



Designation: D8371 – 24

Standard Test Method for Trace Metal Content Analysis in Carbon Black¹

This standard is issued under the fixed designation D8371; 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 metal content in carbon black with ICP-OES or ICP-MS after adequate digestion. See 3.1.5 – 3.1.7 for definitions.

1.2 The concentration ranges covered by these test methods are determined by the sensitivity of the instruments, the amount of sample taken for analysis and the dilution volume.

1.3 Detection limits, sensitivity and optimum ranges of the metals will vary with the matrices and model of spectrometer.

1.4 Elements present at concentrations above the linear response range of the calibration curve can be determined with additional appropriate dilutions.

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

1.6 *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.*

1.7 *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. Referenced Documents

2.1 *ASTM Standards:*²

D1193 Specification for Reagent Water

D1506 Test Methods for Carbon Black—Ash Content

D7260 Practice for Optimization, Calibration, and Validation

tion of Inductively Coupled Plasma-Atomic Emission Spectrometry (ICP-AES) for Elemental Analysis of Petroleum Products and Lubricants

3. Terminology

3.1 *Definitions:*

3.1.1 *calibration, n*—the process by which the relationship between signal intensity and element concentration is determined for a specific element analysis.

3.1.2 *calibration curve, n*—the plot of signal intensity (on the ‘y’ axis) versus element concentration (on the ‘x’ axis) using data obtained from standards that contain certified trace metal concentrations (calibration solutions), known with high accuracy.

3.1.3 *calibration solution, n*—solution containing mixture of elements of known concentrations (multi element certified standard solution).

3.1.4 *detection limit, n*—the concentration of an analyte that results in a signal intensity that is some multiple (typically three) times the standard deviation of the background intensity of the blank.

3.1.5 *ICP-MS, n*—inductively coupled plasma – mass spectrometry.

3.1.6 *ICP-OES, n*—inductively coupled plasma – optical emission spectrometry.

3.1.7 *inductively coupled plasma (ICP), n*—a high temperature discharge generated by flowing an ionizable gas through a magnetic field induced by a load coil that surrounds the tubes carrying the gas.

3.1.8 *linear response range, n*—the elemental concentration range over which the calibration curve is a straight line, within the precision of the test method.

3.1.9 *secondary solution, n*—calibration solution from a second source.

4. Summary of Test Method

4.1 A sample of carbon black is digested either with strong acid under high temperature and pressure or after incineration of the sample and acid treatment of the ash. By digestion, the trace metals are transferred into their soluble salts, and most of the interfering matrix components, that is, carbon black, are removed.

¹ This test method is under the jurisdiction of ASTM Committee D24 on Carbon Black and is the direct responsibility of Subcommittee D24.66 on Environment, Health, and Safety.

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² For referenced ASTM standards, visit the ASTM website, www.astm.org, or contact ASTM Customer Service at www.astm.org/contact. For *Annual Book of ASTM Standards* volume information, refer to the standard’s Document Summary page on the ASTM website.