



Designation: D8110 – 17

Standard Test Method for Elemental Analysis of Distillate Products by Inductively Coupled Plasma Mass Spectrometry (ICP-MS)¹

This standard is issued under the fixed designation D8110; 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.

INTRODUCTION

Certain elements present in distillate petroleum can either adversely or constructively affect the performance of the product and thus impacts its utility and market value. The industry has traditionally relied on inductively coupled plasma atomic emission spectrometry (ICP-AES) or atomic absorption spectrometry (AAS) to determine the concentration of these elements present in the product. As specifications have become more stringent, a need to extend these measurements to lower concentrations by employing more sensitive measurement technologies has arisen. Inductively coupled plasma mass spectrometry is ideal for this application for most distillate petroleum products. By applying ICP-MS for elemental analysis of these products, the concentration range of detectable elements can be extended from low to sub ng/g (ppb mass) to 1000 ng/g (ppb mass) for some elements.

1. Scope

1.1 This test method describes the procedure for the determination of trace elements in light and middle distillate petroleum products using inductively coupled plasma mass spectrometry (ICP-MS).

1.2 This test method should be used by analysts experienced in the use of inductively coupled plasma mass spectrometry (ICP-MS) with knowledge of interpretation of spectral, isobaric, polyatomic, and matrix interferences, as well as procedures for their correction or reduction.

1.3 The table in 6.1 lists elements for which the test method applies along with recommended isotope. Actual working detection limits are sample dependent and, as the sample matrix varies, these detection limits may also vary.

1.4 The concentration range of this test method is typically from low to sub ng/g (ppb mass) to 1000 ng/g (ppb mass), however the precision and bias statement is specified for a smaller concentration range based on test samples analyzed in the ILS, see the table in Section 18. The test method may be used for concentrations outside of this range; however, the precision statements may not be applicable.

1.4.1 This test method shall be further developed to extend that table to include additional elements.

1.5 This test method uses metallo-organic standards (organometallic or organosoluble metal complex) for calibration and does not purport to quantitatively determine insoluble particulates. Analytical results are particle size dependent, and low results are obtained for particles larger than a few micrometers as these particles may settle out in the sample container and are not effectively transported through the sample introduction system.

1.6 Elements present at concentrations above the upper limit of the calibration curves can be determined with additional, appropriate dilutions and with no degradation of precision.

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

1.8 *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 warning statements are given in 8.2, 8.7, and Section 9.

1.9 *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.*

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

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