Designation: D8060 – 16

Standard Specification for 2-Bromo-3,3,3-Trifluoro-1-Propene ($CF_3CBr=CH_2$)[1]

This standard is issued under the fixed designation D8060; 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 requirements for 2-Bromo-3,3,3-Trifluoro-1-Propene ("2-BTP") as a fire-fighting medium.

1.2 This specification does not address the fire-fighting equipment or hardware that employs 2-BTP or the conditions of employing such equipment (for example, handhelds, fixed installations, etc.).

1.3 This specification does not address the storage or transportation of 2-BTP. Storage, handling, and transportation issues are addressed in Practice D8061.

1.4 The values stated in inch-pound units are to be regarded as standard. The values given in parentheses are mathematical conversions to SI units that are provided for information only and are not considered standard.

1.5 The following safety hazards caveat pertains only to the test methods portion, Section 6, of this specification:

1.5.1 *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 hazards statements are given in Section 4.

2. Referenced Documents

2.1 *ASTM Standards:*[2]

D6806 Practice for Analysis of Halogenated Organic Solvents and Their Admixtures by Gas Chromatography

D8061 Practice for Handling, Transportation, and Storage of 2-Bromo-3,3,3-Trifluoro-1-Propene ($CF_3CBr=CH_2$)

2.2 *ASHRAE Standard:*[3]

ASHRAE 34 Designation and Safety Classification of Refrigerants

2.3 *U.S. Government Standard:*[4]

CFR Title 49, Part 172, Subpart D U.S. Department of Transportation (DOT), Marking Requirements of Packaging for Transportation

2.4 *AHRI Standard:*[5]

2008 Appendix C for Analytical Procedures for AHRI Standard 700-2014

3. Terminology

3.1 *Definitions of Terms Specific to This Standard:*

3.1.1 *2-BTP, n*—2-Bromo-3,3,3-Trifluoro-1-Propene ($CF_3CBr=CH_2$); a compound used to inert, extinguish, or suppress a fire or explosion hazard.

3.1.1.1 *Discussion*—The terminology system for fluorine-containing compounds (described in detail in ASHRAE Standard 34) provides a convenient means to reference the structure of individual compounds. By definition for unsaturated compounds, the first digit of the numbering system represents the number of unsaturated bonds; the second digit represents one less than the number of carbon atoms in the compound molecule; the third digit, one more than the number of hydrogen atoms in the compound molecule; and the fourth digit, the number of fluorine atoms in the compound molecule. Unaccounted for valence requirements are assumed to be chlorine atoms. In those instances where bromine (Br) is present in place of part or all of the chlorine, an uppercase letter B is added after the designation for the parent compound. The number following the letter B represents the number of bromine atoms present. For example, the designation R-1233B1 indicates a compound with one unsaturated bond (1), three carbon atoms (2 + 1), two hydrogen atoms (3 - 1), three fluorine atoms (3), and one bromine atom (B1). Since the number of atoms required based on valence requirements are met, there is no chlorine present. Example: $CF_3CBr=CH_2$ is equivalent to R-1233B1.

4. Material Requirements

4.1 "2-BTP" shall conform to the requirements prescribed in Table 1 when tested by the appropriate test methods listed in Section 6.

[1] This specification is under the jurisdiction of ASTM Committee D26 on Halogenated Organic Solvents and Fire Extinguishing Agents and is the direct responsibility of Subcommittee D26.09 on Fire Extinguishing Agents.

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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 Society of Heating, Refrigerating, and Air-Conditioning Engineers, Inc. (ASHRAE), 1791 Tullie Circle, NE, Atlanta, GA 30329, http://www.ashrae.org.

[4] Available from U.S. Government Publishing Office, 732 N. Capitol St., NW, Washington, DC 20401-0001, http://www.gpo.gov.

[5] Available from Air-Conditioning, Heating, & Refrigeration Institute, 2111 Wilson Blvd., Suite 500, Arlington, VA 22201, http://www.ahrinet.org.

TABLE 1 Requirements

Property	Requirement
2–BTP Purity	99.0 %, vol/mol, min
Acidity	3.0 ppm by mass, as HCl, max
Water content	20 ppm by mass, max
Nonvolatile residue	0.45 % by weight, max
Suspended matter or sediment	none visible
Stabilizers	present

4.1.1 When a material analysis is required, by agreement between the purchaser and the supplier, the total pressure in the 2-BTP container, the fill density of 2-BTP within the container and the maximum safe storage temperature shall be part of the material analysis (certification). The pressure shall be reported in pound-force per square inch gauge (preferred) or bar. The fill density shall be reported in pounds per cubic foot at 70°F (preferred) or kilograms per cubic meter at 21°C. The maximum safe storage temperature of the 2-BTP container shall be reported in degrees Fahrenheit (preferred) or in degrees Celsius and shall conform to applicable regulations for the 2-BTP container design and use.

4.2 By agreement between the purchaser and the supplier, analysis may be required and limits established for elements or compounds not specified in Table 1.

4.3 Prolonged exposure to concentrations of 2-BTP in excess of 1 % by volume in air during periods of elevated adrenaline could produce cardiac arrhythmia in some personnel.

5. Sampling

5.1 Samples of 2-BTP shall be taken from the liquid phase in a closed system (that is, the sample should not be exposed to air).

5.2 The 2-BTP selected in accordance with 5.1 shall be tested for quality conformance in accordance with Table 1. The presence of one or more defects shall be cause for rejection.

6. Test Methods

6.1 *Purity*—Conduct the analysis in accordance with Practice D6806.

6.2 *Acidity*—Conduct the analysis in accordance with the method specified in 2008 Appendix C to AHRI Standard 700-2014, Part 1.

6.3 *Water Content*—Conduct the analysis in accordance with the method specified in 2008 Appendix C to AHRI Standard 700-2014, Part 2.

6.4 *Nonvolatile Residue*—Conduct the analysis in accordance with the method specified in 2008 Appendix C to AHRI Standard 700-2014, Part 3. This material develops a stable residue, primarily comprised of oligomers containing up to five molecules of 2-BTP.

6.5 *Suspended Matter or Sediment*—While performing the nonvolatile residue analysis, examine visually for any suspended matter or sediment. Observation of any suspended matter or sediment shall constitute failure of the test.

6.6 *Stabilizers*—This compound requires stabilizing additives. The original manufacturer should be consulted.

7. Container, Packaging, and Package Marking

7.1 This material is not regulated as a hazardous material by DOT.

7.2 Containers should be marked with the following information as a minimum:

7.2.1 Supplier's name and address,

7.2.2 "2-Bromo-3,3,3-Trifluoro-1-Propene," and

7.2.3 Statement that material conforms to Specification D8060.

8. Keywords

8.1 2-bromo-3,3,3-trifluoro-1-propene; 2-bromo-3,3,3-trifluoropropene; 2-BTP; bromotrifluoropropene; BTP; $CF_3CBr{=}CH_2$; fire extinguishant; fire suppressant; Halotron[6] BrX; R-1233B1

[6] Halotron is a trademark of American Pacific Corporation.