

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

HJ 813-2016

Replacing GB/T 12376-1990

Analysis of Polonium-210 in water

水中钋-210的分析方法

(English Translation)

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Foreword

In order to implement the Environmental Protection Law of the People's Republic of China and the Law of the People's Republic of China on the Prevention and Control of Radioactive Pollution, Protect the human health, regulate the environmental monitoring methods, the development of this standard.

This standard specifies the method of analysis of polonium-210 in water.

This standard is the "water polonium -210 analysis method electroplating sample preparation method" (GB 12376-90) revision, the use of the analysis side Principle and the original standard is basically the same, the main technical content has updated changes.

"Determination of polonium-210 in the electroplating method" (GB 12376-90) was first released in 1990, the original standard draft Unit for the Nuclear Industry Corporation Beijing Institute of uranium mining and smelting. The main technical contents of this standard are as follows.

- delete the "plating sample preparation method" and other non-standard text expression;
- revised methodological principles;
- introduced polonium -209 tracer;

- Partial revision of the analytical procedures;
- self-deposition material replaced by silver by the original standard copper;
- the measuring instrument is replaced by the alpha energy spectrometer with the original standard low background alpha, beta proportional counter;
- revised the results of the calculation formula;
- Increased assessment of the uncertainty of the results;
- Blank experiment and quality control made clear requirements;

Since the implementation of this standard, the former State Environmental Protection Bureau on June 9, 1990 approved and issued the People's Republic of China national standard Quasi "water polonium -210 analysis method electroplating method" (GB 12376-90) abolished.

The appendix to this standard is an informative appendix.

This standard is organized by the Ministry of Environmental Protection Nuclear Safety Management Division, Science and Technology Standards Division.

The main drafting of this standard. Ministry of Environmental Protection Radiation Environmental Monitoring Technology Center (Zhejiang Province, radiation environmental monitoring station).

The environmental protection department of this standard approved on October 12, 2016.

This standard has been implemented since November 1, 2016.

This standard is explained by the Ministry of Environmental Protection.

Analysis of polonium - 210 in water

1 Scope of application

This standard specifies the determination of polonium-210 in water.

This standard applies to surface water, seawater, groundwater and nuclear industry wastewater discharge.

The measurement range of this method is. the activity concentration is greater than 1 x 10-3Bq/L.

2 Normative reference documents

The contents of this standard refer to the following documents or their terms. Those who do not specify the date of the reference file, the effective version of the appropriate for this standard.

GB 12997 water quality sampling program design technical specifications Technical Guidance for Water Quality Sampling Technical specification for preservation and management of samples for water quality sampling Technical specification for radiation environmental monitoring of HJ/T 61

3 Principle of the method

Water samples were added to the known ^{209}Po tracer, with iron hydroxide as carrier, adsorbed in water carrying ^{210}Po and ^{209}Po . Hydrochloric acid dissolved After precipitation, add ascorbic acid and hydroxylamine hydrochloride to restore ferric iron. In the hydrochloric acid system, ^{210}Po and ^{209}Po were self-deposited to pure silver on. Measured in the alpha spectrometer, according to ^{210}Po and ^{209}Po count, calculate the concentration of ^{210}Po activity in water.

When each sample contains 25 μg of gold, 25 μg of platinum, 25 μg of tellurium, 50 μg of mercury and 100 μg of vanadium, the ^{210}Po results are low.

4 Reagents and materials

Unless otherwise stated, analytical pure chemical reagents conforming to national standards are used in the analysis, and the test water is freshly prepared.

Ionized water or distilled water.

4.1

ascorbic acid ($\text{C}_6\text{H}_8\text{O}_6$).

4.2

potassium permanganate solution (KMnO_4) solution. 2% (m/V).

4.3

concentrated hydrochloric acid (HCl). mass concentration of 36.0% ~ 38.0% (m/m). The

4.4

Hydrochloric acid. 1 mol/L.

4.5

hydrochloric acid. 0.5mol/L.

4.6

Hydrochloric acid. 0.1 mol/L.

4.7

ferric chloride (FeCl_3) solution. 20mgFe/mL, 0.1mol/L hydrochloric acid system.

4.8

ammonia ($\text{NH}_3 \cdot \text{H}_2\text{O}$). mass concentration of 25% to 28% (m/m).

4.9

Hydrogen Peroxide (H_2O_2). Concentration Concentration 30% (m/m).

4.10 Hydroxylamine hydrochloride (NH_2HClOH). mass concentration 25% (m/m)

4.11 anhydrous ethanol ($\text{C}_2\text{H}_5\text{OH}$). content of not less than 99.5% (m/m).

4.12 polonium -209 standard solution. 0.1 Bq/mL, 1 mol/L hydrochloric acid system.

4.13 pH test paper. pH = 0.5 ~ 5.5 and pH = 5.5 ~ 9.0.

4.14 silver. thickness 0.5mm, diameter 21mm. Before use, the silver side should be coated with paint, the other side with water sandpaper throwing Light, clean water after drying dry.

5 Instruments and equipment

5.1

alpha spectrometer, the background is less than 1 cph.

5.2

Analysis of balance, the amount of 0.1 mg.

5.3

Magnetic heating electric stirrer.

5.4

hot plate.

5.5

Oven.

6 the scale of the instrument

6.1 Energy scale The energy scale is used to store the energy of the energy spectrum with mixed plating. The result is preserved.

6.2 Efficiency scale Use the mixed plating alpha surface source to perform the efficiency scale on the energy spectrum, and take the average value as the instrument efficiency value.

7.1 Acquisition and storage

Samples were collected and stored in accordance with the relevant provisions in GB 12997, GB 12998 and HJ 493.