Irish Standard
I.S. EN ISO 13161:2015

Water quality - Measurement of polonium 210 activity concentration in water by alpha spectrometry (ISO 13161:2011)

I.S. EN ISO 13161:2015

Incorporating amendments/corrigenda/National Annexes issued since publication:

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National Foreword

I.S. EN ISO 13161:2015 is the adopted Irish version of the European Document EN ISO 13161:2015, Water quality - Measurement of polonium 210 activity concentration in water by alpha spectrometry (ISO 13161:2011)

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EUROPEAN STANDARD

NORME EUROPÉENNE

EUROPÄISCHE NORM

EN ISO 13161

October 2015

ICS 13.060.60; 17.240

English Version

Water quality - Measurement of polonium 210 activity concentration in water by alpha spectrometry (ISO 13161:2011)

Qualité de l'eau - Mesurage de l'activité du polonium 210 dans l'eau par spectrométrie alpha (ISO 13161:2011)

Wasserbeschaffenheit - Bestimmung der Aktivitätskonzentration von Polonium-210 in Wasser mittels Alphaspektrometrie (ISO 13161:2011)

This European Standard was approved by CEN on 27 September 2015.

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European foreword

The text of ISO 13161:2011 has been prepared by Technical Committee ISO/TC 147 “Water quality” of the International Organization for Standardization (ISO) and has been taken over as EN ISO 13161:2015 by Technical Committee CEN/TC 230 “Water analysis” the secretariat of which is held by DIN.

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of an identical text or by endorsement, at the latest by April 2016, and conflicting national standards shall be withdrawn at the latest by April 2016.

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.

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Endorsement notice

The text of ISO 13161:2011 has been approved by CEN as EN ISO 13161:2015 without any modification.

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I.S. EN ISO 13161:2015

INTERNATIONAL STANDARD

ISO 13161

First edition
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Water quality — Measurement of polonium 210 activity concentration in water by alpha spectrometry

Qualité de l'eau — Mesurage de l'activité du polonium 210 dans l'eau par spectrométrie alpha

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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.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 2.

The main task of technical committees is to prepare International Standards. 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.

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ISO 13161 was prepared by Technical Committee ISO/TC 147, *Water quality*, Subcommittee SC 3, *Radiological methods*.

Introduction

There are different techniques to measure ^{210}Po activity concentration in water: alpha spectrometry, liquid scintillation counting, alpha proportional counting.

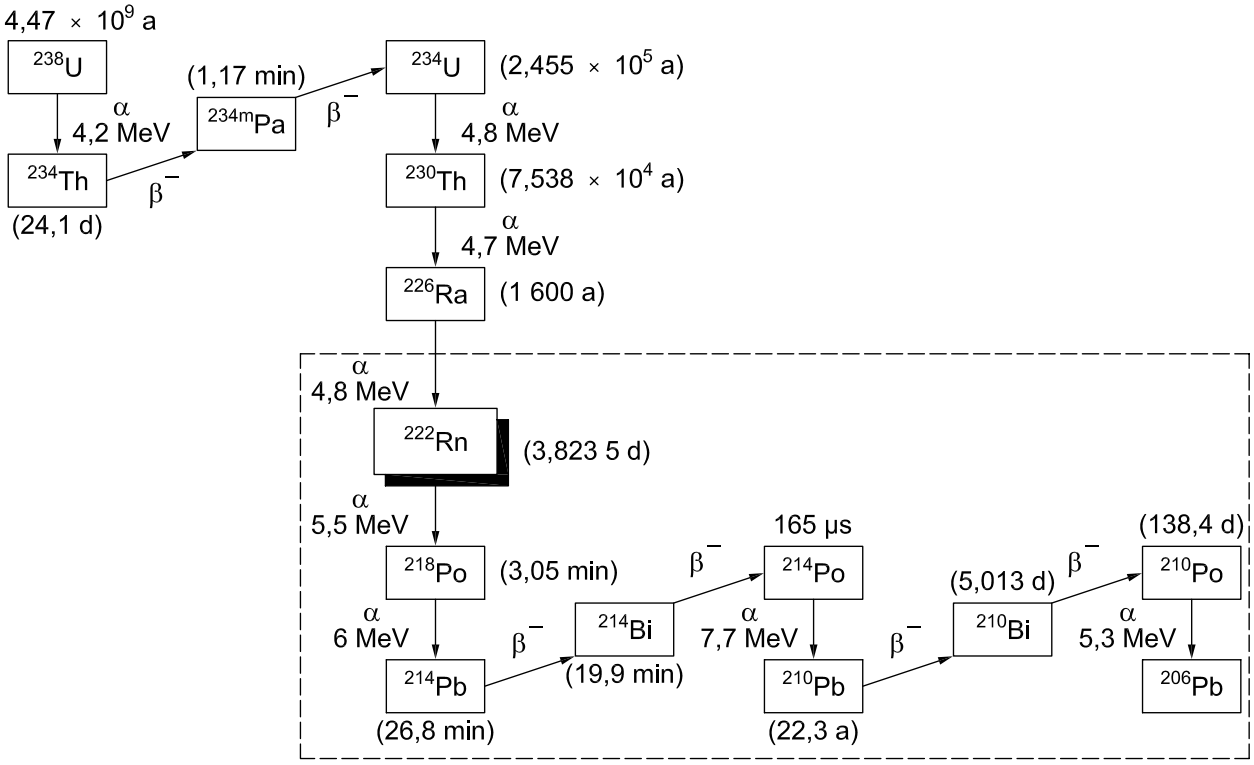
This International Standard describes a method for measuring ^{210}Po activity concentration in natural waters by alpha spectrometry.

