INTERNATIONAL
STANDARD

ISO
10390

Third edition
2021-04

Soil, treated biowaste and sludge – Determination of pH

Sols, biodéchets traités et boues — Détermination du pH

Reference number
ISO 10390:2021(E)

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

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 190, *Soil quality*, Subcommittee SC 3, *Chemical and physical characterization*.

This third edition cancels and replaces the second edition (ISO 10390:2005), which has been technically revised.The main changes compared to the previous edition are as follows:

- The content of ISO 10390:2005 and EN 15933:2012 were merged;
- The scope was widened to include sludge and treated biowaste;
- Additional validation data for soil, sludge and treated biowaste were included;
- The text was editorially revised.

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.

Soil, treated biowaste and sludge – Determination of pH

1 Scope

This document specifies an instrumental method for the routine determination of pH within the range pH 2 to pH 12 using a glass electrode in a 1:5 (volume fraction) suspension of soil, sludge and treated biowaste in either water (pH in H_2O), in 1 mol/l potassium chloride solution (pH in KCl) or in 0,01 mol/l calcium chloride solution (pH in $CaCl_2$).

This document is applicable to all types of air-dried soil and treated biowaste samples.

NOTE For example, pretreated in accordance with ISO 11464 or EN 16179 or EN 15002.

2 Normative references

There are no normative references in this document.

3 Terms and definitions

No terms and definitions are listed in this document.

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 Principle

A suspension of a test portion is made up in five times its volume with one of the following solutions:

— water;

— a solution of potassium chloride (KCl) in water, $c = 1$ mol/l;

— a solution of calcium chloride ($CaCI_2$) in water, $c = 0,01$ mol/l.

The pH of the suspension is measured using a pH-meter.

NOTE 1 To make the procedure generally applicable to all types of soil, treated biowaste samples and sludges except liquid sludge, a volume-to-volume shaking ratio is chosen because all test samples can be treated in the same way. If a mass-to-volume ratio were chosen, the weighed amount of test sample would have to be adapted for e.g. soils with a low density, to enable the preparation of the suspension. For the purpose of this document, it is sufficiently accurate to measure the required volume of test portion with a measuring spoon.

NOTE 2 In samples with a high content of charged particles (e.g. organic matter, clay) the suspension effect can modify the potential difference between the electrodes, and thereby have an influence on the recorded pH value. This problem is minimized by gentle stirring of the suspension. For calcareous material, carbon dioxide can be absorbed by the suspension, which makes it difficult to reach an equilibrium value. Other sources of error are associated with materials containing sulfidic minerals or volatile acids.

5 Reagents

Use only reagents of recognized analytical grade.

5.1 **Water,** with a specific conductivity not higher than 0,2 mS/m at 25 °C.

5.2 **Potassium chloride solution**, $c(\mathrm{KCl}) = 1$ mol/l

Dissolve 74,5 g of potassium chloride in water (5.1) and dilute to 1 000 ml.

5.3 **Calcium chloride solution**, $c(\mathrm{CaCl_2}) = 0{,}01$ mol/l

Dissolve 1,47 g of calcium chloride dihydrate ($CaCl_2 \cdot 2H_2O$) in water (5.1) and dilute to 1 000 ml.

5.4 **Buffer solutions**, for calibration of the pH-meter

Use at least two of the following buffer solutions for calibration. Buffer solutions having a similar or equivalent pH that are commercially available may also be used.

NOTE 1 The buffer solutions 5.4.1, 5.4.2 and 5.4.3 are stable for one month when stored in polyethylene bottles.

NOTE 2 If automated or semi-automated systems are used, buffers recommended by the manufacturer or commercially available buffers can be used.

5.4.1 **Buffer solution**, pH 4,00 at 20 °C

Dissolve 10,21 g of potassium hydrogen phthalate ($C_8H_5O_4K$) in water (5.1) and dilute to 1 000 ml.

The potassium hydrogen phthalate shall be dried before use for 2 h at 115 °C ± 5 °C.

5.4.2 **Buffer solution**, pH 6,88 at 20 °C

Dissolve 3,39 g of potassium dihydrogen phosphate (KH_2PO_4) and 3,53 g of disodium hydrogen phosphate (Na_2HPO_4) in water (5.1) and dilute to 1 000 ml.

The potassium dihydrogen phosphate shall be dried before use for 2 h at 115 °C ± 5 °C.

5.4.3 **Buffer solution**, pH 9,22 at 20 °C

Dissolve 3,80 g of disodium tetraborate decahydrate ($Na_2B_4O_7 \cdot 10H_2O$) in water (5.1) and dilute to 1 000 ml.

NOTE Disodium tetraborate decahydrate could lose water of crystallization when stored for a long time.

6 Apparatus

6.1 Shaking or mixing machine

6.2 **pH-meter**, with slope adjustment and temperature control, readable to two decimals.

6.3 Glass electrode and reference electrode, or combined electrode of equivalent performance

In the case of pH values greater than 10, an electrode specifically designed for that range should be used or an additional buffer solution at pH 12 should be used.

NOTE In case of soils, the danger of deterioration of performance caused by breakage or contamination of the electrodes is increased.

6.4 **Thermometer or temperature probe**, capable of measuring to the nearest 1 °C.