Designation: D 729 – 95

AMERICAN SOCIETY FOR TESTING AND MATERIALS
100 Barr Harbor Dr., West Conshohocken, PA 19428
Reprinted from the Annual Book of ASTM Standards. Copyright ASTM
If not listed in the current combined index, will appear in the next edition.

An American National Standard

Standard Specification for Vinylidene Chloride Molding Compounds[1]

This standard is issued under the fixed designation D 729; 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 thermoplastic molding compounds composed of a copolymer of vinyl chloride and vinylidene chloride in the approximate ratio of 10 to 90, with suitable plasticizers, stabilizers, dyes, and pigments. The molding compounds are suitable for compression, injection, or extrusion molding.

1.2 The values stated in SI units are to be regarded as the standard.

NOTE 1—The properties included in this specification are those required to identify the types of molding materials covered. There may be other requirements necessary to identify particular characteristics. These will be added to the specification as their inclusion becomes generally desirable and the necessary test data and methods become available.

NOTE 2—There is no similar or equivalent ISO standard.

1.3 The following precautionary caveat pertains only to the test method portion, Section 8, 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 and health practices and determine the applicability of regulatory limitations prior to use.*

2. Referenced Documents

2.1 *ASTM Standards:*

D 149 Test Method for Dielectric Breakdown Voltage and Dielectric Strength of Solid Electrical Insulating Materials at Commercial Power Frequencies[2]

D 150 Test Methods for A-C Loss Characteristics and Permittivity (Dielectric Constant) of Solid Electrical Insulating Materials[3]

D 256 Test Methods for Impact Resistance of Plastics and Electrical Insulating Materials[2]

D 257 Test Methods for D-C Resistance or Conductance of Insulating Materials[4]

D 374 Test Methods for Thickness of Solid Electrical Insulation[3]

D 445 Test Method for Kinematic Viscosity of Transparent and Opaque Liquids (and the Calculation of Dynamic Viscosity)[5]

D 568 Test Method for Rate of Burning and/or Extent and Time of Burning of Flexible Plastics in a Vertical Position[2]

D 569 Method of Measuring the Flow Properties of Thermoplastic Molding Materials[2]

D 570 Test Method for Water Absorption of Plastics[2]

D 638 Test Method for Tensile Properties of Plastics[2]

D 648 Test Method for Deflection Temperature of Plastics Under Flexural Load[2]

D 759 Recommended Practice for Conducting Physical Property Tests of Plastics at Subnormal and Supernormal Temperatures[6]

D 792 Test Methods for Specific Gravity (Relative Density) and Density of Plastics by Displacement[2]

D 883 Terminology Relating to Plastics[2]

D 1600 Terminology for Abbreviated Terms Relating to Plastics[2]

D 1898 Practice for Sampling of Plastics[2]

D 3892 Practice for Packaging/Packing of Plastics[7]

2.2 *Military Standard:*[8]

MIL-STD-105 Sampling Procedures and Tables for Inspection by Attributes

3. Terminology

3.1 *General:* Definitions are in accordance with Terminology D 883 and Terminology D 1600, unless otherwise indicated.

4. Type and Forms

4.1 This specification covers one general-purpose type of vinylidene chloride material in the form of powder or pellets.

5. General Requirements

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

5.2 The form and color shall be as specified by the purchaser in the contract or order.

NOTE 3—Vinylidene chloride molding compounds are generally supplied in powder and pellet forms conforming to the following sieve analysis:

Powder:	
retained on a No. 18 (1.00-mm) sieve	not over 1%

[1] This specification is under the jurisdiction of ASTM Committee D-20 on Plastics and is the direct responsibility of Subcommittee D20.15 on Thermoplastic Materials (Section D20.15.01).

Current edition approved Dec. 10, 1995. Published February 1996. Originally published as D 729 – 43 T. Last previous edition D 729 – 91.

This edition contains changes in Section 1 to add an ISO equivalency statement.

[2] *Annual Book of ASTM Standards*, Vol 08.01.

[3] *Annual Book of ASTM Standards*, Vol 10.01.

[4] *Annual Book of ASTM Standards*, Vol 10.02.

[5] *Annual Book of ASTM Standards*, Vol 05.01.

[6] Discontinued, see 1982 *Annual Book of ASTM Standards*, Vol 08.01.

[7] *Annual Book of ASTM Standards*, Vol 08.02.

[8] Available from Standardization Documents Order Desk, Bldg. 4 Section D, 700 Robbins Ave., Philadelphia, PA 19111-5094, Attn: NPODS.

