

ISO 13163:2021 (E)

Water quality — Lead-210 — Test method using liquid scintillation counting

Contents

	Foreword
	Introduction
1	Scope
2	Normative references
3	Terms, definitions and symbols
3.1	Terms and definitions
3.2	Symbols and abbreviated terms
4	Principle
5	Sampling and storage
6	Procedure
6.1	Sample preparation for measurement
6.2	Sample measurement
7	Quality assurance and quality control program
7.1	General
7.2	Variables that could influence the measurement
7.3	Instrument quality control
7.4	Reagent interferences
7.5	Interference control
7.6	Method verification
7.7	Demonstration of analyst capability
7.8	Calibration
8	Expression of results
8.1	General
8.2	Sample recovery, activity and uncertainties
8.3	Decision threshold
8.4	Detection limit
8.5	Limits of the coverage intervals
8.5.1	Limits of the probabilistically symmetric coverage interval
8.5.2	The shortest coverage interval
9	Test report
Annex A	(informative) Separation and purification of ²¹⁰ Pb
A.1	Principle
A.2	Reagents and apparatus
A.2.1	Reagents
A.2.1.1	Lead-210 standard solutions
A.2.1.2	Standard solution of Pb(II)
A.2.1.3	Quenching agent
A.2.1.4	Laboratory water, distilled or deionized, complying with grade 3 of ISO 3696
A.2.1.5	Solution of stable iron carrier, approximately 1 g·l ⁻¹ (for example in 0,5 mol·l ⁻¹ HNO ₃).
A.2.1.6	Cationic exchange resin, e.g. sulfonic type 8 % cross-linking.
A.2.1.7	Hydrochloric acid solution, c(HCl) = 2 mol·l ⁻¹ .
A.2.1.8	Nitric acid solution, c(HNO ₃) = 1 mol·l ⁻¹ .
A.2.1.9	Nitric acid solution, c(HNO ₃) = 0,1 mol·l ⁻¹ .

- A.2.1.10 ammonium hydroxide solution, $c(\text{NH}_4\text{OH})$ concentrated = 280 g·l⁻¹.
- A.2.1.11 Ammonium citrate or citric acid solution, $c(\text{C}_6\text{H}_{11}\text{NO}_7)$ or $c(\text{C}_6\text{H}_8\text{O}_7) = 0,01 \text{ mol}\cdot\text{l}^{-1}$ to 0,1 mol·l⁻¹
- A.2.1.12 EDTA solution, $c(\text{C}_{10}\text{H}_{16}\text{N}_2\text{O}_8) = 0,01 \text{ mol}\cdot\text{l}^{-1}$.
- A.2.1.13 Chromatographic extraction resin, 18C6 Crown ether-type resins.
- A.2.1.14 Liquid scintillation cocktail
- A.2.2 Apparatus
 - A.2.2.1 Centrifuge or vacuum filtration system.
 - A.2.2.2 Membrane filter, of pore size 0,45 µm.
 - A.2.2.3 Analytical balance, accuracy 0,1 mg.
 - A.2.2.4 Equipment for the measurement of stable lead.
 - A.2.2.5 Measurement equipment: Liquid scintillation counter
 - A.2.2.6 Scintillation vials
- A.3 Procedure with 2 mol·l⁻¹ HCl loading medium
 - A.3.1 Preconcentration
 - A.3.1.1 Preparation
 - A.3.1.2 Preconcentration by iron (III) hydroxide co-precipitation
 - A.3.1.3 Preconcentration with cation exchange resin [10]
 - A.3.2 Separation of ²¹⁰Pb - Method with 2 mol·l⁻¹ HCl loading medium (see Figure A.1)
 - A.3.2.1 General
 - A.3.2.2 Preparation for the counting and the determination of the chemical recovery
 - A.3.2.3 Measurement
- A.4 Procedure with 1 mol·l⁻¹ HNO₃ loading medium
 - A.4.1 Preparation
 - A.4.2 Preconcentration
 - A.4.3 Separation of ²¹⁰Pb - Method with 1mol·l⁻¹ HNO₃ loading medium (see Figure A.2)

Annex B (informative) Spectra examples