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LY

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

LY/T 3129-2019

**Determination of the total copper, zinc, iron and manganese in
forest soils by Inductively Coupled Plasma-Optical Emission
Spectrometer (ICP-OES)**

森林土壤铜、锌、铁、锰全量的测定电感耦合等离子体发射光谱法
(English Translation)

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Foreword

This standard was drafted in accordance with the rules given in GB/T 1.1-2009.

This standard is proposed and managed by the State Forestry and Grassland Administration.

This standard was drafted. Forestry Research Institute of Chinese Academy of Forestry, Beijing Forestry University, Chinese Academy of Forestry Subtropical Forest Industry Research Institute, Beijing Huaxue North Testing Technology Co., Ltd.

1 Scope

This standard specifies the determination of the total amount of copper (Cu), zinc (Zn), iron (Fe), and manganese (Mn) in forest soils by inductively coupled plasma.

Emission Spectroscopy (ICP-OES).

This standard applies to the determination of copper, zinc, iron, and manganese in forest soils.

2 Normative references

The following documents are essential for the application of this document. For dated references, only the dated version applies to this article. For undated references, the

latest version (including all amendments) applies to this document.

Preparation of preparations and products used in GB/T 603 chemical reagent test method
GB/T 6682 Analytical laboratory water specifications and test methods GB/T 4842 Argon
LY/T 1210 Collection and preparation of forest soil samples

3 Matters needing attention

Some of the reagents used in the experiment are toxic or corrosive. The operation of adding acid, digestion, and acid drive should be performed in a fume hood.

Protective equipment should be worn in accordance with regulations to avoid contact with skin and clothing. If accidentally splashed on the skin, immediately use spray facilities or clean water.

Contamination should be prevented during sampling and sample preparation. The vessel used in the sample analysis process should be soaked with 10 90 nitric acid solution for 24 h.

Then rinse with tap water and experimental water in order, and dry in a clean environment for later use.

The main source of errors in the determination of copper, zinc, iron, and manganese is whether the sample is completely digested. During the actual measurement, it can be based on the difference in soil organic matter.

Adjust the amount of nitric acid, hydrochloric acid and hydrofluoric acid appropriately.

During the digestion using a microwave digester, attention should be paid to the requirements of the corresponding instrument and the temperature and pressure limitations of the digestion tank to avoid Bursting can cause personal and instrument damage.

ICP-OES cannot open the rectangular chamber door or rectangular tube chamber after igniting the plasma to prevent high frequency radiation from causing harm to personnel.

Due to the differences in the manufacturer and model of the instrument used in each laboratory, the instrument safety and operating instructions are different. List all relevant the recommendations are beyond the scope of this method. You can refer to the relevant instrument manual, consult the manufacturer, or consult the literature on safe operation.

4 Method summary

Soil samples are mixed with acid, digested by electric hot plate, graphite digestion furnace, microwave digestion instrument or automatic digestion instrument, and then inductively coupled to plasma the daughter emission spectrometer (ICP-OES) was used for detection.

The digested sample enters the atomizer of the plasma emission spectrometer to be

atomized, and is carried into the plasma torch by the argon carrier gas.

The element is vaporized, ionized, excited and radiates characteristic lines in the plasma torch. The intensity of the characteristic spectral line and the content of the test element in the sample it is proportional to a certain concentration range.

5.1 Reagents

5.1.1

Water.

The deionized or distilled water used should meet the specifications for secondary water in GB/T 6682. It is recommended to use the same batch of water in the same batch.

5.1.2

Hydrofluoric acid. excellent grade pure, concentration omega (HF) = 40%...

5.1.3

Nitric acid. excellent grade pure, omega (HNO₃) = 65%.

5.1.4

Perchloric acid. excellent grade pure, omega (HClO₄) = 70%.

5.1.5

Hydrochloric acid. excellent grade, omega (HCl) = 36%.

5.1.6

Hydrogen peroxide. super pure, omega (H₂O₂) = 30%.

5.1.7

Argon. purity ≥99.99%.

5.2 Reagent preparation

5.2.1

Nitric acid solution (1 99).

Take 10 mL of nitric acid, slowly add to 990 mL of water, and mix.

5.2.2

Nitric acid solution (10 90).

Take 100 mL of nitric acid, slowly add it to 900 mL of water, and mix well.

5.3.1 Element Standard Stock Solution

Use high-purity metals (purity greater than 99.99%) or metal salts (reference or high-purity reagents), configured to 100 mg/L or 1000 mg/L Standard solution of copper, zinc, iron, and manganese containing nitric acid solution, the acidity of the solution should be kept above 1% (v/v) Or use national certification and award Standard solution for quasi-substance certificates.

5.3.2 Preparation of standard series solutions

Accurately absorb the appropriate amount of element standard stock solution, and dilute with nitric acid solution (1 99) to prepare a mixed standard solution series, each element See Appendix A.1 for mass concentration. According to the element concentration in the sample solution, the element concentration range of the standard series can be adjusted appropriately.

6 Instruments and equipment

6.1

Inductively coupled plasma emission spectrometer.

6.2

Electric heating plate. The temperature control accuracy is ± 2.5 °C.

6.3

Graphite digestion furnace. equipped with Teflon digestion tank.

6.4

Microwave Digestion Apparatus. The temperature accuracy is ± 2.5 °C, equipped with a polytetrafluoroethylene digestion tank.

6.5

Acid drive. acid drive equipment for microwave digestion.

6.6

Automatic digestion instrument. equipped with PTFE digestion tank.

6.7

Balance. Accuracy is 0.0001 g.

6.8

PTFE crucible. 50 mL.