

Soil quality

Part 4. Biological methods

Section 4.4 Effects of pollutants on microbes

Subsection 4.4.4 Laboratory incubation systems for measuring the mineralization of organic chemicals in soil under aerobic conditions

ICS 13.080

National foreword

This British Standard reproduces verbatim ISO 14239 : 1997 and implements it as the UK national standard.

The UK participation in its preparation was entrusted by Technical Committee EH/4, Soil quality, to Subcommittee EH/4/4, Biological methods, which has the responsibility to:

- aid enquirers to understand the text;
- present to the responsible international/European committee any enquiries on the interpretation, or proposals for change, and keep the UK interests informed;
- monitor related international and European developments and promulgate them in the UK.

A list of organizations represented on this subcommittee can be obtained on request to its secretary.

BS 7755 is being published in a series of Parts subdivided into Sections and Subsections that will generally correspond to particular international standards. Other Parts of BS 7755 are, or will be, as follows.

- Part 1 *Terminology and classification*
- Part 2 *Sampling*
- Part 3 *Chemical methods*
- Part 4 *Biological methods*
- Part 5 *Physical methods*

Cross-references

The British Standards which implement international or European publications referred to in this document may be found in the BSI Standards Catalogue under the section entitled 'International Standards Correspondence Index', or by using the 'Find' facility of the BSI Standards Electronic Catalogue.

Compliance with a British Standard does not of itself confer immunity from legal obligations.

Summary of pages

This document comprises a front cover, an inside front cover, the ISO title page, pages ii to iv, pages 1 to 16, an inside back cover and a back cover.

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INTERNATIONAL STANDARD

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Soil quality — Laboratory incubation systems for measuring the mineralization of organic chemicals in soil under aerobic conditions

*Qualité du sol — Méthodes de mesure de la minéralisation de produits chimiques
organiques dans le sol sous conditions aérobies, au moyen de systèmes
d'incubation de laboratoire*



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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.

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 14239 was prepared by Technical Committee ISO/TC 190, *Soil quality*, Subcommittee SC 4, *Biological methods*.

Annex A forms an integral part of this International Standard. Annex B is for information only.

Introduction

This International Standard describes incubation systems for determining the mineralization of organic compounds in soil under aerobic conditions.

Mineralization is only one of the parameters which can be used to assess the biodegradation of organic compounds in soil. If mineralization is not extensive, this does not necessarily mean that the test material is not biodegradable. Material balance studies to assess the production of metabolites, in addition to mineralization studies, provide a comprehensive assessment of biodegradation.

It is essential that this International Standard be used in conjunction with ISO 11266, which gives general guidance on the information needed to assess the potential of an organic compound to be degraded in soil.

Depending on the aim of the study, it is feasible to use a range of incubation conditions, described below, and different methods of analysis.

NOTE — Several trade names of products are given as examples of products available commercially. This information is given for the convenience of users of this International Standard and does not constitute an endorsement by ISO of these products.

Soil quality - Laboratory incubation systems for measuring the mineralization of organic chemicals in soil under aerobic conditions

1 Scope

This International Standard specifies three incubation systems for measuring the rates and extent of mineralization of organic compounds in soil by measurement of carbon dioxide evolution. All three incubation systems are applicable to soluble or insoluble compounds but choice of system depends on the overall purposes of the study.

This International Standard does not apply to the use of such systems for material balance studies, which are often test-substance specific.

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 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 10381-6:1993, *Soil quality - Sampling - Guidance on the collection, handling and storage of soil for the assessment of aerobic microbial processes in soil*.

ISO 11266:1994, *Soil quality - Guidance on laboratory testing for biodegradation of organic chemicals in soil*.

ISO 11274:—¹⁾, *Soil quality - Determination of the water retention characteristic - Laboratory methods*.

3 Methods

3.1 General requirements

The following procedures shall be followed, whichever incubation system is selected.

3.1.1 Soil collection and characterization

Soil shall be collected and handled in accordance with ISO 10381-6. The soil shall be characterized in accordance with ISO 11266:1994, 5.1.1.

¹⁾ To be published.

3.1.2 Test material

The test material shall be characterized in accordance with ISO 11266:1994, 5.2.

3.1.3 Incubation conditions

The following conditions shall be used unless there is a specific reason for using different conditions:

Temperature:	$(20 \pm 2)^{\circ}\text{C}$
Pore water pressure of soil:	-0,01 MPa to -0,03 MPa (measured to $\pm 5\%$) as determined in accordance with ISO 11274 [or between 40% and 60% max. <i>WHC</i> (measured to $\pm 5\%$) in accordance with Annex A.]
Incubation:	in the dark

The incubation conditions should be reported in the test report. If they differ from those above, the reasons for changing them should also be reported in the test report.

A temperature of $(20 \pm 2)^{\circ}\text{C}$ has been chosen as a standard for comparative purposes and because it gives relatively rapid results. Temperatures outside this range can be used if they are more appropriate (for example, because of local conditions, lack of cooling equipment).

3.2 Choice of incubation systems

One of the three systems described in this International Standard, the flow-through system (3.3), the soda-lime column system (3.4) or the biometer system (3.5), shall be used.

Data on the mineralization of organic chemicals can most reliably be obtained from experiments with radiolabelled compounds. Where unlabelled organic chemicals are used, a number of controls are necessary and carbon dioxide evaluation data should be analysed statistically.

Recoveries of carbon dioxide (CO_2) in the three systems can be measured using known quantities of unlabelled or ^{14}C -labelled calcium carbonate and adding sufficient hydrochloric acid to dissolve fully the calcium carbonate.

WARNING The methods in this International Standard use several materials of a hazardous nature. Due care is necessary in their handling and disposal. In particular, all pertinent national regulations should be complied with.

The main advantages and disadvantages of the systems are:

a) Flow-through system:

The main advantages are: sufficient oxygen for long-term, aerobic degradation studies; uses standard laboratory glassware; allows measurement of unlabelled CO_2 (titration), $^{14}\text{CO}_2$ (scintillation counting), and/or ^{14}C -labelled volatile products (scintillation counting).