INTERNATIONAL STANDARD



First edition 2009-09-01

Soil quality — Determination of selected organotin compounds — Gaschromatographic method

Qualité du sol — Dosage d'une sélection de composés organostanniques — Méthode par chromatographie en phase gazeuse



Reference number ISO 23161:2009(E)

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Foreword

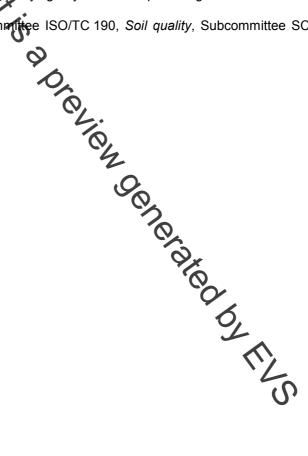
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ISO 23161 was prepared by Technical Committee ISO/TC 190, *Soil quality*, Subcommittee SC 3, *Chemical methods and soil characteristics*.



Introduction

It is absolutely essential that tests conducted in accordance with this International Standard be carried out by suitably qualified staff.

It is absolutely essential that tests conducted in accordance with this international standard be carried out by suitably qualified staff. It can be noted whether, and to what extent, particular problems will require the specification of additional boundary conditions.

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Soil quality — Determination of selected organotin compounds — Gas-chromatographic method

WARNING — Bersons using this International Standard should be familiar with normal laboratory practice. This International Standard does not purport to address all of the safety problems, if any, associated with the use. It is the responsibility of the user to establish appropriate safety and health practices and to ensure compliance with any national regulatory conditions.

1 Scope

This International Standard specifies a gas-chromatographic method for the identification and quantification of organotin compounds (OTCs) in soils as specified in Table 1. The method is also applicable to samples from sediments, sludges and wastes (sollike materials). The working range depends on the detection technique used and the amount of sample taken for analysis. The limit of quantification for each compound is about 10 µg/kg.

Table 1 — Organotin compound, which can be determined in accordance with this International	L
Standard	

$R_n Sn^{(4-n)+}$	R	n	Name	Acronym
rganotin catio	ns ^a		10	
BuSn ³⁺	Butyl	1	Monobutyltin cation	MBT
Bu ₂ Sn ²⁺	Butyl	2	Dibutyltin cation	DBT
Bu ₃ Sn ⁺	Butyl	3	This with cation	TBT
OcSn ³⁺	Octyl	1	Monooctylin cation	МОТ
Oc ₂ Sn ²⁺	Octyl	2	Dioctyltin cation	DOT
Ph ₃ Sn ⁺	Phenyl	3	Triphenyltin cation	TPhT
Cy ₃ Sn ⁺	Cyclohexyl	3	Tricyclohexyltin cation	ТСуТ
eralkylated or	ganotin			
Bu₄Sn	Butyl	4	Tetrabutyltin	ттвт

NOTE When applying this method to the determination of other organotin compounds not specified in the scope, its suitability is proven by proper in-house validation experiments, e.g. methyltin compounds. See Table 2. Methyltin cations are unlikely to evaporate from aqueous solvents, but peralkylated methyltin compounds are volatile and subject to losses (see C.3). Therefore, additional precautions are established.

			• •	
$R_n Sn^{(4-n)+}$	R	п	Name	Acronym
MeSn ³⁺	Methyl	1	Monomethyltin cation	MMT
Me ₂ Sn ²⁺	Methyl	2	Dimethyltin cation	DMT
${\rm Me_3Sn^+}$	Methyl	3	Trimethyltin cation	TMT

Table 2 — Methyltin compounds

Organotin cations can only be determined in accordance with this International Standard after derivatization. The anionic part bound to the organotin cation is mainly dependent on the chemical environment and is not determined using this method. The peralkylated organotin compounds behave in a completely different way from their parent compounds. Tetraalkylated organotin compounds which are already peralkylated, such as tetrabutyltin, are determined directly without derivatization.

The properties, such as particle size distribution, water content and organic matter content of the solids to be analysed using this International Standard vary widely. Sample pretreatment is designed adequately with respect to both the properties of the organotin compounds and the matrix to be analysed.

2 Normative references

The following referenced to cuments 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 11465, Soil quality — Determination of dry matter and water content on a mass basis — Gravimetric method

ISO 16720, Soil quality — Pretreatment of semples by freeze-drying for subsequent analysis

ISO 22892, Soil quality — Guidelines for the identification of target compounds by gas chromatography and mass spectrometry

3 Terms and definitions

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

The number of Sn-C bonds is a measure for the degree of subst

3.1

organotin compound

substance containing 1 to 4 Sn-C bonds

NOTE

3.2

organotin cation

part of the organotin compound (3.1) that contains all Sn-C bonds and is formally charged

3.3

organotin cation derivatives

non-dissociated tetrasubstituted organotin compounds which are produced by derivatization

3.4

solid

soil, sediment, sludge and waste (soil-like material)

4 Principle

For the ionic and the non-ionic organotin compounds (see Table 1), a different sample pretreatment and sample preparation are necessary. For the determination of organotin cations, laboratory samples are pretreated by freeze drying and grinding. This procedure enables homogeneity of the sample to be achieved. The determination of non-ionic TTBT cannot be carried out with freeze-dried materials due to evaporation losses, thus, it shall be determined in the field-moist sample. Organotin cations can only be determined after derivatization, whereas TTBT is already peralkylated and can be determined without derivatization (see the flowchart in Figure 1).