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**NATIONAL STANDARD OF THE
PEOPLE'S REPUBLIC OF CHINA**

GB/T 15221-2025

Replacing GB/T 15221-1994

Analytical method for cobalt-60 in water

水中钴-60的分析方法

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Table of Contents

1.Scope	1
2 Normative References	1
3.Terms and Definitions	1
4.Principle	1
5.Reagents or materials	1
6.Instruments and Equipment 2 7 samples	3
8.Experimental Procedure	3
9.Experimental Data Processing	5
10 Precision	6
9 References	10

Foreword

This document complies with the provisions of GB/T 1.1-2020 "Standardization Work Guidelines Part

1.Structure and Drafting Rules of Standardization Documents". Drafting. This document replaces GB/T 15221-1994 "Analytical Methods for Cobalt-60 in Water". Compared with GB/T 15221-1994, the only changes are structural adjustments. Aside from editorial changes, the main technical changes are as follows:

---The recovery rate was determined by atomic absorption spectrometry (see

8.1.3 and 8.2.2);

---Added measurement methods, instrument calibration, and result calculation for liquid scintillation counters (see

---The dimensions of the glass exchange column have been changed. inner diameter 10mm, column height.200mm (see 6.6,

5.5 in the.1994 edition);

---Added quality control and assurance (see Chapter 11). Please note that some content in this document may involve patents. The issuing organization of this document assumes no responsibility for identifying patents. This document was proposed and is under the jurisdiction of the National Nuclear Energy Standardization Technical Committee (SAC/TC58). This document was drafted by the China Institute of Radiation Protection. The main drafters of this document are. Li Pengxiang, Han Yuhu, Wang Ruijun, Zhang Feng,

Yang Hailan, Ma Xuyuan, Wang Meimei, Bao Li, Lu Kait, and Du Ke. Yang Youkun, Guo Chen, Li Zhou, Song Qinnan, Yin Yali, Gao Zequan, Shi Qiqi. The release history of this document and the document it replaces is as follows:

---First published in 1994 as GB/T 15221-1994;

---This is the first revision. Analytical methods for cobalt-60 in water

1 Scope

GB/T 15221-2025 is the Chinese national standard covering measuring cobalt-60 in water - the sampling and preservation, the concentration and separation from the other gamma emitters, the gamma spectrometry and the counting time, and the detection limit, on the activated corrosion product that dominates dose around a reactor. It replaces GB/T 15221-1994, a standard thirty-one years old. In force from 1 May 2026. Issued on 5 October 2025, it has been in force since 1 May 2026, replacing GB/T 15221-1994.

This document describes the analytical method for cobalt-60 in water, including the principle, reagents or materials, instruments and equipment, samples, experimental procedures, and experimental data. Processing, precision, quality assurance and control, etc. This document applies to the analysis of cobalt-60 in surface water, groundwater, drinking water, and liquid effluents from nuclear facilities. Under typical conditions, the detection limit of the low-background alpha/beta meter measurement method is

9.9 mBq/L, and the detection limit of the liquid scintillation counter measurement method is...

2 Normative references

The contents of the following documents, through normative references within the text, constitute essential provisions of this document. Dated citations are not included. For references to documents, only the version corresponding to that date applies to this document; for undated references, the latest version (including all amendments) applies. This document.

GB/T 10259 Liquid Scintillation Counter

GB/T 11682 Low-background alpha and/or beta measuring instruments

GB 12379 Regulations for Environmental Nuclear Radiation Monitoring HJ

61 Technical Specification for Radiation Environment Monitoring

3 Terms and Definitions

This document does not contain any terms or definitions that need to be defined.

4.Principles A cobalt carrier was added to the water sample, and cobalt-60 was concentrated as a hydroxide precipitate. Cobalt was then complexed with ammonia, allowing it to react with nuclides such as iron, manganese, ruthenium, and zirconium. Separation. Cobalt was further purified by passing it through an anion exchange resin column. The eluent was collected, and the resorption was determined using atomic absorption spectrophotometry or gravimetric analysis. Yield. When measuring with a low-background alpha/beta meter, the desorption solution was evaporated to dryness, dissolved in electrolyte buffer, and then measured after electrodeposition to prepare the source. Alternatively, when using a liquid scintillation counter for measurement, evaporate the desorption liquid to dryness, dissolve it in nitric acid solution, add the scintillation liquid, mix thoroughly, and then measure.

5.Reagents or materials Unless otherwise specified, all analytical reagents conforming to national standards were used in the analysis, and the water used in the tests was freshly prepared deionized water or distilled water. Distilled water.

5.1 Ammonium chloride (NH_4Cl).

5.2 Sodium bisulfite (NaHSO_3).

5.3 Cobalt chloride ($\text{CoCl}_2 \cdot 6\text{H}_2\text{O}$).

5.4 Ammonia water ($\text{NH}_3 \cdot \text{H}_2\text{O}$). $\rho = 0.91\text{g/mL}$.

5.5 Hydrochloric acid (HCl). $\rho = 1.19\text{g/mL}$.