SVENSK STANDARD
SS-EN ISO 17402:2011

Fastställd/Approved: 2011-07-20
Publicerad/Published: 2011-09-28
Utgåva/Edition: 1
Språk/Language: engelska/English
ICS: 13.080.01

Markundersökningar – Krav och vägledning för val och tillämpning av metoder för värdering av biotillgänglighet hos föroreningar i jord och jordmaterial (ISO 17402:2008)

Soil quality – Requirements and guidance for the selection and application of methods for the assessment of bioavailability of contaminants in soil and soil materials (ISO 17402:2008)

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Europastandarden EN ISO 17402:2011 gäller som svensk standard. Detta dokument innehåller den officiella engelska versionen av EN ISO 17402:2011.

Denna standard ersätter SS-ISO 17402:2008, utgåva 1.

The European Standard EN ISO 17402:2011 has the status of a Swedish Standard. This document contains the official version of EN ISO 17402:2011.

This standard supersedes the Swedish Standard SS-ISO 17402:2008, edition 1.

Upplysningar 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 upplysningar 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.

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EUROPEAN STANDARD

NORME EUROPÉENNE

EUROPÄISCHE NORM

EN ISO 17402

June 2011

ICS 13.080.01

English Version

Soil quality - Requirements and guidance for the selection and application of methods for the assessment of bioavailability of contaminants in soil and soil materials (ISO 17402:2008)

Qualité du sol - Lignes directrices pour la sélection et l'application des méthodes d'évaluation de la biodisponibilité des contaminants dans le sol et les matériaux du sol (ISO 17402:2008)

Bodenbeschaffenheit - Anleitung zur Auswahl und Anwendung von Verfahren für die Bewertung der Bioverfügbarkeit von Kontaminanten im Boden und in Bodenmaterialien (ISO 17402:2008)

This European Standard was approved by CEN on 10 June 2011.

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

Management Centre: Avenue Marnix 17, B-1000 Brussels

Ref. No. EN ISO 17402:2011: E

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Foreword

The text of ISO 17402:2008 has been prepared by Technical Committee ISO/TC 190 “Soil quality” of the International Organization for Standardization (ISO) and has been taken over as EN ISO 17402:2011 by 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 2011, and conflicting national standards shall be withdrawn at the latest by December 2011.

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Endorsement notice

The text of ISO 17402:2008 has been approved by CEN as a EN ISO 17402:2011 without any modification.

Introduction

Laboratory and field studies have demonstrated that biological effects are not related to the total concentration of a contaminant in the soil. Instead, an organism responds only to the fraction that is biologically available (bioavailable) for that organism. This is particularly true in soils that undergo interaction of contaminant molecules with the soil, in such a way that the contaminant is not attainable anymore by the organism or is present in a non-available form (sometimes referred to as sequestration or irreversible sorption). The bioavailable fractions of contaminants are dependent on soil properties and various processes varying with time and on the biological receptors. The conservative approach of exposure assessment, as typically described in a regulatory context, assumes that the total concentration of a contaminant present in a soil or soil material is available for uptake by organisms, including man, and as such will overestimate the risks. Therefore, a risk assessment can be optimised by using an approach that is based on estimated exposure representing the available, effective concentration of the contaminant(s) and on (existing) intrinsic toxicity data.

This assumption is not new as, already in the last half of the nineteenth century, agronomists and soil scientists began to search for chemical methods to determine the concentration of individual plant-available nutrients in agricultural soils. The impetus for this search was the need for recommended nutrient additions to achieve maximum crop yield. Mulder [1] stated already in 1860: "*The unnecessary full analysis of soil to learn if it is fertile or not cannot be argued enough. The long and short of it is availability, which cannot be derived beforehand. The analysis shows what there is, agriculture must draw its own conclusions from that.*" Chemical methods were devised to reasonably predict the availability of inorganic ions necessary for plant development. Chemical partial extraction methods are now commonly used to evaluate available levels of nutrients in soils. Extraction methods have been optimised by correlating extraction results with response of susceptible crop species to the addition of fertilisers.

