B]	>20[B]
max:	4[A]	15[A]	20[B]	40[B]
Tensile strength, min,:				
MPa	25	22.75	20.68	20.68
psi	3625	3300	3000	3000
Elongation, min, %:	300	275	260	250

[A] Measured with 10,000 g load.
[B] Measured with 5000 g load

8. Specimen Preparation

8.1 Prepare a molded sheet 1.5 ± 0.3 mm (0.06 ± 0.01 in.) thick. Use a picture-frame-type chase having a suitable blanked-out section and thickness to produce the desired sheet. Use clean aluminum foil, 0.13 to 0.18 mm (0.005 to 0.007 in.) thick, in contact with the resin. Spraying a high-temperature mold release agent on the aluminum foil will help prevent the foil from sticking to the sheet. Use steel molding plates at least 1.0 mm (0.040 in.) thick and have an area adequate to cover the chase.

8.2 Lay down and smoothly cover one plate with a sheet of aluminum foil. Place the mold chase on top of this assembly. Place within the mold chase sufficient molding material to produce the required sheet in such manner that the polymer charge is a mound in the middle of the chase. Place a second sheet of aluminum foil on top of the granules and add the top mold plate. Place the assembly in a compression molding press having platens that have been heated to 320 ± 5°C (608 ± 9°F).

8.3 Bring the press platens to incipient contact with the mold assembly. Hold for 2 to 4 min without pressure. Apply approximately 1 MPa (145 psi) and hold for 1 to 1.5 min. Then apply 2 to 4 MPa (290 to 580 psi) and hold for 1 to 1.5 min. Maintain the press at 320 ± 5°C (608 ± 9°F) during these steps. Remove the assembly from the press and place between two 20 ± 7-mm (0.75 ± 0.25-in.) steel plates whose temperature is less than 40°C (104°F).

8.4 When the sheet is cool enough to touch about 50 to 60°C (122 to 140°F)), remove aluminum foil from the sheet. (If the sheet is allowed to cool to room temperature, the aluminum foil cannot be pulled free.)

9. Conditioning

9.1 For tests of specific gravity and tensile properties, condition the molded test specimens in accordance with Procedure A of Practice D618 for a period of at least 4 h prior to test. The other tests require no conditioning.

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

10. Packaging and Package Marking

10.1 *Packaging*—The material shall be packaged in standard commercial containers so constructed as to ensure acceptance by common or other carriers for safe transportation to the point of delivery unless otherwise specified in the contract or order.

10.2 *Marking*—Shipping containers shall be marked with the name of the material, type, grade, and quantity therein.

10.3 All packing, packaging, and marking provisions of Practice D3892 shall apply to this specification.

11. Test Methods

11.1 *Melt Flow Rate:*