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HJ

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

HJ 1081-2019

**Soil and sediment--Determination of cobalt--Flame atomic
absorption spectrometry**

土壤和沉积物 钴的测定 火焰原子吸收分光光度法

(English Translation)

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Foreword

In order to implement the "Environmental Protection Law of the People's Republic of China" Environment, protect human health, standardize the determination method of cobalt in soil and sediment, and formulate this standard.

This standard specifies the flame atomic absorption spectrophotometry for the determination of cobalt in soil and sediment.

Appendix A of this standard is an informative appendix.

This standard is issued for the first time.

This standard is formulated by the Department of Eco-Environmental Monitoring, Laws and Standards Department of the Ministry of Ecology and Environment.

This standard was drafted. Hunan Ecological Environment Monitoring Center.

Verification units of this standard. Tianjin Ecological Environment Monitoring Center, Guangxi Zhuang Autonomous Region Ecological Environment Monitoring Center, Hunan Changsha Ecological Environment Monitoring Center of Hunan Province, Xiangtan Ecological Environment Monitoring Center of Hunan Province, Chenzhou Ecological

Environment Monitoring Center of Hunan Province and Radio and Television Metrology and Testing (Hunan) Co., Ltd.

This standard was approved by the Ministry of Ecology and Environment on December 31, 2019.

This standard will be implemented from June 30, 2020.

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

Determination of cobalt in soil and sediment by flame atomic absorption spectrophotometry
Warning. nitric acid, perchloric acid, hydrofluoric acid, etc. are highly oxidizing and corrosive. The reagent preparation and sample preparation process should be it should be carried out in a fume hood, and protective equipment should be worn as required to avoid breathing into the respiratory tract or touching skin and clothing.

1 Scope

This standard specifies the flame atomic absorption spectrophotometry for the determination of cobalt in soil and sediment.

This standard applies to the determination of total cobalt in soil and sediment.

When the sample volume is 0.5 g and the constant volume is 50 ml, the detection limit of the method is 2 mg/kg, and the lower limit of determination is 8 mg/kg.

2 Normative references

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

GB 17378.3 Marine Monitoring Code Part 3. Sample Collection, Storage and Transportation
GB 17378.5 Marine Monitoring Code Part 5. Sediment Analysis HJ 25.2 Technical Guidelines for Soil Pollution Risk Management and Remediation Monitoring on Construction Land HJ 494 Water Quality Sampling Technical Guide HJ 613 Soil dry matter and moisture determination by gravimetric method HJ 832 Digestion of total metal elements in soil and sediment by microwave digestion HJ/T 91 Technical specifications for surface water and sewage monitoring HJ/T 166 Technical Specifications for Soil Environmental Monitoring

3 Method principle

Cobalt formed in a high-temperature flame of a soil or sediment sample after acid digestion and sprayed into a lean air-acetylene flame Ground state atom, which selectively absorbs the 240.7 nm characteristic spectral line emitted by a cobalt sharp-line light source or a continuous light source.

Within the range, its absorbance is directly proportional to the mass concentration of cobalt.

4 Interference and cancellation

Zn and Ni below 10 mg/L, Ba and Pb at 20 mg/L, Mn at 60 mg/L, 400 mg/L Mg, 500 mg/L K, 900 mg/L Ti, 3000 mg/L Al, 5000 mg/L Ca, and 7000 mg/L Na does not interfere with the determination of cobalt.

5 Reagents and materials

Unless otherwise stated, the analysis is performed using high-grade pure reagents that meet national standards. The experimental water is freshly prepared pure water or Distilled water.

5.1

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

5.2

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

5.3

Hydrofluoric acid. $\rho(\text{HF}) = 1.49 \text{ g/ml}$.

5.4

Perchloric acid. $\rho(\text{HClO}_4) = 1.68 \text{ g/ml}$.

5.5

Cobalt metal. spectrally pure.

5.6

Nitric acid solution. 1 1.

5.7

Nitric acid solution. 1 99.

5.8

Cobalt standard stock solution. $\rho(\text{Co}) = 500 \text{ mg/L}$.

Accurately weigh 0.1 g (accurate to 0.1 mg) metal cobalt (5.5), heat and dissolve it in 6 ml nitric acid solution (5.6), cold. However, make up to 200 ml with water. Transfer to polyethylene reagent bottle, sealed and refrigerated at $0^\circ\text{C} \sim 4^\circ\text{C}$. Can also be straight. Then purchase a commercially available certified standard solution.

5.9

Cobalt standard solution. $\rho(\text{Co}) = 50 \text{ mg/L}$.

Accurately pipette 10.0 ml of standard cobalt stock solution (5.8) into a 100 ml volumetric flask, and add nitric acid solution (5.7) to make up the volume to the mark, shake well. Keep refrigerated below 4 °C for one year.

5.10

Gas. acetylene, purity $\geq 99.6\%$.

5.11

Assisting gas. air.

6 Instruments and equipment

6.1

Flame atomic absorption spectrophotometer.

6.2

Cobalt sharp-line light source or continuous light source with 240.7 nm spectral line.

6.3

Microwave Digestion Apparatus. Power is 600 W ~ 1500 W, temperature accuracy is ± 2.5 °C, with microwave digestion tank.

6.4

Electric heating plate. with temperature control function, temperature accuracy is ± 5 °C.

6.5

Teflon beaker or crucible with lid. 50 ml.

6.6

Analytical balance. The sensitivity is 0.1 mg.

6.7

Nylon screen. 0.15 mm (100 mesh).

6.8

Instruments and equipment commonly used in general laboratories.

7.1 Sample collection and storage

Collect and preserve soil samples in accordance with the relevant requirements of HJ/T 166 and HJ 25.2; in accordance with the relevant requirements of GB 17378.3 Collect and preserve marine sediment samples; collect surface water sediment samples in accordance