



Designation: D7132 – 19

Standard Test Method for Determination of Retained Blowing Agent in Extruded Polystyrene Foam¹

This standard is issued under the fixed designation D7132; 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 covers the determination of retained blowing agent in extruded polystyrene foam.

1.2 This test method applies to organic blowing agents which lend themselves to a convenient analysis by gas chromatography. The method is not applicable to blowing agents such as nitrogen, carbon dioxide, or water.

1.3 The values stated in SI units are to be regarded as standard. No other units of measurement are included in this standard.

1.4 *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—There is no known ISO equivalent to this standard.

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. Summary of Test Method

2.1 Polystyrene foams are made with a variety of blowing agents such as hydrocarbons, hydrofluorocarbons, ethers, ketones, and other volatile organic chemicals. A fraction of the blowing agent used in the manufacture of foam is retained in the product, some residing in the cell walls and some entrapped inside the cells. This test method is based on releasing the retained blowing agent by dissolving the polystyrene foam in a solvent, such as toluene, and then analyzing the solution for its components by gas chromatography. An internal standard is used as a reference analyte and calibration of the gas chro-

matograph (GC) with standard solutions allows conversion of the GC response to the amount of blowing agent retained in the foam matrix.

3. Interferences

3.1 The gas chromatogram has the potential to contain a signal(s) from the polymer matrix that interferes with the signal(s) from the blowing agent components. Test calibration solutions with and without the polymer matrix to rule out any interference. These calibration solutions shall contain about the same amount of dissolved resin as in the foam sample being analyzed.

4. Apparatus

4.1 Any GC equipped with a column suitable for resolving blowing agent components is suitable for use. For example, if separating non-polar blowing agents, a 100 % dimethylpolysiloxane with 530- μ m thick film and 30-m length is a reasonable selection. If separating polar blowing agents, a 50 % diphenyl/50 % dimethyl polysiloxane column with 530- μ m thick film and 30-m length is suitable. Typical operating parameters for the GC are:

Head pressure (kPa)	50
Initial oven temperature ($^{\circ}$ C)	50
Initial hold time (min)	3.5
Temperature program rate ($^{\circ}$ C/min)	25
Final temperature ($^{\circ}$ C)	150
Final hold time (min)	3
Injector temperature ($^{\circ}$ C)	250
Detector temperature ($^{\circ}$ C)	300
Carrier gas	He
Carrier gas flow rate (cm^3/min)	30
Injection sample size (μ L)	0.2

NOTE 2—An autosampler is not recommended as the transfer of a solution containing volatile components can lead to loss of the volatile analyte.

4.2 Analytical balance with at least 250 g full scale and 0.1 mg resolution.

4.3 Instrument grade air supplied at 515 ± 40 kPa, helium at 450 ± 40 kPa, and hydrogen at 380 ± 40 kPa.

4.4 Volumetric flasks.

4.5 1- cm^3 syringe with Chaney Adapter, and 10- cm^3 gas tight syringe with Chaney Adapter.

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.

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