



Standard Test Method for Manganese in Gasoline By Atomic Absorption Spectroscopy¹

This standard is issued under the fixed designation D 3831; 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 the total manganese content, present as methylcyclopentadienyl manganese tricarbonyl (MMT)², of gasoline within the concentration range from 0.25 to 40 mg/L of manganese.

1.2 This test method is applicable to reformulated gasoline containing up to 12 % volume methyl tertiary butylether or up to 10 % volume ethanol. This test method may not be applicable to highly cracked materials containing greater than 18 volume % olefins as determined by Test Method D 1319 (nondepentanized).

1.3 This test method has been developed and tested specifically for the determination of MMT in gasoline over the recommended concentration range. Application of the method to other concentration ranges, to the determination of MMT in other materials, or to the determination of other manganese compounds in gasoline have not been tested

1.4 The values stated in SI units are to be regarded as the standard. The preferred concentration units are mg/L manganese.

1.5 *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. For specific precautionary statements, see Sections 5, 6 and 7.*

2. Referenced Documents

2.1 ASTM Standards:

- D 1319 Test Method for Hydrocarbon Types in Liquid Petroleum Products by Fluorescent Indicator Adsorption³
- D 4057 Practice for Manual Sampling of Petroleum and Petroleum Products⁴
- D 4177 Practice for Automatic Sampling of Petroleum and Petroleum Products⁴

¹ This test method is under the jurisdiction of ASTM Committee D02 on Petroleum Products and Lubricants and is the direct responsibility of Subcommittee D02.03 on Elemental Analysis.

Current edition approved May 10, 2001. Published June 2001. Originally published as D 3831 – 79. Last previous edition D 3831 – 98.

² MMT is a registered trademark of Ethyl Corp.

³ *Annual Book of ASTM Standards*, Vol 05.01.

⁴ *Annual Book of ASTM Standards*, Vol 05.02.

D 6299 Practice for Applying Statistical Quality Assurance Techniques to Evaluate Analytical Measurement System Performance⁵

D 6300 Practice for Determination of Precision and Bias Data for Use in Test Methods for Petroleum Products and Lubricants⁵

3. Summary of Test Method

3.1 The gasoline sample is treated with bromine solution and diluted with methyl isobutyl ketone. The manganese content of the sample is determined by atomic absorption spectrometry using an air-acetylene flame at 279.5 nm and standards prepared from an organo-manganese standard material.

4. Significance and Use

4.1 Certain organo-manganese compounds act as antiknock agents when added to gasoline. This test method provides a means for determining the concentration of such a material in a gasoline sample.

5. Apparatus

5.1 *Atomic Absorption Spectrometer*, capable of scale expansion and equipped with a manganese hollow-cathode lamp for monitoring manganese absorption at 279.5 nm, a premix slot-type burner with rotatable burner head, and an adjustable nebulizer. (**Warning**—Hazardous. Potentially toxic and explosive. Refer to the manufacturer's instrument manual for associated safety hazards.)

5.2 *Vials*, up to 40-mL size with polyethylene or TFE-fluorocarbon-lined caps or glass stoppers.

5.3 *Pipet, Delivery*, 1-mL size.

5.4 *Micropipet*, 100-μL size, Eppendorf type or equivalent.

5.5 *Automatic Pipet*, or equivalent delivery pipet, capable of delivering 9.0-mL quantities.

6. Reagents

6.1 *Purity of Reagents*—Reagent grade chemicals shall be used in all tests. Unless otherwise indicated, it is intended that all reagents shall conform to the specifications of the Committee on Analytical Reagents of the American Chemical Society,

⁵ *Annual Book of ASTM Standards*, Vol 05.03.

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