

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

**HJ 830-2017**

---

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

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

**Issued on: May 2, 2017**

**Implemented on: July 1, 2017**

---

**Issued by: Ministry of Ecology and Environment**

## Table of Contents

|                                                                                        |     |
|----------------------------------------------------------------------------------------|-----|
| Preface                                                                                | .ii |
| 1 Scope of application                                                                 |     |
| 2 Normative reference documents                                                        |     |
| 3 Principle of the method                                                              |     |
| 4 Interference and elimination                                                         |     |
| 5 Reagents and materials                                                               |     |
| 6 Instruments and equipment                                                            |     |
| 7 Samples                                                                              | .2  |
| 8 Analysis steps                                                                       |     |
| 9 Results are calculated and expressed                                                 |     |
| 10 Precision and accuracy                                                              |     |
| 11 Quality assurance and quality control                                               |     |
| 12 Precautions                                                                         |     |
| Appendix A (normative) method detection limit and lower limit of determination         |     |
| Appendix B (informative) Examples of interference factor correction factor calculation |     |
| Appendix C (informative) WD-XRF Example of measurement conditions                      |     |
| Appendix D (informative) Methodological precision and method accuracy                  |     |

## 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 wavelength dispersion X-ray fluorescence of inorganic elements in the determination of ambient air and unorganized emissions of particulate matter (WD-XRF) analysis method.

This standard is the first release.

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

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 to verify the units are. Hunan Province Environmental Monitoring Center Station, Beijing Environmental Protection Monitoring Center, Tianjin Environmental Monitoring Center, Ministry of Environmental Protection Standard Samples Institute, Brook (Beijing) Technology Co., Ltd., Shimadzu Enterprise Management (China) Co., Ltd., Institute of Earth Environment, Chinese Academy of Sciences, Shanghai Environmental Science Research Institute, Jiangsu Tianrui Instrument Unit Co., Ltd., Shanghai Si Baiji Instrument System Co., Ltd. (Panax business unit).

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 - Wavelength dispersive X - ray fluorescence spectrometric method

## 1 Scope of application

This standard specifies the wavelength dispersion X-ray fluorescence of inorganic elements in the determination of ambient air and unorganized emissions.

(WD-XRF).

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 (PM<sub>10</sub> and PM<sub>2.5</sub>) 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 JJG 810 Wavelength Dispersive X - Ray Fluorescence Spectrometer

### 3 Principle of the method

When the primary X-ray produced by the X-ray tube is irradiated onto the surface of the flat and uniform particle sample, the element to be measured is released the characteristic X-ray is crystallized by the crystal, and the detector measures the X-ray fluorescence intensity at a selected characteristic wavelength corresponding to 2 ° C.

Particulate matter load in a certain range, the use of thin sample analysis technology, X-ray fluorescence intensity is proportional to the measured element content.

### 4 Interference and elimination

Lead LNP line has significant interference with arsenic Kui line. Can be used to eliminate the interference factor of the interference element. The correction factor is real the calculation is shown in Appendix B.

### 5 Reagents and materials

#### 5.1

Commercially available argon-methane mixed gas (P10), referred to as argon gas, 90% argon 10% methane.

#### 5.2

Load on a polyester film (Mylar film) or a polycarbonate core membrane (Nuclepore polycarbonate membranes) of the single element or compound standard sample, (0.5 ~ 50) g/cm<sup>2</sup>, 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 the B mode (see 12.2).

#### 5.3

Standard sample of mixed elements supported on polycarbonate core membrane or simulated PM<sub>2.5</sub> 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

Wavelength Dispersive X - Ray Fluorescence Spectrometer. Equipped with a suitable sample cup. The main test items and measurement performance should be accurate the requirements of the A or B level specified in the JJG 810.

**Note:** The sample cup should have a gas channel design to avoid the vacuum, the filter surface measurement pressure caused by uneven imbalance. Filter in the sample the cup should be fixed in a suitable way.

### 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/cm<sup>2</sup> in principle. Load the particles to 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 PM<sub>10</sub> (or PM<sub>2.5</sub>) samples are collected, the sample volume may be increased as appropriate. Mining Samples should