

SVENSK STANDARD

SS-EN ISO 12782-3:2012



Fastställt/Approved: 2012-06-12
Publicerad/Published: 2012-06-15
Utgåva/Edition: 1
Språk/Language: engelska/English
ICS: 13.080.05

Markundersökningar – Parametrar för geokemisk modellering av lakning och specifiering av beståndsdelar i mark och material – Del 3: Extraktion av aluminiumoxider och aluminiumhydroxider med ammoniumoxalat/oxalsyra (ISO 12782-3:2012)

Soil quality – Parameters for geochemical modelling of leaching and speciation of constituents in soils and materials – Part 3: Extraction of aluminium oxides and hydroxides with ammonium oxalate/oxalic acid (ISO 12782-3:2012)



Standarder får världen att fungera

SIS (Swedish Standards Institute) är en fristående ideell förening med medlemmar från både privat och offentlig sektor. Vi är en del av det europeiska och globala nätverk som utarbetar internationella standarder. Standarder är dokumenterad kunskap utvecklad av framstående aktörer inom industri, näringsliv och samhälle och befrämjar handel över gränser, bidrar till att processer och produkter blir säkrare samt effektiviserar din verksamhet.

Delta och påverka

Som medlem i SIS har du möjlighet att påverka framtida standarder inom ditt område på nationell, europeisk och global nivå. Du får samtidigt tillgång till tidig information om utvecklingen inom din bransch.

Ta del av det färdiga arbetet

Vi erbjuder våra kunder allt som rör standarder och deras tillämpning. Hos oss kan du köpa alla publikationer du behöver – allt från enskilda standarder, tekniska rapporter och standardpaket till handböcker och onlinetjänster. Genom vår webbtjänst e-nav får du tillgång till ett lättnavigerat bibliotek där alla standarder som är aktuella för ditt företag finns tillgängliga. Standarder och handböcker är källor till kunskap. Vi säljer dem.

Utveckla din kompetens och lyckas bättre i ditt arbete

Hos SIS kan du gå öppna eller företagsinterna utbildningar kring innehåll och tillämpning av standarder. Genom vår närhet till den internationella utvecklingen och ISO får du rätt kunskap i rätt tid, direkt från källan. Med vår kunskap om standarders möjligheter hjälper vi våra kunder att skapa verklig nytta och lönsamhet i sina verksamheter.

Vill du veta mer om SIS eller hur standarder kan effektivisera din verksamhet är du välkommen in på www.sis.se eller ta kontakt med oss på tel 08-555 523 00.



Standards make the world go round

SIS (Swedish Standards Institute) is an independent non-profit organisation with members from both the private and public sectors. We are part of the European and global network that draws up international standards. Standards consist of documented knowledge developed by prominent actors within the industry, business world and society. They promote cross-border trade, they help to make processes and products safer and they streamline your organisation.

Take part and have influence

As a member of SIS you will have the possibility to participate in standardization activities on national, European and global level. The membership in SIS will give you the opportunity to influence future standards and gain access to early stage information about developments within your field.

Get to know the finished work

We offer our customers everything in connection with standards and their application. You can purchase all the publications you need from us - everything from individual standards, technical reports and standard packages through to manuals and online services. Our web service e-nav gives you access to an easy-to-navigate library where all standards that are relevant to your company are available. Standards and manuals are sources of knowledge. We sell them.

Increase understanding and improve perception

With SIS you can undergo either shared or in-house training in the content and application of standards. Thanks to our proximity to international development and ISO you receive the right knowledge at the right time, direct from the source. With our knowledge about the potential of standards, we assist our customers in creating tangible benefit and profitability in their organisations.

If you want to know more about SIS, or how standards can streamline your organisation, please visit www.sis.se or contact us on phone +46 (0)8-555 523 00



Europastandarden EN ISO 12782-3:2012 gäller som svensk standard. Detta dokument innehåller den officiella engelska versionen av EN ISO 12782-3:2012.

The European Standard EN ISO 12782-3:2012 has the status of a Swedish Standard. This document contains the official version of EN ISO 12782-3:2012.

