



Standard Test Method for Determining Residual Vinyl Chloride Monomer Content in PPB Range in Vinyl Chloride Homo- and Co-Polymers by Headspace Gas Chromatography¹

This standard is issued under the fixed designation D 4443; 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 test method is suitable for determining the residual vinyl chloride monomer (RVM) content of homopolymer and copolymers of vinyl chloride down to a level of ~5 ppb.

1.2 This test method is applicable to any polymer form, such as resin, compound, film, bottle wall, etc. that can be dissolved in a suitable solvent.

1.3 *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.* Specific hazard statements are given in Section 9 and Note 13.

NOTE 1—There is no similar or equivalent ISO standard.

2. Referenced Document

- 2.1 OSHA Standard:
29 CFR 1919.1017—Vinyl Chloride²

3. Terminology

- 3.1 *Abbreviations: Abbreviations:*
3.1.1 DMAc—N,N-dimethylacetamide.
3.1.2 VCM—Vinyl chloride monomer.

4. Summary of Test Method

4.1 Samples of vinyl chloride-containing polymers are dissolved in a suitable solvent in a closed system.

4.2 The polymer solution and headspace are equilibrated at an elevated temperature.

4.3 Aliquots of headspace gas are injected into a gas chromatograph and the vinyl chloride monomer is separated.

The response of vinyl chloride monomer is determined by the use of one of several suggested detectors.

4.4 Calibration is accomplished using either (a) vinyl chloride monomer in nitrogen gas standards, (b) standard solutions containing known amounts of vinyl chloride monomer, or (c) a method of standard addition.

5. Significance and Use

5.1 Vinyl chloride-containing polymers are widely used to package a variety of materials, including foods.

5.2 Vinyl chloride monomer has been shown to be a human carcinogen. Threshold toxicity value has not been established.

5.3 Plastic manufacturers, food packagers, government agencies, etc. have a need to know the residual vinyl chloride monomer content of vinyl chloride-containing polymers.

6. Interferences

6.1 N,N-dimethylacetamide should be analyzed under identical conditions to determine the absence of interferences at the vinyl chloride monomer gas chromatography (GC) retention time.

6.2 Other solvents, monomers, or compounding aids may cause interference at the vinyl chloride monomer GC retention time.

7. Apparatus

7.1 *Gas Chromatography*, equipped with either a flame ionization detector (FID), a photo ionization detector (PID), or a Hall electroconductivity detector (HED), backflushing valve, and either automatic capability or manual sampling (Note 2) and ability to analyze the headspace vapors contained in a sealed vial.

NOTE 2—If the analyses are to be performed manually (that is, by syringe injection), then the following equipment will also be needed:

- (1) Constant-temperature bath or oven capable of maintaining a temperature of $90 \pm 1^\circ\text{C}$.
- (2) Gas-tight GC syringes for sampling and injection.
- (3) Sample bottles with fluoropolymer faces septa and caps (size optional).
- (4) Gloves for handling hot syringes.

¹ This test method is under the jurisdiction of ASTM Committee D20 on Plastics and is the direct responsibility of Subcommittee D20.70 on Analytical Methods (Section D20.70.03).

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This revision includes the addition of an ISO equivalency statement and a keywords section.

² Available from Superintendent of Documents, US Government Printing Office, Washington, DC 20402.