Pellets:	
passing a No. 4 (4.75-mm) sieve	100 %

6. Detail Requirements

6.1 *Molding Compound*—The compound covered by this specification shall conform to the following requirement:

Viscosity of 2 % solution in orthodichlorobenzene at 120°C (248°F), min, cP	0.96

6.2 *Molded Test Specimens*—Test specimens molded by injection under conditions specified by the manufacturer shall conform to the following requirements as to properties except that materials for nonelectrical applications need not be tested for electrical properties:

Flow temperature, °C (°F):	
min	120 (248)
max	140 (284)
Specific gravity, 23/23°C (73.4/73.4°F):	
min	1.68
max	1.75
Tensile strength, min:	
MPa	20.7
psi	3000
Deflection temperature at 1820 kPa (264 psi) fiber stress, min, °C (°F)	55 (131)
Water absorption (24-h immersion), max, weight gain plus soluble matter loss, %	0.1
Dielectric strength, kV/mm (V/mil):	
short-time test	350
step-by-step test	300
Dielectric constant, max	
at 1 KHz	4.7
at 1 MHz	3.5
Dissipation factor, max	
at 1 KHz	0.06
at 1 MHz	0.065
Volume resistivity, Ω-cm	
min	10^{14}
Burning rate	[A]
Impact strength (Izod), min, J/m (ft·lb/in.) of notch:	
at 23°C (73.4°F)	5.34 (0.1)
at −40°C (−40°F)	26.7 (0.5)
Weight loss on heating (72 h at 82°C (180°F)), max, %	2.0

[A] Requirement being revised.

7. Sampling

7.1 The molding compound shall be sampled in accordance with the sampling procedure described in Practice D 1898. A batch of molding compound shall be considered as a unit of manufacture as prepared for shipment and may consist of a blend of two or more "production runs" of material.

8. Test Methods

8.1 The properties enumerated in this specification shall be determined in accordance with the following test methods:

8.1.1 *Conditioning*—Molded test specimens of vinylidene chloride molding compounds are not sensitive to humidity but condition for at least 48 h at 23 ± 1°C (73.4 ± 1.8°F) prior to testing, unless otherwise specified in the test methods or in this specification.

8.1.2 *Test Conditions*—Conduct the tests in a laboratory atmosphere of 23 ± 1°C (73.4 ± 1.8°F), unless otherwise specified in the test methods or in this specification.

8.1.3 *Viscosity of 2 % Solution*—Determine the viscosity of the 2 % solution as follows:

8.1.3.1 *Apparatus*—Size 50 Cannon-Fenske viscometer conforming to the requirements prescribed in Appendix X1 of Test Method D 445, source of compressed air, constant-temperature oil bath accurately maintained at 120°C (248°F), small oil bath, 5-mL pipet, 1-oz wide-mouth bottle, and stop watch or timer.

8.1.3.2 *Reagent*—The ortho-dichlorobenzene used for preparing the 2 % solution shall be the grade containing 96 to 99 % of ortho-dichlorobenzene and 1 to 4 % of paradichlorobenzene and conforming to the following requirements:

	Limit	ASTM Method
Specific gravity, 20/4°C:		
max	1.311	D 268 [A]
min	1.305	
Distillation range (first drop to dry point):		
	179 to 180.7°C (354.2 to 357.3°F)	D 86 [B]
Freezing point:		
max	−17.2°C (+1°F)	[C]
min	−18.6°C (−1.5°F)	[C]

[A] D 268, Sampling and Testing Volatile Solvents and Chemical Intermediates for Use in Paint and Related Coatings and Material.[9]

[B] D 86, Distillation of Petroleum Products.[3]

[C] Freezing point shall be determined as follows: Use a thick-walled test tube having a side tube and fitted into a slightly wider jacket.[10] Place the tube and jacket in a covered jar filled with a freezing mixture. Pour a sample of the ortho-dichlorobenzene in the inner test tube and close the test tube with a cork stopper containing a stirrer and a thermometer. The thermometer shall have subdivisions and an accuracy of 0.1°C in the approximate range from −25 to −15°C and should be calibrated by comparison with a standard thermometer. Regulate the temperature of the freezing mixture to not more than 5°C below the expected freezing point of the sample. Remove the test tube from its jacket and immerse it in the freezing mixture until the sample begins to freeze. Replace the test tube in its jacket and stir the sample vigorously. As the sample solidifies, the temperature will rise until the true freezing point is reached and then it will remain constant. Record this temperature as the freezing point of the sample.

8.1.3.3 *Preparation of 2 % Solution*—Weigh 0.2663 g of the sample into the wide-mouth bottle and add 10 mL of ortho-dichlorobenzene to make a 2 % solution of polymer. Heat in the small oil bath with constant stirring to about 165°C (329°F) until all of the test sample has dissolved. If too much heat is applied, the test sample will decompose, which is indicated by a dark coloration, and the viscosity obtained will be low.

