



BSI Standards Publication

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

**INTERNATIONAL
STANDARD**

**ISO
22145**

First edition
2021-02

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

*Engrais et amendements — Amendements minéraux —
Détermination de la teneur totale en calcium et en magnésium*



Reference number
ISO 22145:2021(E)

© ISO 2021



COPYRIGHT PROTECTED DOCUMENT

© ISO 2021

All rights reserved. Unless otherwise specified, or required in the context of its implementation, no part of this publication may be reproduced or utilized otherwise in any form or by any means, electronic or mechanical, including photocopying, or posting on the internet or an intranet, without prior written permission. Permission can be requested from either ISO at the address below or ISO's member body in the country of the requester.

ISO copyright office
CP 401 • Ch. de Blandonnet 8
CH-1214 Vernier, Geneva
Phone: +41 22 749 01 11
Email: copyright@iso.org
Website: www.iso.org

Published in Switzerland

Contents		Page
Foreword		iv
Introduction		v
1 Scope		1
2 Normative references		1
3 Terms and definitions		1
4 List of existing and relevant methods		1
Bibliography		4

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).

Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

For an explanation of the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT), see www.iso.org/iso/foreword.html.

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 conditioners — 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, *Fertilizers and soil conditioners — Vocabulary*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 8157 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](#) 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 ₂ O 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	HNO ₃ + 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
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)	—

^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
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, CaCO ₃ 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 / thymolphthalein 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
International	ISO 11885:2007	Determination of selected elements by inductively coupled plasma — optical emission spectrometry (ICP-OES), [including Ca and Mg]	Waters, waste waters, sludges, sediments	—	ICP-OES	—
^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
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, CaCO ₃ 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 / thymolphthalein 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
International	ISO 11885:2007	Determination of selected elements by inductively coupled plasma — optical emission spectrometry (ICP-OES), [including Ca and Mg]	Waters, waste waters, sludges, sediments	—	ICP-OES	—
^a RESTRICTION: If the dilution is not precise enough, it can bring some bias.						

This page deliberately left blank

British Standards Institution (BSI)

BSI is the national body responsible for preparing British Standards and other standards-related publications, information and services.

BSI is incorporated by Royal Charter. British Standards and other standardization products are published by BSI Standards Limited.

About us

We bring together business, industry, government, consumers, innovators and others to shape their combined experience and expertise into standards-based solutions.

The knowledge embodied in our standards has been carefully assembled in a dependable format and refined through our open consultation process. Organizations of all sizes and across all sectors choose standards to help them achieve their goals.

Information on standards

We can provide you with the knowledge that your organization needs to succeed. Find out more about British Standards by visiting our website at bsigroup.com/standards or contacting our Customer Services team or Knowledge Centre.

Buying standards

You can buy and download PDF versions of BSI publications, including British and adopted European and international standards, through our website at bsigroup.com/shop, where hard copies can also be purchased.

If you need international and foreign standards from other Standards Development Organizations, hard copies can be ordered from our Customer Services team.

Copyright in BSI publications

All the content in BSI publications, including British Standards, is the property of and copyrighted by BSI or some person or entity that owns copyright in the information used (such as the international standardization bodies) and has formally licensed such information to BSI for commercial publication and use.

Save for the provisions below, you may not transfer, share or disseminate any portion of the standard to any other person. You may not adapt, distribute, commercially exploit or publicly display the standard or any portion thereof in any manner whatsoever without BSI's prior written consent.

Storing and using standards

Standards purchased in soft copy format:

- A British Standard purchased in soft copy format is licensed to a sole named user for personal or internal company use only.
- The standard may be stored on more than one device provided that it is accessible by the sole named user only and that only one copy is accessed at any one time.
- A single paper copy may be printed for personal or internal company use only.

Standards purchased in hard copy format:

- A British Standard purchased in hard copy format is for personal or internal company use only.
- It may not be further reproduced – in any format – to create an additional copy. This includes scanning of the document.

If you need more than one copy of the document, or if you wish to share the document on an internal network, you can save money by choosing a subscription product (see 'Subscriptions').

Reproducing extracts

For permission to reproduce content from BSI publications contact the BSI Copyright and Licensing team.

Subscriptions

Our range of subscription services are designed to make using standards easier for you. For further information on our subscription products go to bsigroup.com/subscriptions.

With **British Standards Online (BSOL)** you'll have instant access to over 55,000 British and adopted European and international standards from your desktop. It's available 24/7 and is refreshed daily so you'll always be up to date.

You can keep in touch with standards developments and receive substantial discounts on the purchase price of standards, both in single copy and subscription format, by becoming a **BSI Subscribing Member**.

PLUS is an updating service exclusive to BSI Subscribing Members. You will automatically receive the latest hard copy of your standards when they're revised or replaced.

To find out more about becoming a BSI Subscribing Member and the benefits of membership, please visit bsigroup.com/shop.

With a **Multi-User Network Licence (MUNL)** you are able to host standards publications on your intranet. Licences can cover as few or as many users as you wish. With updates supplied as soon as they're available, you can be sure your documentation is current. For further information, email cservices@bsigroup.com.

Revisions

Our British Standards and other publications are updated by amendment or revision.

We continually improve the quality of our products and services to benefit your business. If you find an inaccuracy or ambiguity within a British Standard or other BSI publication please inform the Knowledge Centre.

Useful Contacts

Customer Services

Tel: +44 345 086 9001

Email: cservices@bsigroup.com

Subscriptions

Tel: +44 345 086 9001

Email: subscriptions@bsigroup.com

Knowledge Centre

Tel: +44 20 8996 7004

Email: knowledgecentre@bsigroup.com

Copyright & Licensing

Tel: +44 20 8996 7070

Email: copyright@bsigroup.com

BSI Group Headquarters

389 Chiswick High Road London W4 4AL UK