

INTERNATIONAL
STANDARD

ISO
13536

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**Soil quality — Determination of the
potential cation exchange capacity and
exchangeable cations using barium
chloride solution buffered at pH = 8,1**

*Qualité du sol — Détermination de la capacité d'échange cationique
potentielle et des teneurs en cations échangeables en utilisant une
solution tampon de chlorure de baryum à pH = 8,1*



Reference number
ISO 13536:1995(E)

Foreword

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Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

International Standard ISO 13536 was prepared by Technical Committee ISO/TC 190, *Soil quality*, Subcommittee SC 3, *Chemical methods and soil characteristics*.

Annex A of this International Standard is for information only.

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International Organization for Standardization
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Soil quality — Determination of the potential cation exchange capacity and exchangeable cations using barium chloride solution buffered at pH = 8,1

WARNING — Barium is a very toxic element if ingested. The barium ion has health risks for laboratory personnel working with this chemical; it is also harmful for the environment.

1 Scope

This International Standard specifies a method for the determination of the potential cation exchange capacity (CEC) of soil buffered at pH = 8,1 and of the determination of the content of exchangeable sodium, potassium, calcium and magnesium in soil.

This International Standard is applicable to all types of air-dried soil samples.

2 Normative references

The following standards contain provisions which, through reference in this text, constitute provisions of this International Standard. At the time of publication, the editions indicated were valid. All standards are subject to revision, and parties to agreements based on this International Standard are encouraged to investigate the possibility of applying the most recent editions of the standards indicated below. Members of IEC and ISO maintain registers of currently valid International Standards.

ISO 3696:1987, *Water for analytical laboratory use — Specification and test methods*.

ISO 11464:1994, *Soil quality — Pretreatment of samples for physico-chemical analyses*.

3 Principle

The determination of CEC as specified in this International Standard is a modification of the method proposed by Mehlich^{[1],[2]} and modified by

Bascomb^[3]. The CEC of soil samples is determined in barium chloride solution buffered at pH = 8,1 using triethanolamine.

The soil is first saturated with respect to barium by treating the soil three times with buffered barium chloride solution. Subsequently, a known excess of 0,02 mol/l magnesium sulfate solution is added. All the barium present, in solution as well as adsorbed, is precipitated in the form of highly insoluble barium sulfate and the sites with exchangeable ions are then readily occupied by magnesium. The excess magnesium is determined by either flame atomic absorption spectrometry (FAAS) or inductively coupled plasma atomic emission spectrometry (ICP-AES).

It is also possible to determine sodium, potassium, calcium and magnesium (and other elements) in the barium chloride extract of the soil.

NOTES

1 Besides sodium, potassium, calcium and magnesium, it is also possible to determine other cations, for example manganese, in the same extract.

2 A yellowish-brown colour of the barium chloride extract indicates that some organic matter has been dissolved. Since organic matter contributes to the CEC, the measured value will be an underestimate of the potential CEC.

3 The sum of exchangeable cations may give a result that is greater than the CEC due to the dissolution of salts present in the soil. Preliminary washing of the soil with water to remove these salts should not be employed because it could change the relative proportions of cations in the CEC.