8.1.3.4 *Procedure*—Clean and dry the viscometer, and suspend it in the constant-temperature bath for a sufficient time to reach bath temperature. Preheat the pipet and then transfer 5 mL of the hot 2 % solution to the viscometer, using a piece of cotton over the tip of the pipet for a filter. Force the solution up the capillary above the upper mark, using compressed air, and then allow it to drain down through the capillary. Again force the solution up the capillary just above the upper mark using compressed air, allow it to drain down, and measure the time interval for the meniscus to pass from the upper to the lower mark, using the stop watch or timer. Repeat this operation three times and

[9] *Annual Book of ASTM Standards*, Vol 06.03.

[10] The Beckman apparatus, described in *Physikalisch-Chemisches Centrablatt*, PCCEA, Part II, 1888, p. 683, has been found satisfactory.

average the three measurements of efflux time. The three measurements should agree within 1 s. Since the solution solidifies upon cooling, the viscometer should be removed from the bath and boiling ortho-dichlorobenzene immediately forced through the capillary to remove all of the solution. Two check tests shall be conducted on each 2 % solution in two separate viscometers, and the results should agree within 0.01 cP.

8.1.3.5 *Calculations*—Calculate the kinematic viscosity of the 2 % solution in accordance with the provisions of Test Method D 445, and convert the results in centistokes to centipoises as follows:

$$\text{Viscosity, cP} = s \times V$$

where:

s = specific gravity of 2 % solution, and
V = kinematic viscosity of 2 % solution, cSt.

8.1.4 *Flow Temperature*—Method D 569.

8.1.5 *Specific Gravity*—Method A of Test Methods D 792.

8.1.6 *Tensile Strength*—Test Method D 638, using a speed of testing of 0.25 in./min.

8.1.7 *Deflection Temperature*—Test Method D 648, using a fiber stress of 1820 kPa (264 psi).

8.1.8 *Water Absorption*—Test Method D 570, using the 24-h immersion.

8.1.9 *Dielectric Strength*—Test Method D 149, using test specimen 3.175 mm (⅛ in.) in thickness and immersed in oil. Test three specimens using short term and three specimens using step-by-step procedures.

8.1.10 *Dielectric Constant and Dissipation Factor*—Test Methods D 150. Test five specimens of convenient thickness, measured in accordance with Test Methods D 374, using vacuum plated metal electrodes. Other electrode systems, as specified in Test Methods D 150, may be used upon agreement between the buyer and the seller.

8.1.11 *Volume Resistivity*—Test Methods D 257. Test three specimens.

8.1.12 *Burning Rate*—Test Method D 568.

8.1.13 *Impact Strength (Izod)*—Method A of Test Methods D 256, and Recommended Practice D 759.

8.1.14 *Weight Loss on Heating*—Condition test specimens 3 by 1 by ⅛ in. for 48 h over anhydrous calcium chloride at 23 ± 1°C (73.4 ± 1.8°F). Weigh the specimens and then place in a circulating air oven for 72 h at 82 ± 1°C (180 ± 1.8°F). Support the specimens flatwise on a screen in the oven. Upon removal from the oven, cool the specimens in a desiccator over anhydrous calcium chloride to 23 ± 1°C (73.4 ± 1.8°F). Weigh the specimens and calculate the percentage weight loss on heating on the basis of the conditioned weight.

8.2 *Precision and Bias:*

8.2.1 Precision and bias statements are included in each ASTM test method listed in the Referenced Document section.

8.2.2 Attempts to develop precision and bias statements have not been successful for the "Viscosity of 2 % Solution" test method and the "Weight Loss on Heating" test method included herein. For this reason precision and bias statements cannot be given. Anyone wishing to participate in the development of precision and bias data should contact the Chairman of Section D20.15.07.

9. Number of Tests

9.1 One set of test specimens as prescribed in the test methods (Section 8) shall be considered sufficient for testing each batch. The average result for the specimens tested shall conform to the requirements prescribed in this specification. All of the tests listed in Section 8 shall be used to establish conformity of a material to this specification. It is recommended that routine inspection be limited to those tests required to identify the material to the satisfaction of the purchaser. The purchaser shall state in the contract or order the tests that the manufacturer will be required to make on each shipment for identification of the material.

10. Retest and Rejection

10.1 If any failure occurs, the materials may be retested to establish conformity in accordance with agreement between the purchaser and the seller.

11. Packaging and Marking

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

11.2 *Marking*—Shipping containers shall be marked with the name of the material, form, and quantity contained therein, as defined by the contract or order under which shipment is made, the name of the manufacturer, and the number of the contract or order.

11.3 All packing, packaging, and marking provisions of Practice D 3892 shall apply to this specification.

12. Keywords

12.1 molding compounds; vinylidene chloride; vinylidene chloride/vinylidene chloride copolymer