

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

HJ 958-2018

**Water quality - Determination of cobalt - Graphite furnace
atomic absorption spectrometry**

水质钴的测定石墨炉原子吸收分光光度法

(English Translation)

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Foreword

To implement the Environmental Protection Law of the People's Republic of China and the Law of the People's Republic of China on Water Pollution Prevention and Control, to protect the environment, this standard is formulated to ensure human health and to regulate the determination of cobalt in water.

This standard specifies the graphite furnace atomic absorption spectrophotometry for the determination of cobalt in surface water, groundwater and wastewater.

Appendix A and Appendix B of this standard are normative appendices, and Appendix C is an informative appendix.

This standard is the first release.

This standard is formulated by the Environmental Monitoring Department of the Ministry of Ecology and Environment and the Science and Technology Standards Department.

This standard was drafted. Anshan City Environmental Monitoring Center Station.

This standard is verified by. Shenyang Environmental Monitoring Center Station, Dalian Environmental Monitoring Center, Harbin Environmental Monitoring Xinzhan, Liaoning

Provincial Environmental Monitoring Experimental Center, Fushun Environmental Monitoring Center Station and Liaoyang Environmental Monitoring Station.

This standard is approved by the Ministry of Ecology and Environment on July 29, 2018.

This standard has been implemented since January 1, 2019.

This standard is explained by the Ministry of Ecology and Environment.

1 Determination of cobalt in water - Graphite furnace atomic absorption spectrophotometric method Warning. Nitric acid and hydrogen peroxide are highly corrosive and strongly oxidizing. The sample preparation process should be carried out in a fume hood.

Wear protective equipment as required to avoid contact with skin and clothing.

1 Scope of application

This standard specifies the graphite furnace atomic absorption spectrophotometry for the determination of cobalt in water.

This standard applies to the determination of soluble cobalt and total cobalt in surface water, groundwater and wastewater.

When the injection volume is 20 μl , the detection limit of soluble cobalt and total cobalt in this standard is 2 $\mu\text{g/L}$.

The limit is 8 $\mu\text{g/L}$.

2 Normative references

This standard refers to the following documents or their terms. For undated references, the valid version applies to this standard.

HJ 678 Water quality metal total digestion microwave digestion method HJ/T 91 Surface Water and Wastewater Monitoring Technical Specifications HJ/T 164 Technical Specifications for Groundwater Environmental Monitoring

3 Terms and definitions

The following terms and definitions apply to this standard.

Soluble cobalt soluble cobalt Refers to the cobalt measured after filtration of a non-acidified sample through a 0.45 μm filter.

Total cobalt of total quantity of cobalt Refers to the cobalt measured after acid digestion of the unfiltered sample.

4 Principle of the method

The sample is filtered or digested and injected into a graphite furnace atomizer to form a cobalt-based atom formed by drying, ashing and atomization.

Vapor, selective absorption of the 240.7 nm characteristic line emitted by a cobalt hollow cathode lamp or continuous source. In a certain range the absorbance is proportional to the mass concentration of cobalt.

5 Interference and elimination

5.1

Cobalt has spectral interference near the sensitive line of 240.7 nm. Selecting a narrow spectral passband for measurement can reduce interference.

25.2 Determination of cobalt by phosphoric acid and perchloric acid, 3% nitric acid and hydrogen peroxide, 0.4% sulfuric acid at a concentration of 1% or more Negative interference; hydrochloric acid with a concentration of 3% or more produces positive interference. The concentration of hydrogen peroxide in the sample after digestion is controlled below 3% Does not affect the determination of cobalt.

5.3 Ca below 500 mg/L; Mg, K, Na below.200 mg/L; Ni, Mn, Al below 4.00 mg/L

Cu, Pb, Zn, Cr; Fe below 10.0 mg/L; Cl⁻, F⁻, SO₄²⁻ below 100 mg/L do not interfere with the determination of cobalt.

5.4 When the sample matrix is complex and there is matrix interference, the matrix interference is checked in Appendix A; the standard addition method can be used to offset See Appendix B for the elimination of matrix interference; Appendix C for the applicability of the standard addition method.

6 Reagents and materials

Unless otherwise stated, analytically pure reagents in accordance with national standards were used for the analysis, and experimental water was newly prepared deionized.

Water or water of the same purity.

6.1

Nitric acid. $\rho(\text{HNO}_3) = 1.42 \text{ g/ml}$, excellent grade pure.

6.2

Hydrogen peroxide. $w(\text{H}_2\text{O}_2) = 30\%$, excellent grade pure.

6.3

Nitric acid solution. 1 1.

6.4

Nitric acid solution. 1 99.

6.5

Cobalt. $w \geq 99.99\%$, pure spectrum.

6.6

Magnesium nitrate $[\text{Mg}(\text{NO}_3)_2]$.

6.7

Cobalt standard stock solution. $\rho(\text{Co}) = 1000 \text{ mg/L}$.

Accurately weigh 1 g (accurate to 0.0001 g) of cobalt (6.5), dissolve in 10 ml of nitric acid solution (6.3), heat and drive off Nitrogen oxides, after cooling, transfer to a 1000 ml volumetric flask, dilute to volume with water and mix. Transfer to polyethylene bottle Medium sealed, refrigerated below 4 ° C, can be stored for 1 year. Commercially available certified standard solutions can also be used.

6.8

Cobalt standard intermediate solution. $\rho(\text{Co}) = 50.0 \text{ mg/L}$.

Accurately remove 5.00 ml of cobalt standard stock solution (6.7) in a 100 ml volumetric flask and dilute with nitric acid solution (6.4) Allow to the marking line and mix. It is sealed in a polyethylene bottle and refrigerated at 4 ° C for 30 days.

6.9

Cobalt standard use solution. $\rho(\text{Co}) = 1.00 \text{ mg/L}$.

Accurately transfer 2.00 ml of cobalt standard intermediate solution (6.8) to a 100 ml volumetric flask and dilute with nitric acid solution (6.4).

Allow to the marking line and mix. Available now.

6.10

Matrix modifier. Magnesium nitrate solution. $\rho[\text{Mg}(\text{NO}_3)_2] = 50 \text{ g/L}$.

Weigh 5.0 g of magnesium nitrate (6.6), dissolve it in a beaker with a small amount of water, transfer to a 100 ml volumetric flask, and dilute with water.

Make up to the mark and mix.

6.11

Argon. purity $\geq 99.98\%$.