**Förhållandet till övriga delar under samma huvudtitel - Utdrag ur Förord i ISO 12782-3:2012/
Relations to other parts under the same general title - Extract from the Foreword of
ISO 12782-3:2012**

ISO 12782 consists of the following parts, under the general title *Soil quality — Parameters for geochemical modelling of leaching and speciation of constituents in soils and materials*:

- Part 1: *Extraction of amorphous iron oxides and hydroxides with ascorbic acid*
- Part 2: *Extraction of crystalline iron oxides and hydroxides with dithionite*
- Part 3: *Extraction of aluminium oxides and hydroxides with ammonium oxalate/oxalic acid*
- Part 4: *Extraction of humic substances from solid samples*
- Part 5: *Extraction of humic substances from aqueous samples*

© Copyright/Upphovsrätten till denna produkt tillhör SIS, Swedish Standards Institute, Stockholm, Sverige. Användningen av denna produkt regleras av slutanvändarlicensen som återfinns i denna produkt, se standardens sista sidor.

© Copyright SIS, Swedish Standards Institute, Stockholm, Sweden. All rights reserved. The use of this product is governed by the end-user licence for this product. You will find the licence in the end of this document.

Uppllysningar om sakinnehållet i standarden lämnas av SIS, Swedish Standards Institute, telefon 08-555 520 00. Standarder kan beställas hos SIS Förlag AB som även lämnar allmänna uppllysningar om svensk och utländsk standard.

Information about the content of the standard is available from the Swedish Standards Institute (SIS), telephone +46 8 555 520 00. Standards may be ordered from SIS Förlag AB, who can also provide general information about Swedish and foreign standards.

Denna standard är framtagen av kommittén för Karaktärisering av avfall, mark och slam, SIS/TK 535.

Har du synpunkter på innehållet i den här standarden, vill du delta i ett kommande revideringsarbete eller vara med och ta fram andra standarder inom området? Gå in på www.sis.se - där hittar du mer information.

EUROPEAN STANDARD
NORME EUROPÉENNE
EUROPÄISCHE NORM

EN ISO 12782-3

June 2012

ICS 13.080.05

English Version

**Soil quality - Parameters for geochemical modelling of leaching
and speciation of constituents in soils and materials - Part 3:
Extraction of aluminium oxides and hydroxides with ammonium
oxalate/oxalic acid (ISO 12782-3:2012)**

Qualité du sol - Paramètres pour la modélisation
géochimique de la lixiviation et de la spéciation des
constituants des sols et des matériaux - Partie 3: Extraction
des oxydes et hydroxydes d'aluminium à l'acide oxalique et
à l'oxalate d'ammonium (ISO 12782-3:2012)

Bodenbeschaffenheit - Parameter zur geochemischen
Modellierung der Elution und Speziation von Bestandteilen
in Böden und Materialien - Teil 3: Extraktion von
Aluminiumoxiden und -hydroxiden mittels
Ammoniumoxalat/Oxalsäure (ISO 12782-3:2012)

This European Standard was approved by CEN on 31 May 2012.

CEN members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration. Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the CEN-CENELEC Management Centre or to any CEN member.

This European Standard exists in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CEN member into its own language and notified to the CEN-CENELEC Management Centre has the same status as the official versions.

CEN members are the national standards bodies of Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and United Kingdom.



EUROPEAN COMMITTEE FOR STANDARDIZATION
COMITÉ EUROPÉEN DE NORMALISATION
EUROPÄISCHES KOMITEE FÜR NORMUNG

Management Centre: Avenue Marnix 17, B-1000 Brussels

Contents		Page
Foreword		iv
Introduction		v
1	Scope	1
2	Normative references	1
3	Terms and definitions	1
4	Principle	2
5	Apparatus	2
6	Reagents	3
7	Sample pretreatment	3
7.1	Sample size	3
7.2	Particle size reduction	4
7.3	Determination of the water content	5
8	Procedure	5
8.1	Preparation of the extraction solution	5
8.2	Extraction	5
8.3	Analytical determination	5
9	Calculation	5
10	Expression of results	6
11	Test report	6
Annex A (informative) Conditions regarding centrifugation		7
Bibliography		10

Foreword

This document (EN ISO 12782-3:2012) has been prepared by Technical Committee ISO/TC 190 "Soil quality" in collaboration with Technical Committee CEN/TC 345 "Characterization of soils" the secretariat of which is held by NEN.

