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

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**Water quality. Determination of gross alpha activity. Thick
source method**

水质 总 α 放射性的测定 厚源法

(English Translation)

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Foreword

In order to carry out the "Law of the People's Republic of China on Environmental Protection" and the "Law of the People's Republic of China on Prevention and Control of Radioactive Pollution", the protection Environment, protect human health, standardize the determination of total radioactivity in water, the development of this standard.

This standard specifies the thick source method for the determination of total alpha radioactivity in surface water, groundwater, industrial waste water and domestic sewage.

Appendix A of this standard is informative, Appendix B is a normative appendix.

This standard is released for the first time.

This standard by the Environmental Protection Department of Environmental Monitoring Division and Science and Technology Standards Division to develop.

This standard was drafted. Nuclear and Radiation Safety Administration of Jiangsu Province.

This standard verification unit. Zhejiang Provincial Environmental Monitoring Station radiation, radioactive environmental monitoring station in Shanghai, Anhui Province Environmental Radiation Supervision Governor Station, Jiangsu Provincial Center for Disease Control and Prevention, Tianwan Nuclear Power Station Health and Physical Department and Jiangsu Provincial Radiation Environment Monitoring and Management

Station.

This standard MEP approved on December 21, 2017.

This standard since February 1, 2018 come into operation, this standard is interpreted by the MEP.

1 Water quality determination of total radioactive thick source method

Warning. nitric acid, sulfuric acid, acetone and trace radioactive substances used in the experiment are corrosive, toxic and radioactive, Reagent preparation process should be carried out in a fume hood, operation should wear protective equipment as required to avoid inhalation of respiratory and skin contact Skin, clothing.

1 scope of application this standard specifies the thick source method for the determination of total alpha radioactivity in water.

This standard applies to the determination of total alpha radioactivity in surface water, groundwater, industrial wastewater and domestic sewage.

The method detection limit depends on the total mass of the residue contained in the sample, the detection efficiency of the measuring instrument, the background count rate, the measurement Time, etc. Under typical conditions, the detection limit of up to 4.3×10^{-2} Bq/L.

2 Normative references

This standard references the following documents or the terms. For undated references, the effective version applies to this book standard.

GB 12379 Environmental Nuclear Radiation Monitoring Regulations GB/T 11682 low background alpha and/or beta measuring instrument HJ 493 Technical Specifications for the Preservation and Management of Water Quality Samples HJ 494 water sampling technical guidance HJ 495 water quality sampling program design specifications HJ/T 61 radiation environmental monitoring technical specifications HJ/T 91 Technical Specifications for Surface Water and Sewerage Monitoring

3 Terms and definitions

The following terms and definitions apply to this standard.

Total alpha radioactivity gross alpha activity Refers to the sample preparation conditions specified in this standard, the sample is not volatile all natural and artificial radionuclide alpha radiator General 3.2 Effective thickness of saturated layer Refers to a radioactive ray emission rate increases with the increase of radioactive material thickness, when the

radioactive material thickness reaches a to a certain extent, the radiation emissivity will no longer increase with the thickness of the radioactive material, and the thickness is the Effective saturation thickness.

23.3

Thick source method

According to different diameter measuring disc, when the shop thickness reaches the effective saturation thickness of radioactive rays, the corresponding sampling volume to pave the amount of "minimum sampling volume", this paving method is thick source method.

4 Method principle

The sample was slowly evaporated and concentrated, converted to sulfate and evaporated to dryness, and then placed in a muffle furnace to give a solid Residue. Weigh accurately not less than the "minimum sampling volume" of the residue evenly spread in the measuring plate, placed in a low background alpha, beta measuring instrument the total alpha count rate is measured to calculate the total alpha radioactivity concentration in the sample.

5 Reagents and materials

Unless otherwise specified, the analysis of the use of analytical reagents in line with national standards, experimental water for the newly prepared deionized Water or distilled water, the total alpha radioactivity of all reagents should be below the detection limit of the method.

5.1

Nitric acid (HNO_3). $\rho = 1.42 \text{ g/ml}$.

5.2

nitric acid solution. 1 1.

Measure 100 ml nitric acid (5.1) and dilute to 200 ml.

5.3

Sulfuric acid (H_2SO_4). $\rho = 1.84 \text{ g/ml}$.

5.4

Organic solvents.

Absolute ethanol ($\text{C}_2\text{H}_5\text{OH}$). purity $\geq 95\%$;

Or acetone ($\text{C}_3\text{H}_6\text{O}$). Purity $\geq 95\%$.

5.5

calcium sulfate (CaSO_4). excellent grade pure.

Before use should be dried at 105 °C constant weight, stored in a desiccator. The calcium sulfate powder may contain traces of ^{226}Ra and ^{210}Pb , before use, should be weighed with the same quality sample of calcium sulfate powder in the measuring plate paved the bottom of the low alpha, beta test the total alpha count rate measured on the meter should be kept within 3 times the standard deviation of the average total background count rate of the instrument, otherwise Replacing the calcium sulfate powder or using the total alpha count rate of the calcium sulfate powder instead of the instrument background count rate.

5.6

certified reference material.

^{241}Am standard solution for the total alpha standard material, the recommended concentration of activity 5.0 Bq/g ~ 100.0 Bq/g.

6 Instruments and equipment

6.1

low background alpha, beta measuring instrument. Instrument performance indicators should meet the relevant requirements GB/T 11682.

6.2

Analytical Balance. Sense of 0.1 mg.

6.3

adjustable temperature electric hot plate. You can also use electric furnace or other heating equipment.

6.4

oven.

6.5

infrared box or infrared light.

6.6

muffle furnace. to maintain a constant temperature at 350 °C.

6.7

Measuring disc. stainless steel disc with edge, disc mass thickness of at least 2.5 mg/mm², measuring disc diameter

3 Depends on the diameter of the instrument detector and the size of the sample source holder.