

BS ISO 17586:2016



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Soil quality — Extraction of trace elements using dilute nitric acid

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National foreword

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A list of organizations represented on this committee can be obtained on request to its secretary.

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Soil quality — Extraction of trace elements using dilute nitric acid

*Qualité du sol — Extraction d'éléments traces à l'aide d'acide
nitrique dilué*



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Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular the different approval criteria needed for the different types of ISO documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights. Details of any patent rights identified during the development of the document will be in the Introduction and/or on the ISO list of patent declarations received (see www.iso.org/patents).

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For an explanation on the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the WTO principles in the Technical Barriers to Trade (TBT), see the following URL: Foreword — Supplementary information.

The committee responsible for this document is ISO/TC 190, *Soil quality*, Subcommittee SC 3, *Chemical methods and soil characteristics*.

Soil quality — Extraction of trace elements using dilute nitric acid

WARNING — Users of this International Standard should be familiar with usual laboratory practice. This International Standard does not address all of the safety problems, if any, associated with its use. It is the responsibility of the user to establish appropriate safety and health practices and to ensure compliance with any national regulatory conditions.

IMPORTANT — It is absolutely essential that tests conducted according to this International Standard be carried out by suitably trained staff.

1 Scope

This International Standard specifies a method of extracting trace elements from soil at approximately pH 0,5 using a dilute nitric acid solution. Using this method the potential environmental available trace elements as defined in ISO 17402 is extracted.

The method is applicable for all soils and soil like materials.

2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 11464, *Soil quality — Pretreatment of samples for physico-chemical analysis*

ISO 11465, *Soil quality — Determination of dry matter and water content on a mass basis — Gravimetric method*

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

3.1

test portion

analytical portion

quantity of material, of proper size, for measurement of the concentration or other property of interest, removed from the test sample

Note 1 to entry: The test portion may be taken from the field sample or from the laboratory sample directly if no preparation of the sample is required (e.g. with liquids), but usually it is taken from the prepared test sample.

Note 2 to entry: A unit or increment of proper homogeneity, size, and fineness, needing no further preparation, may be a test portion.

[SOURCE: ISO 11074:2005, 4.3.13]

4 Principle

The soil sample with particle size of <2 mm is extracted with $(0,43 \pm 0,02)$ mol/l nitric acid solution at a soil:solution ratio of 1:10 (m/V) for four hours at (20 ± 2) °C. After centrifugation of the suspension,

the liquid phase is filtered through an in-line membrane filter. The solution is then ready for the determination of elements by appropriate analytical methods.

NOTE 1 The determination of trace elements in extracts can be performed using flame, hydride generation or electrothermal atomic absorption spectrometry, inductively coupled plasma atomic emission spectrometry, inductively coupled plasma mass spectrometry or any other sensitive technique.

The pH after extraction is usually in the range of pH 0,5 to 1. For highly calcareous soils, the final pH shall be less than 1,0. In this case, the pH should be adjusted accordingly or the method may not work appropriately.

NOTE 2 The range of pH 0,5 to 1 is required to extract the potential environmental availability of trace elements as defined in ISO 17402.

5 Interferences

Sulfide minerals will interfere, e.g. if pyrite in soil or sediment change from anaerobic to aerobic conditions and hydrogen sulfide is evolved by contact with nitric acid. Heavy metal sulfides will precipitate.

The extraction is directly applicable to all types of soil, with less than 5 % carbonate. In order to ensure that soils with more carbonate are extracted at the proper pH, the amount of acid neutralised by the soil carbonate has to be accounted by adding extra acid.

6 Reagents

Reagents used shall be of analytical or higher grade. The blank value of the reagents shall be much smaller than the lowest element concentration to be determined.

6.1 Water.

Use only water complying with the requirements for ISO 3696 grade 2 water (electrical conductivity less than 0,1 mS m⁻¹ equivalent to resistivity greater than 0,01 MΩ m at 25 °C). It is recommended that the water be obtained from a water purification system that delivers high purity water having a resistivity greater than 0,18 MΩ m.

6.2 Nitric acid, pro analysis, w(HNO₃) = 63 % to 68 %.

6.3 Nitric acid, diluted, 5 mol/l.

Put 350 ml of nitric acid (6.2) into 500 ml of water, cool to room temperature and fill up in a volumetric flask to 1 l with water.

6.4 Nitric acid, diluted, 0,43 mol/l.

Dilute 30 ml of nitric acid (65 %) to 1 l water (6.1). Add nitric acid (6.2) to the water.

NOTE Using another percentage of nitric acid (6.2), adjust the amount of nitric acid to obtain 0,43 ± 0,02 mol/l.

7 Apparatus

All glassware used shall be thoroughly cleaned, e.g. with 5 % nitric acid to remove contaminants.

7.1 Balance, accuracy 0,01 g.

7.2 Conical test tubes with screwing caps, of nominal capacity 150 ml to 200 ml, made of polypropylene or another suitable material. Before use check cleanliness of tubes and caps.