The concept of availability is nowadays applied to the risk assessment of contaminants and can be tailored to the specific protection goals. Depending on the intended use of a soil or soil material, soil characterisation for different purposes (e.g. assessment of habitat and retention functions, risk assessment and compliance with regulatory values) may include chemical testing and ecotoxicological testing with selected representative test organisms. These tests will, in many cases, be soil- or site-specific at a given point in time, and cannot be extrapolated to other soils or points in time where other factors may control bioavailability.

Bioavailability may be assessed in two complementary ways (see also Figure 1):

— Chemical methods (e.g. extraction methods) which determine the fraction of a well-defined class of contaminants available for defined specific biotic receptors or the mobility of the contaminants in the soil. Usually these chemical methods were developed to predict the amount of contaminants taken up by the organisms. Nevertheless, these analytically determined values can also be correlated with effects. In a routine assessment of soil quality, chemical measurements may replace biological testing, if a correlation between the resulting chemical values and effect or accumulation has been demonstrated.

— Biological methods which expose organisms to soil or soil eluates in order to monitor effects. If accumulation and/or effects (e.g. mortality, growth inhibition) are encountered, bioavailable contaminants are likely to be present even if they cannot be chemically identified. More knowledge on processes controlling bioavailability can close the still existing gap between chemical measurements and biological effects.

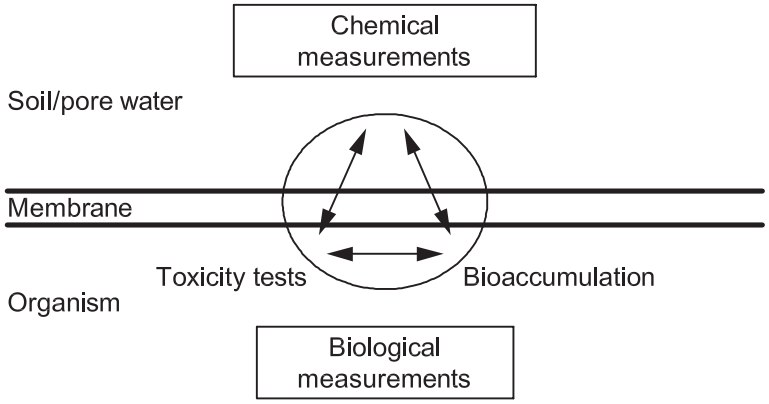

Figure 1 — Methods to assess bioavailability — Relation between chemical and biological assays and bioaccumulation

Under regulatory aspects of soil protection, the risk assessment should be based upon the same common concept with regard to determination/assessment of exposure and measurement/assessment of effects. Thus, existing concepts and derived trigger values based on total concentrations of pollutants in soils or soil materials can be transferred to the proposed concept based on the prediction of the bioavailable fraction by using the more accurate description of exposure. For instance, the translation of information on bioavailability into acceptable evaluations of “how clean is clean” (e.g. site-specific limits for regulating the extent to which the remediation of soil is required) is essential for establishing realistic risk assessments and the determination of proper endpoints for remediation.

A harmonised framework on bioavailability is considered in order to promote the development and introduction of workable standard methods to be used in soil and site assessment. In addition, methods for the estimation of bioavailable effective concentrations of contaminants according to the protection goals envisaged are required. These methods should preferably be described in International Standards and that standardization process should result in a limited set of established methods for the measurement of bioavailability [2]. As described in this International Standard, this process will not lead to one single method to measure bioavailability, because bioavailability depends on variables such as the contaminant, the target and the actual soil properties. Therefore, methods should not only use the word bioavailability but also refer to these variables (bioavailable *for*).

In this International Standard, requirements and guidance are given to select methods to assess bioavailability for different target species with regard to several classes of contaminants. Methods to assess bioavailability are not described in this International Standard. Reference is made to existing International Standards and additional principles of measurement, which may need to be worked out in these International Standards. As only a few standards exist, reference is also made to measuring principles. Guidance is also provided for further standardization of a method where promising first results are reported.

After a short description of methods (Clause 6), the pathways of a contaminant to the target organism are discussed (Clause 7). A summary of existing methods and promising methods that should be further developed is given in Clause 8. Clause 9 gives recommendations and includes the minimal requirements for application and further development.