

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

HJ 804-2016

**Determination of Available Soil eight kinds of elements
diethylenetriamine pentaacetic acid extraction - inductively
coupled plasma emission spectrometry**

土壤 8种有效态元素的测定 二乙烯三胺五乙酸浸提-电感耦合等离子体发射光谱法
(English Translation)

Issued on: June 24, 2016

Implemented on: August 1, 2016

Issued by: Ministry of Ecology and Environment

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Foreword

To implement the "People's Republic of China Environmental Protection Law" to protect the environment, protect human health, regulate the soil in the effective state the determination of the method, the development of this standard.

This standard specifies the extraction of copper, iron, manganese, zinc, cadmium, cobalt, nickel and lead in soil by extraction with diethylenetriaminepentaacetic acid.

Inductively Coupled Plasma Atomic Emission Spectrometry.

This standard is the first release.

Appendix A of this standard is an informative appendix.

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

The main drafting unit of this standard. Yunnan Province Environmental Monitoring Center Station.

This standard is verified by. Institute of Biogeochemistry, Xishuangbanna Tropical Botanical Garden, Chinese Academy of Sciences, Shanghai Environmental Monitoring Measuring center, Sichuan Province Environmental Monitoring Station, Jiangsu Province Environmental Monitoring Center, Yuxi City Environmental Monitoring Station and Taizhou Environmental Monitoring Center station.

The Environmental Protection Department of this standard was issued on June 24, 2016.

This standard has been implemented since August 1, 2016.

This standard is explained by the Ministry of Environmental Protection.

Determination of 8 active elements in soil Extraction of diethylene triamine pentaacetic acid
- inductively coupled plasma - atomic emission spectrometry

1 Scope of application

This standard specifies the use of diethylenetriaminepentaacetic acid (DTPA) extraction of soil in the determination of the effective elements of the inductance coupling Son emission spectroscopy.

This standard is applicable to the effects of copper (Cu), iron (Fe), manganese (Mn), zinc (Zn), cadmium (Cd), cobalt (Co) (Ni) and lead (Pb) were measured.

When the sampling volume is 10.0 g and the volume of the extract is 20 ml, the detection limit and the determination limit of this method are shown in Table 1.

Table 1 Method Detection limit and lower limit of determination (mg/kg)

Elemental copper	iron	manganese	zinc	cadmium	cobalt	Method Detection limit	0.005
0.04	0.02	0.04	0.007	0.02	0.03	0.05	Determination of the lower limit of
0.02	0.16	0.08	0.16	0.028	0.08	0.12	0.2

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.

Technical specification for soil environmental monitoring Determination of Dry Matter and Moisture in Soil

3 Terms and definitions

The following terms and definitions apply to this standard.

3.1 Soil active elements

The elements that can be absorbed by the plant roots during the growing period of the plant, that is, under the conditions specified in this standard can be DTPA buffer solution is extracted from the soil.

4 Principle of the method

(DTPA-CaCl₂-TEA) buffer solution was extracted with diethylene triamine pentaacetic acid-calcium chloride-triethanolamine (DTPA-CaCl₂-TEA) the element was determined by inductively coupled plasma emission spectrometry.

The sample is atomized by the carrier gas into the atomization system, enters the plasma in the form of aerosols, and the target element is in the plasma the torch is vaporized, ionized, excited and radiated to the characteristic line. In a certain concentration range, the characteristic line intensity and the element the concentration of the ingredients is proportional.

5.1 Spectral interference

2 spectral interference, including spectral overlap interference and continuous background interference. Select the appropriate analysis line to avoid the overlap of spectral lines Interference, Table 2 for the measured elements in the proposed analysis of the wavelength of the main spectral interference. Use the instrument's own calibration software or interference Coefficient method to correct the spectral interference, when there is a single element of interference, according to formula (1) obtained interference coefficient.

Where. t_K - interference coefficient;

'Q - content measured at the wavelength of the element, $\mu\text{g/L}$;

Q - Analysis of elemental content, $\mu\text{g/L}$;

TQ - the content of interfering elements, $\mu\text{g/L}$.

By preparing a series of known interfering element content solutions, the 'Q is determined at the position of the elemental wavelengths, (1) to find t_K , and then artificial deduction or computer automatic deduction. Continuous background interference is usually deducted by the instrument Background method to eliminate. Note that the interferometric coefficients for different instruments are different.

Table 2 The main spectral interference of the element to be measured

Measured element wavelength/nm interference element to be measured wavelength/nm
interference element Cu 324.754 327.396 Fe, Al, Ti, Mo Cd

214.438 Fe

239.924 Cr, W 226.502 Fe, Ni, Ti, Ce, K, Co

240.488 Mo, Co, Ni 228.806 As, Co, Sc

259.940 Mo, W

228.616

Ti, Ba, Cd, Ni, Cr,

Mo, Ce

261.762 Mg, Ca, Be, Mn 230.768 Fe, Ni Mn

257.610 Fe, Mg, Al, Ce 238.892 Al, Fe, V, Pb

293.306 Al, Fe

231.604 Fe, Co

202.548 Co, Mg 221.647 W

206.200 Ni, La, Bi Pb 220.353 283.306 Fe, Al, Ti, Co, Ce, Sn, Bi

213.856 Ni, Cu, Fe, Ti

5.2 Non-spectral interference

Non-spectral interference mainly includes chemical interference, ionization interference, physical interference and solvent interference. In the actual analysis process, All kinds of interference is difficult to separate. Whether it is compensated and corrected, and the concentration of interfering elements in the sample. In addition, Physical interference is generally caused by the viscosity of the sample and the surface tension changes, especially the sample contains a large number of soluble salts or Acid is too high, will interfere with the determination. An effective way to eliminate or reduce such interference is dilution or matrix matching (That is, the components of the standard solution used in addition to the target substance are consistent with the sample solution).

36 Reagents and materials

Unless otherwise stated, analytical reagents conforming to national standards are used for analysis. Experimental water is a newly prepared deionized Water or water of the same purity.

6.1 Triethanolamine ($C_6H_{15}NO_3$). TEA.

6.2 Diethylenetriaminepentaacetic acid ($C_{14}H_{23}N_3O_{10}$). DTPA.

6.3 Calcium chloride dihydrate ($CaCl_2 \cdot 2H_2O$) ..

6.4 hydrochloric acid. $\rho(HCl) = 1.19 \text{ g/ml}$, excellent grade pure.

6.5 nitric acid. $\rho(HNO_3) = 1.42 \text{ g/ml}$, excellent grade pure.

6.6 Hydrochloric acid solution. 1 1, prepared with hydrochloric acid (6.4).

6.7 nitric acid solution. 2 98, with nitric acid (6.5) preparation.

6.8 Nitric acid solution. 1 1, with nitric acid (6.5) preparation.