

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

HJ 829-2017

**Ambient air -- Determination of inorganic elements in ambient
particle matter -- Energy dispersive X-ray fluorescence
spectroscopy (ED-XRF) method**

环境空气 颗粒物中无机元素的测定 能量色散X射线荧光光谱法
(English Translation)

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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, Environment, the protection of human health, regulate the ambient air and unorganized emissions of particulate matter in the determination of inorganic elements, the development of this standard.

This standard specifies the energy dispersive X-ray fluorescence of inorganic elements in the determination of ambient air and unorganized emissions of particulate matter (ED-XRF) analysis method.

This standard is the first release.

Appendix A to this standard is a normative appendix, both Appendix B and Appendix C are informative.

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

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

Participate in this standard method to verify the units are. Institute of Earth Environment, Chinese Academy of Sciences, Shanghai Environmental Science Research Institute, Jiangsu Tianrui Instrument Co., Ltd., Shanghai Si Baiji Instrument System Co., Ltd. (Panax business unit), Shimadzu enterprise management (China) Co., Ltd., Hunan Province Environmental Monitoring Center Station, Beijing Environmental Protection Monitoring Center, Tianjin Environmental Monitoring Center, Brooke (Beijing) Technology Co., Ltd. and the Ministry of Environmental Protection Standard Samples Institute.

The environmental protection department of this standard approved on May 2, 2017.

This standard has been implemented since July 1, 2017.

This standard is explained by the Ministry of Environmental Protection.

Determination of inorganic elements in ambient airborne particles - Energy dispersive X - ray fluorescence spectrometric method

1 Scope of application

This standard specifies the energy dispersive X-ray fluorescence spectroscopy for the determination of inorganic elements in ambient air and unorganized particulate matter.

This standard applies to the use of filter-collected ambient air and non-organized emissions of sodium (Na), magnesium (Mg), Aluminum (Al), silicon (Si), phosphorus (P), sulfur (S), chlorine (Cl), potassium (K), calcium (Ca), scandium (Sc), titanium (Ti), vanadium (V), chromium (Cr), manganese (Mn), iron (Fe), cobalt (Co), nickel (Ni) (Zn), arsenic (As), selenium (Se), strontium (Sr), bromine (Br), cadmium (Cd), barium (Ba) Tin (Sn), antimony (Sb) and other elements of the determination. This standard also applies to method validation to achieve accuracy and precision Requires other inorganic elements.

The limit of detection and the limit of determination are shown in Appendix A under the characteristic line conditions recommended by this standard.

2 Normative reference documents

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

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

3 Principle of the method

X-ray tube produced by the primary X-ray irradiation to the formation of flat, uniform particles on the surface of the sample, the measured elements released the characteristic X-ray fluorescence enters the detector directly. X-ray fluorescence of different energy (element) is obtained by the electronic system Light spectrum. The characteristic X-ray fluorescence intensity is obtained by full spectrum fitting or specific peak area integral. Particle load in a certain range, the use of thin sample analysis technology, the measured element characteristics peak intensity and its content is proportional to.

4 Interference and elimination

Usually using full spectrum fitting or specific peak area integral in two ways to obtain strength. Element content is low and no interference, Optional area of a specific peak area to obtain the intensity of the area. In the presence of interference, the full spectrum fitting method should be used to overlap the peaks and the influence of the interference peak is deduced to obtain the characteristic peak intensity of the target element. Examples of interference element fitting analysis

Table B.4.

5 Reagents and materials

5.1

Load on a polyester film (Mylar film) or a polycarbonate core membrane (Nuclepolar polycarbonate membranes) of the single element or compound standard sample, (0.5 ~ 50) g/cm², in terms of single element content.

Note: The element surface of the film is supported under the support ring for the A mode, in the support ring above the B mode. It is recommended to use B mode (see 12).

5.2

pure metal or inorganic compounds samples, the purity is greater than 99.9%.

5.3

Standard sample of mixed elements supported on polycarbonate core membrane or simulated PM_{2.5} standard sample, certified reference material.

5.4

quartz filter, Teflon, polypropylene and other organic filter.

Note: When using XRF to measure inorganic elements in ambient air particulates, Teflon filters are more suitable than quartz filters.

6 Instruments and equipment

6.1

Particulate Sampler. Its performance and technical specifications shall comply with the requirements of HJ/T 374 and HJ 93.

6.2

Energy Dispersive X - ray Fluorescence Spectrometer. According to the determination of light elements, can be equipped with helium replacement or vacuum function.

6.3

particle filter cut round knife, diameter 47mm. Or ceramic scissors.

6.4

tweezers (tweezers head for non-metallic material).

6.5

with a lid sample box, PVC material, diameter 47mm, 90mm.

6.6

Packaging with foil.

6.7

XRF special polypropylene film (Prolene thin film 4.0 m).

7.1.1 Sample load

The amount of particulate matter collected on the filter should not exceed 100 g/cm² in principle, and the particulate matter of the load should be evenly distributed A diameter of at least 30 mm. The amount of particulate matter on the filter can be controlled by controlling the sampling time.

Note: Excessive particulate loading can lead to sample matrix effects, deviating from the thin sample hypothesis, affecting the accuracy of the analytical results.

7.1.2 Environmental airborne particulate samples

The setting of ambient air sampling points shall comply with the relevant requirements of HJ 664. The sampling process was sampled according to the particulate matter in HJ/T 194 Request execution. When the target element content is low or PM₁₀ (PM_{2.5}) samples are collected, the sample volume can be increased as appropriate. sampling Sampling environmental conditions should be recorded in detail.