Polonium 210 (^{210}Po) is a natural alpha-emitting radionuclide with a half-life of 138 d. It appears in the natural chain of uranium 238 (^{238}U) (see Figure 1). It is a long-life decay product of radon 222 (^{222}Rn) through lead 210 (^{210}Pb) (see References [5] to [9]).

Precautions are required when manipulating radioactive materials such as polonium isotopes.

The activity concentration ranges of ^{210}Po, in drinking waters for example, are generally very low, usually ranging from 1 mBq l^{-1} to 30 mBq l^{-1}.

This International Standard is applicable to all types of water, including sea water, and usually allows the measurement of ^{210}Po activity concentrations greater or equal to 5 mBq l^{-1}.



NOTE ^{206}Pb is stable.

Figure 1 — Uranium 238 and its decay products

Water quality — Measurement of polonium 210 activity concentration in water by alpha spectrometry

WARNING — Persons 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 its use. It is the responsibility of the user to establish appropriate safety and health practices and to ensure compliance with any national regulatory conditions.

IMPORTANT — It is absolutely essential that tests conducted according to this International Standard be carried out by suitably trained staff.

1 Scope

This International Standard specifies the measurement of ^{210}Po activity concentration by alpha spectrometry in all kinds of natural waters.

The detection limit of this method depends on the volume of the sample, the counting time, the background count rate and the detection efficiency. In the case of drinking water, the analysis is usually carried out on the raw sample, without filtration or other pretreatment.

If suspended material has to be removed or analysed, filtration at 0,45 µm is recommended. The analysis of the insoluble fraction requires a mineralization step that is not covered by this International Standard (see NF M 60-790-4[4]). In this case, the measurement is made on the different phases obtained. The final activity is the sum of all the measured activity concentrations.

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 5667-1, *Water quality — Sampling — Part 1: Guidance on the design of sampling programmes and sampling techniques*

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

ISO 11929, *Determination of the characteristic limits (decision threshold, detection limit and limits of the confidence interval) for measurements of ionizing radiation — Fundamentals and application*

ISO 80000-10, *Quantities and units — Part 10: Atomic and nuclear physics*

ISO/IEC 17025, *General requirements for the competence of testing and calibration laboratories*

ISO/IEC Guide 98-3, *Uncertainty of measurement — Part 3: Guide to the expression of uncertainty in measurement (GUM:1995)*

3 Terms, definitions, symbols and units

For the purposes of this document, the terms, definitions, symbols and abbreviations given in ISO 80000-10 and the following apply.

3.1 Terms and definitions

3.1.1
certified reference solution
solution of known concentration traceable to primary or secondary certified reference solution standards of radioactivity

3.1.2
tracer solution
usually a secondary standard or reference material, such as ^{208}Po or ^{209}Po, employed to determine the chemical yield of the analysis

3.1.3
quality control standard
radioactive source used to demonstrate that the measurement equipment employed performs within defined limits

NOTE Quality control is usually carried out by the regular measurement of a suitable radioactive source in accordance with ISO 7870-1[1], ISO 7870-2[2], and ISO 7871[3].

3.2 Symbols, definitions and units

A	activity of the tracer added	Bq
c_A	activity concentration of ^{210}Po	Bq l^{-1}
c_A^*	decision threshold	Bq l^{-1}
$c_A^\#$	detection limit	Bq l^{-1}
$c_A^\triangleleft, c_A^\triangleright$	lower and upper limits of the confidence interval	Bq l^{-1}
R_c	chemical yield	1
R_T	total yield	1
r_0	background count rate in the ^{210}Po region of interest	s^{-1}
r_{0T}	background count rate in the tracer region of interest	s^{-1}
r_g	gross count rate of the sample in the ^{210}Po region of interest	s^{-1}
r_T	gross count rate in the tracer region of interest	s^{-1}
t_0	background counting time	s
t_g	sample counting time	s
U	expanded uncertainty calculated by $U = k \cdot u(c_A)$ with $k = 1, 2 \ldots$	Bq l^{-1}
$u(c_A)$	standard uncertainty associated with the initial measurement result	Bq l^{-1}
V	volume of the test sample aliquot	l
ε	counting efficiency	1

4 Principle

4.1 General

After sampling, the test sample undergoes a treatment which leads to an extremely thin deposit of the polonium on a metal disc, for measurement by alpha spectrometry.