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Standard Practices for Extraction of Trace Elements from Sediments¹

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1. Scope

1.1 These practices describe the partial extraction of soils, bottom sediments, suspended sediments, and waterborne materials to determine the extractable concentrations of certain trace elements.

1.1.1 *Practice A* is capable of extracting concentrations of aluminum, boron, barium, cadmium, calcium, chromium, cobalt, copper, iron, lead, magnesium, manganese, molybdenum, nickel, potassium, sodium, strontium, vanadium, and zinc from the preceding materials. Other metals may be determined using this practice. This extraction is the more vigorous and more complicated of the two.

1.1.2 *Practice B* is capable of extracting concentrations of aluminum, cadmium, chromium, cobalt, copper, iron, lead, manganese, nickel, and zinc from the preceding materials. Other metals may be determined using this practice. This extraction is less vigorous and less complicated than Practice A.

1.2 These practices describe three means of preparing samples prior to digestion:

1.2.1 Freeze-drying.

1.2.2 Air-drying at room temperature.

1.2.3 Accelerated air-drying, for example, 95°C.

1.3 The detection limit and linear concentration range of each procedure for each element is dependent on the atomic absorption spectrophotometric or other technique employed and may be found in the manual accompanying the instrument used. Also see various ASTM test methods for determining specific metals using atomic absorption spectrophotometric techniques.

1.3.1 The sensitivity of the practice can be adjusted by varying the sample size (14.2) or the dilution of the sample (14.6), or both.

1.4 Extractable trace element analysis provides more information than total metal analysis for the detection of pollutants, since absorption, complexation, and precipitation are the methods by which metals from polluted waters are retained in sediments.

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.

2. Referenced Documents

2.1 *ASTM Standards:*

D 887 Practice for Sampling Water-Formed Deposits²

D 1129 Terminology Relating to Water³

D 1193 Specification for Reagent Water³

3. Terminology

3.1 Refer to Terminology D 1129.

4. Summary of Practices

4.1 The chemical portion of both practices involves acid digestion to disassociate the elements complexed in precipitated hydroxides, carbonates, sulfides, oxides, and organic materials. Surface but not interstitially bound elements will be desorbed in the case of clay mineral particulates. The silicate lattices of the minerals are not appreciably attacked (1-5).⁴

4.2 These practices provide samples suitable for analysis using flame or flameless atomic-absorption spectrophotometry, or other instrumental or colorimetric procedures.

5. Significance and Use

5.1 Industrialized and urban areas have been found to deposit a number of toxic elements into environments where those elements were previously either not present or were found in trace amounts. Consequently, it is important to be able to measure the concentration of these pollution-deposited elements to properly study pollution effects.

5.2 This procedure is concerned with the pollution-related trace elements that are described in 4.1 rather than those elements incorporated in the silicate lattices of the minerals from which the sediments were derived. These pollution-related trace elements are released into the water and read-sorbed by the sediments with changes in general water quality, pH in particular. These elements are a serious source of pollution. The elements locked in the silicate lattices are not readily available in the biosphere (1-8).

¹ These practices are under the jurisdiction of ASTM Committee D-19 on Water and are the direct responsibility of Subcommittee D19.07 on Sediments, Geomorphology, and Open-Channel Flow.

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² *Annual Book of ASTM Standards*, Vol 11.02.

³ *Annual Book of ASTM Standards*, Vol 11.01.

⁴ The boldface numbers in parentheses refer to the references at the end of these practices.