This European Standard shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by December 2012, and conflicting national standards shall be withdrawn at the latest by December 2012.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CEN [and/or CENELEC] shall not be held responsible for identifying any or all such patent rights.

According to the CEN/CENELEC Internal Regulations, the national standards organisations of the following countries are bound to implement this European Standard: Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and the United Kingdom.

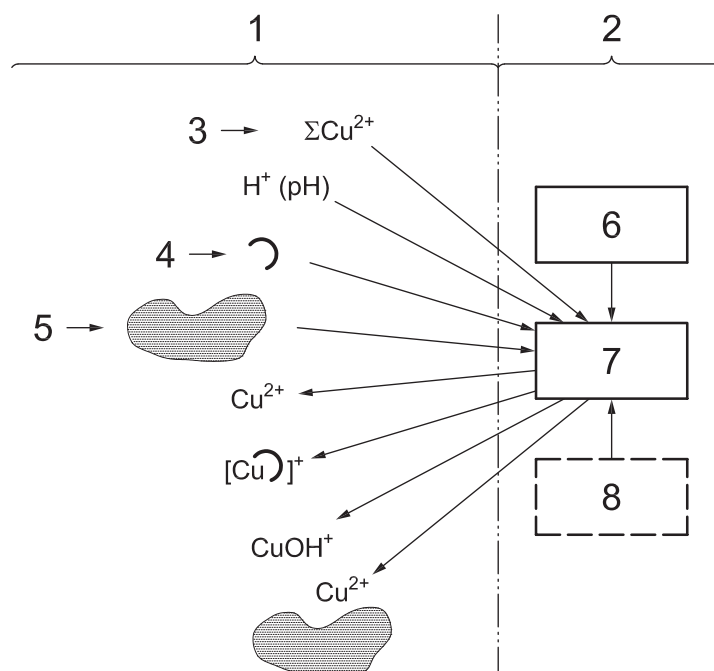
Endorsement notice

The text of ISO 12782-3:2012 has been approved by CEN as a EN ISO 12782-3:2012 without any modification.

Introduction

In addition to leaching procedures for subsequent chemical and ecotoxicological testing of soil and other materials including waste, predictive models are becoming indispensable tools in the environmental risk assessment of these materials. Models are particularly required when the results of laboratory leaching tests are to be translated to specific scenarios in the field, with regard to assessing the risks of both contaminant migration and bioavailability.

In the past few years, geochemical models have been shown to be valuable tools to be combined with the data obtained from characterization leaching standards, such as pH-dependence and percolation tests. These models have the advantage of being based on fundamental thermodynamic parameters that have a general validity. In order to enable extrapolation of laboratory leaching data to the mobility and/or bioavailability of a constituent in a specific field scenario, these models require additional input parameters for specific soil properties (see Figure 1).



Key

- 1 experiment
- 2 geochemical speciation modelling
- 3 available metal concentration
- 4 dissolved humic substances
- 5 reactive (solid) surfaces
- 6 database with stability constants
- 7 computer program
- 8 assumptions

Figure 1 — Relationships between experimental data, as obtained from laboratory leaching/extraction tests, and geochemical modelling of the speciation of a heavy metal in the environment (modified after M. Gfeller & R. Schulin, ETH, Zürich)

Characterization leaching standards provide information on the concentrations of the contaminant of interest as a function of, in particular, pH and liquid/solid (L/S) ratio. In addition, a more complete analysis of the leachates also provides information on the major ion composition and dissolved organic carbon (DOC), parameters that are particularly important for the chemical speciation of constituents through processes such as precipitation, complexation and competition for adsorption on reactive mineral and organic surfaces in the soil. As illustrated

SS-EN ISO 12782-3:2012 (E)

in Figure 1 for the example of copper, geochemical modelling enables calculation of the metal distribution among these different chemical species in the system of interest. This provides necessary information for risk-assessment purposes, as these different chemical forms play distinct roles in the mobility and bioavailability of the metal in the soil. In addition to information obtained from the leaching standards (in their current state of development/definition), two additional types of information are required.

