

HJ

INDUSTRY STANDARD OF THE PEOPLE'S REPUBLIC OF CHINA

HJ 777-2015

**Ambient air and waste gas from stationary sources emission.
Determination of metal elements in ambient particle matter.
Inductively coupled plasma optical emission spectrometry**

空气和废气 颗粒物中金属元素的测定 电感耦合等离子体发射光谱法

(English Translation)

Issued on: December 4, 2015

Implemented on: January 1, 2016

Issued by: Ministry of Ecology and Environment

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Foreword

In order to implement the Environmental Protection Law of the People's Republic of China and the Law of the People's Republic of China on the Prevention and Control of Atmospheric Pollution, Standardize the health of the human body, regulate the ambient air and pollution sources of particulate matter in the determination of metal elements, the development of this standard.

This standard specifies the inductively coupled plasma emission spectrometric method for the determination of metal elements in air and particulate matter.

This standard is the first release.

Appendix A, Appendix B, Appendix D and Appendix E of this Standard are informative

appendices.

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

The main drafting unit of this standard. Sino-Japanese Friendship Environmental Protection Center (National Environmental Analysis and Testing Center).

The standard verification unit. Shanghai Environmental Monitoring Center, Jiangsu Province Environmental Monitoring Center, Australia real analysis and testing (Shanghai) limited Company, Chengdu Environmental Monitoring Center Station, Beijing Physical and Chemical Analysis and Testing Center, Beijing Environmental Protection Monitoring Center and National Geological Survey Test center.

This standard is approved by the Ministry of Environmental Protection on December 4, 2015.

This standard has been implemented since January 1, 2016.

This standard is explained by the Ministry of Environmental Protection.

Determination of Metallic Elements in Air and Waste Particulate Matter - Inductively Coupled Plasma Emission spectroscopy

1 Scope of application

This standard specifies the inductively coupled plasma emission spectrometric method for the determination of metal elements in air and particulate matter.

This standard applies to ambient air, unorganized emissions and fixed sources of waste particulate matter in silver (Ag), aluminum (Al), Arsenic (As), barium (Ba), beryllium (Be), bismuth (Bi), calcium (Ca), cadmium (Cd), cobalt (Co) Copper (Cu), iron (Fe), potassium (K), magnesium (Mg), manganese (Mn), sodium (Na), nickel (Ni) (Sb), tin (Sn), strontium (Sr), titanium (Ti), vanadium (V), zinc (Zn) and other 24 kinds of metal elements.

When the air sampling volume is 150 m³ (standard state), the pollution source gas sampling volume is 0.600 m³ (standard state dry flue gas) when the sample pretreatment volume is 50 ml, the detection limit and the determination limit of each metal element are shown in Appendix A.

2 Normative reference documents

The contents of this standard refer to the following documents or their terms. Any annotated file that does not specify the date, its valid version Applicable to this standard.

Determination of particulate matter and sampling method of gaseous pollutants in exhaust gas of fixed pollution sources GB/T 16157 HJ/T 48 smoke and dust sampler technical

conditions Technical Guidelines for Unorganized Emissions Monitoring of Air Pollutants
 Technical Requirements and Test Methods for HJ 93 Environmental Air Particulate (PM₁₀
 and PM_{2.5}) Sampler Technical specification for manual monitoring of ambient air quality
 Technical requirements and testing methods for HJ/T 374 total suspended particulate
 matter sampler Technical specification for HJ/T 397 fixed source exhaust gas monitoring HJ
 664 ambient air quality monitoring point layout technical specifications (Trial) JJG 768
 emission spectrometer verification procedures

3 Principle of the method

Will be collected to the appropriate filter on the air and waste particulate samples by
 microwave digestion or electric plate digestion, with inductively coupled Plasma emission
 spectrometry (ICP-OES) was used to determine the content of each metal element.

The digested sample is atomized into the atomizer of the plasma emission spectrometer
 and is carried by the argon carrier gas into the plasma torch , The target element is
 vaporized in the plasma torch, ionized, excited and radiated to the characteristic line. In a
 certain concentration range, the characteristic line intensity is proportional to the
 concentration of the element.

4 Interference and elimination

Inductively Coupled Plasma Atomic Emission Spectroscopy usually exists in the
 interference can be divided into two categories. one is spectral interference, another One is
 non-spectral interference.

4.1 Spectral interference

Spectral disturbances mainly include continuous background and overlapping lines. The
 usual method of correcting spectral interference is the background subtraction method
 (According to the single element test to determine the location and manner of subtracting
 the background) and the interference coefficient method. It can also be mixed in standard
 solutions Using matrix matching method to eliminate its impact.

When there is a single element interference, the interference factor can be obtained
 according to the following formula.

Where. t_K - interference coefficient;

'Q - interference element plus analysis element content;

Q - analysis of the content of elements;

TQ - the content of interfering elements.

The Q & apos; was determined at the position of the wavelength of the analytical element

by preparing a series of solutions of known interfering element content, Formula to find tK , and then artificial deduction or computer automatically deducted.

Under normal circumstances, the atmospheric particulate matter in the concentration of each element is low, the interference between the spectral and matrix elements can be ignored slightly. Pollutants Particulate matter Common Target Metal Element Determination Wavelength Spectral interference and its interference coefficient Reference values are given in Appendix C.

Note that the interferometric coefficients for different instruments are different.

4.2 Non-spectral interference

Non-spectral interference mainly includes chemical interference, ionization interference, physical interference and solvent interference, etc., in the actual analysis the process of interference is difficult to completely separate. Whether it is compensated and corrected, and the concentration of interfering elements in the sample. this , The physical interference is generally caused by the viscosity of the sample and the surface tension changes, especially when the sample contains a large number of soluble Salt, the measurement may interfere. The easiest way to eliminate such interference is to dilute the sample.

5 Reagents and materials

Unless otherwise stated, all grades of pure or high purity (eg microelectronics) chemical reagents that meet national standards are used for analysis.

The test water is deionized water or water with a specific resistance of $\geq 18 \text{ Mohm} \cdot \text{cm}$.

5.1

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

5.2

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

5.3

Hydrogen peroxide. $\omega(\text{H}_2\text{O}_2) = 30\%$.

5.4

hydrofluoric acid. $\rho(\text{HF}) = 1.16 \text{ g/ml}$.

5.5

perchloric acid. $\rho(\text{HClO}_4) = 1.67 \text{ g/ml}$.

5.6

nitric acid - hydrochloric acid mixed digestion.