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Fertilizers and soil conditioner — Mineral soil amendments — Determination of total calcium and magnesium content

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Foreword

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This document was prepared by Technical Committee ISO/TC 134, *Fertilizers, soil conditioners and beneficial substances*.

Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at www.iso.org/members.html.

Introduction

The determination of calcium and magnesium content of mineral soil amendments, and especially total content is part of the assessment of their properties through their chemical characteristics.

In order to improve efficiency, this document provides a list of existing and relevant methods published all over the world. As most of these methods claim total content, no significant differences are expected between existing methods, provided calibration, sample preparation, dilution and measurement procedures are operated as described. Total extraction is supposed to be the strongest method and to give the highest result.

Fertilizers and soil conditioner — Mineral soil amendments — Determination of total calcium and magnesium content

1 Scope

This document establishes an overview of the relevant methods for the determination of calcium and magnesium as defined in ISO 8157.

This document is applicable to any mineral soil amendment, neutral, basic or acid containing calcium and/or magnesium.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 8157:2015, *Fertilizers and soil conditioners — Vocabulary*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 8157:2015 apply.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

— ISO Online browsing platform: available at https://www.iso.org/obp

— IEC Electropedia: available at http://www.electropedia.org/

4 List of existing and relevant methods

The following methods listed in Table 1 below have been considered in their scope. All these methods are considered relevant and suitable for the purpose of the determination of total calcium and/or magnesium content in mineral soil amendments defined in ISO 8157.

Table 1 — List of existing and relevant methods for the determination of total calcium and/or magnesium content in mineral soil amendments

Origin	Reference	Title	Official scope	Extraction	Measurement	Ring test r/R
USA	AOAC 917.02[17]	Calcium in Liming Materials — Gravimetric Method	Liming materials	Information not available	Information not available	Information not available
USA	AOAC 919.01[18]	Magnesium in liming materials — Gravimetric Method	Liming Materials	Information not available	Information not available	Information not available
USA	AOAC 990.08[14]	Metals in solid waste, ICP-AES	Waste	—	ICP-AES	Information not available
USA	AOAC 2017.02[15]	Simultaneous Determination of Arsenic, Cadmium, Calcium, Chromium, Cobalt, Copper, Iron, Lead, Magnesium, Manganese, Molybdenum, Nickel, Selenium, and Zinc in Fertilizers	Fertilizer	Microwave Acid Digestion	ICP-OES[a]	Information not available
USA	EPA 3050 B[5]	Acid digestion of sediments, sludges and soils	Sediments, sludges, soils	Strong digestion (HNO_3, H_2O_2, HCl)	(specially designed for flame AAS or ICP-AES)	—
USA	EPA 3051[6]	Microwave assisted acid digestion of sediments, sludges, soils and oils	Sludges, sediments, soils and oils	HNO3 + microwave digestion, alternative to method EPA 3050	—	yes
USA	EPA 6010 A[7]	Inductively coupled plasma-atomic emission spectroscopy	Trace elements and metals in solution	—	ICP-AES	yes
USA	EPA 6010 B [8]	Inductively coupled plasma-atomic emission spectrometry	Trace elements and metals in solution	—	ICP-AES	yes
USA	EPA 7140 [9]	Calcium (Atomic Absorption, direct aspiration)	See method 7000 (waste)	—	AAS	yes

[a] RESTRICTION : if the dilution is not precise enough, it can bring some bias.

Table 1 *(continued)*

Origin	Reference	Title	Official scope	Extraction	Measurement	Ring test r/R
USA	ASTM D 511 B[10]	Calcium and Magnesium in water by AAS	?	Water	AAS	?
USA	APHA 3120 B[11]	Inductively coupled plasma (ICP) Method	Water and waste water	—	ICP-AES	yes
Canada	BNQ 0419-070/8.4[12]	Amendements minéraux — Pierre à chaux naturelle — Détermination de la teneur en carbonate de calcium et en carbonate de Magnésium	Pierre à chaux naturelle	HCl	— AAS (ASTM D 511 B) — ICP-AES (AOAC 990.08 or EPA 6010 A)	—
Canada	BNQ 0419-090-6/7.6[13]	Amendements calciques ou magnésiens provenant de procédés industriels	Ca(OH)2 from acetylene production, dust from burnt lime kilns, CaCO3 from kraft paper industry, ashes from wood and ... combustion, steel industry slags, from Portland cement production, egg shells, ...	EPA 3050 B or EPA 3051	— ICP-AES (EPA 6010 B or APHA 3120 B or AOAC 990.08) — AAS (EPA 7140 for Ca, EPA 7450 for Mg)	—
EU	EN 12946:2000[2]	Liming materials — Determination of calcium content and magnesium content — Complexometric method	Liming materials except silicate liming materials	HCl	Titration EDTA — eriochrome black T (Mg) — calcein / thymolphtalein or calcon carbonic acid (Ca and Mg)	yes
EU	EN 12947:2000[3]	Liming materials — Determination of magnesium content — Atomic absorption spectrometric method	All liming materials	HCl	Flame AAS	yes
EU	EN 13475:2002[4]	Liming materials — Determination of calcium content — Oxalate method	Silicate liming materials and other liming materials	HCl and HNO_3	Titration with potassium permanganate	yes
France	AFNOR NF U 44-148: 1984[16]	Matières fertilisantes — Dosage du calcium — Méthode par spectrométrie d'absorption atomique	Fertilizing products	HCl in NF U44-140	AAS	no

[a] RESTRICTION : if the dilution is not precise enough, it can bring some bias.