



Standard Test Method for Elemental Analysis of Soil and Solid Waste by Monochromatic Energy Dispersive X-ray Fluorescence Spectrometry Using Multiple Monochromatic Excitation Beams¹

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1. Scope

1.1 This test method is based upon energy-dispersive X-ray Fluorescence (EDXRF) spectrometry using multiple monochromatic excitation beams for detection and quantification of selected heavy metal elements in soil and related solid waste.

1.2 This test method is also known as High Definition X-ray Fluorescence (HDXRF) or Multiple Monochromatic Beam EDXRF (MMB-EDXRF).

1.3 This test method is applicable to various soil matrices for the determination of Cr, Ni, As, Cd, Hg, and Pb in the range of 1 to 5000 mg/kg, as specified in [Table 1](#) and determined by a ruggedness study using representative samples. The limit of detection (LOD) for each element is listed in [Table 1](#). The LOD is estimated by measuring a SiO₂ blank sample (see [Table X1.1](#) in [Appendix X1](#)).

1.4 This test method is applicable to other elements: Sb, Cu, Se, Ag, Tl, Zn, Ba, Au, Co, V, Fe, Mn, Mo, K, Rb, Sn, Sr, and Ti.

1.5 *X-ray Nomenclature*—This standard names X-ray lines using the Siegbahn convention.²

1.6 *Units*—The values stated in SI units are to be regarded as standard. No other units of measurement are included in this standard.

1.7 *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.*

¹ This test method is under the jurisdiction of ASTM Committee [D34](#) on Waste Management and is the direct responsibility of Subcommittee [D34.01.06](#) on Analytical Methods.

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² Jenkins, R., Manne, R., Robin, R., and Senemaud, C., “Nomenclature System for X-ray Spectroscopy,” *Pure & Appl Chem.*, Vol 63, No. 5, pp. 735–746, 1991.

2. Referenced Documents

2.1 *ASTM Standards*:³

[D653 Terminology Relating to Soil, Rock, and Contained Fluids](#)

[D4944 Test Method for Field Determination of Water \(Moisture\) Content of Soil by the Calcium Carbide Gas Pressure Tester](#)

[D5283 Practice for Generation of Environmental Data Related to Waste Management Activities: Quality Assurance and Quality Control Planning and Implementation](#)

[D5681 Terminology for Waste and Waste Management](#)

[D5847 Practice for Writing Quality Control Specifications for Standard Test Methods for Water Analysis](#)

[E1169 Practice for Conducting Ruggedness Tests](#)

[E1727 Practice for Field Collection of Soil Samples for Subsequent Lead Determination](#)

[E2554 Practice for Estimating and Monitoring the Uncertainty of Test Results of a Test Method Using Control Chart Techniques](#)

2.2 *Other Documents*:

[ASTM DS46 X-Ray Emission Wavelengths and Kev Tables for Nondiffractive Analysis](#)⁴

[ASTM MNL 7 Manual on Presentation of Data and Control Chart Analysis, 8th ed.](#)⁴

[US EPA Method, Method 6200 Field Portable X-Ray Fluorescence Spectrometry for the Determination of Elemental Concentrations in Soil and Sediment](#)⁵

³ 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.

⁴ Available from ASTM International, 100 Barr Harbor Dr., West Conshohocken, PA 19428-2959, www.astm.org.

⁵ Available from United States Environmental Protection Agency (EPA), William Jefferson Clinton Bldg., 1200 Pennsylvania Ave., NW, Washington, DC 20460, <https://www.epa.gov/hw-sw846/sw-846-test-method-6200-field-portable-x-ray-fluorescence-spectrometry-determination>.