- a) The “available” (sometimes also referred to as “active” or “exchangeable”) concentration of the constituent in the solid phase, as opposed to the total concentration determined by acid destruction of the solid matrix. This “available” concentration can be obtained by leaching at low pH, a condition that can be obtained by extending the pH range in the pH-dependent leaching test (ISO/TS 21268-4) down to $\text{pH} \approx 0,5$ to $\text{pH} \approx 1$.
- b) The concentration of reactive organic and mineral surfaces in the soil, which constitute the major binding (adsorption) sites for most constituents in the soil matrix.

The major reactive surfaces that control the binding of constituents by sorption processes to the soil matrix are particulate organic matter and iron and aluminium (hydr)oxides. It is generally accepted that the reactivity of these mineral and organic surfaces can strongly vary as a function of their specific surface area/crystallinity [iron and aluminium (hydr)oxides] and composition (organic matter). When the results are intended to be used for the above-described purposes of geochemical modelling in conjunction with leaching tests, it is important that the methods be selective for reactive surfaces for which generic thermodynamic adsorption parameters are also available for the most important major and trace elements.

These reactive surfaces have been identified in soils, as well as in a variety of other materials for which the leaching of constituents is of relevance. It has been shown that the binding properties of these surfaces play a generic role in the speciation and leaching of constituents among these different materials. As an example, a similar geochemical modelling approach, using model input from the partial or complete ISO 12782 series, has been successfully applied to different soils^[5], amended soils^{[6][7]}, municipal incinerator bottom ash^[8], steel slag^{[9][10]}, bauxite residues^[11], and recycled concrete aggregate^[12]. Hence, the scope of the ISO 12782 series extends from soils to materials including soil amendments and waste materials.

This part of ISO 12782 aims to determine amorphous aluminium (hydr)oxides in soil and materials. The procedure is based on Reference [13]. Although generic thermodynamic adsorption parameters for aluminium (hydr)oxides are not available, such parameters are available for amorphous iron (hydr)oxides with similar structure and properties^[14]. These parameters have been successfully applied to aluminium (hydr)oxides, as justified and demonstrated in Reference [15].

Thermodynamic parameters for other adsorption models other than those used in Reference [14] are also available in the literature and may also be used to model the binding of constituents to aluminium (hydr)oxides.

Soil quality — Parameters for geochemical modelling of leaching and speciation of constituents in soils and materials —

Part 3: Extraction of aluminium oxides and hydroxides with ammonium oxalate/oxalic acid

1 Scope

This part of ISO 12782 specifies the determination of the content of “reactive” aluminium in the form of amorphous aluminium oxides and hydroxides in soil and other materials by extraction with ammonium oxalate/oxalic acid. Other materials also include waste. The content of “reactive” aluminium can be used as input in geochemical models.

2 Normative references

The following referenced documents are indispensable for the application 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 3696, *Water for analytical laboratory use — Specification and test methods*

ISO 5667-3, *Water quality — Sampling — Part 3: Preservation and handling of water samples*

ISO 10381-1, *Soil quality — Sampling — Part 1: Guidance on the design of sampling programmes*

ISO 10381-2, *Soil quality — Sampling — Part 2: Guidance on sampling techniques*

ISO 10381-3, *Soil quality — Sampling — Part 3: Guidance on safety*

ISO 10381-4, *Soil quality — Sampling — Part 4: Guidance on the procedure for investigation of natural, near-natural and cultivated sites*

ISO 10381-5, *Soil quality — Sampling — Part 5: Guidance on the procedure for the investigation of urban and industrial sites with regard to soil contamination*

ISO 10381-6, *Soil quality — Sampling — Part 6: Guidance on the collection, handling and storage of soil under aerobic conditions for the assessment of microbiological processes, biomass and diversity in the laboratory*

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*

EN 14899, *Characterization of waste — Sampling of waste materials — Framework for the preparation and application of a sampling plan*

EN 15002, *Characterization of waste — Preparation of test portions from the laboratory sample*

CEN/TR 15310-3, *Characterization of waste — Sampling of waste materials — Part 3: Guidance on procedures for sub-sampling in the field*

3 Terms and definitions

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