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

GB/T 35097-2018

**Microbeam analysis -- Scanning electron microscopy with energy
dispersive X-ray spectrometry -- Determination of numeric
concentration of inorganic fibrous particles in ambient air**

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Foreword

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

This standard uses the redrafting method to modify the use of ISO 14966.2002 "environmental air inorganic fibrous particles counting concentration determination

Scanning electron microscopy.

This standard and ISO 14966.2002 "Determination of the concentration of inorganic particulate matter in ambient air by scanning electron microscopy" (English version)

The main technical differences and their reasons are as follows.

---According to Chinese expression habits, in order to highlight the main target analytes of this standard, before the original title "Inorganic Fiber", "Asbestos, etc." was added.

Three words;

--- The original standard explains the detection limit of the method in multiple places. The Chinese version consolidates this part of the content with the original "method performance" chapter.

And included in Chapter 1, "Scope", and added the scope of concentration measurement in Chapter 1;

--- Deleted the reference and added a chapter on "normative references";

--- Deleted some terms in the term and definition that are not closely related to the detection method, and reordered the terms;

---According to the actual operating experience, the sample collection and sampling membrane pretreatment steps are simplified in the standard text, and the nuclear pore membrane is first plated.

Gold and plasma ashing related content;

--- Deleted the contents of the original Appendix A and Appendix C, and moved the sampling record representation example and the test report example from the standard text to the appendix.

The appendix has been reordered;

--- Set the measurement uncertainty content in the original "method performance" chapter separately as Chapter 9 "Measurement Uncertainty". For the convenience of readers

The solution adds specific calculation methods and explanatory content.

This standard is proposed and managed by the National Microbeam Standardization Technical Committee (SAC/TC38).

This standard was drafted. National Environmental Analysis and Testing Center.

Introduction

Asbestos fibers and other inorganic fibers are widely used in construction, insulation, insulation, sealing and friction due to their unique excellent chemical and physical properties.

Materials and other fields. The use of asbestos fiber materials is currently limited in certain regions and in certain areas. But it still exists widely

People's life, production activities. The results of the study show that asbestos fibers entering the human body are highly carcinogenic.

There are many ways for inorganic fibers such as asbestos to enter the human body, and the entry through breathing is the most important way. Biological research results show that

The carcinogenicity of asbestos fibers is related to the length and diameter of the fibers and the ability of the fibers to resist decomposition in the living environment. Generally considered that the length is less than

The potential carcinogenicity of 5 μm fibers is very low, and fibers larger than 3 μm in diameter are difficult to be inhaled into the human body. In this standard, the fiber can be counted.

It is defined as the length of the fibers exceeding 5 μm , the width ranging from the observation limit to 3 μm , and the aspect ratio being greater than 3.1. Therefore, this method requires

Record the length and diameter of all tested fibers.

According to the current scientific point of view, calcium sulphate does not cause damage to the human body, so it should be distinguished from other inorganic fibers.

Included in the final result. However, it is necessary to measure the calcium sulfate fiber

count concentration because high concentrations of such fibers make possible asbestos fibers.

The dimensional result has a negative bias. In some cases, these samples should even be discarded.

Standardized testing of inorganic fiber concentrations such as asbestos in ambient air, assessment of ambient air quality and people's living environment

It is important. Asbestos is very low in ambient air, accounting for only tens of thousands to thousands of parts of the total suspended particulate matter.

It was measured by an electron microscope-energy spectrometer. For fibers with a width of less than 0.2 μm , this method has a large detection and discrimination result.

Certainty. It can be confirmed according to the analysis results of known sources or suspected sources (such as block building materials, thermal insulation materials, etc.) around the sampling site.

Reduce the uncertainty of the identification results. In addition to the very difficult case of fiber differentiation, the results measured by this method are attached to ISO 10312.1995.

The results of the method of measuring fibers by transmission electron microscopy in E are basically the same.

If ordinary scanning electron microscopy is used, there is a limitation in the determination and differentiation of fibers having a width of less than 0.2 μm . If the sample taken

Fibers with a medium width of less than 0.2 μm are dominant. It is recommended to use a field emission gun to scan electron microscopy or TEM (according to

The requirements of ISO 10312) are measured.

Microbeam analysis scanning electron microscopy-energy spectroscopy

Inorganic fibrous particles such as asbestos in ambient air

Determination of count concentration

1 Scope

This standard specifies the method for measuring the concentration of inorganic fibrous particles such as asbestos in ambient air by scanning electron microscopy. This method is simultaneous

X-ray energy spectrum analysis (EDX) is used to analyze the elemental composition of fibrous particles, and according to this data, asbestos fiber and calcium sulfate fiber are distinguished.

Peace with other inorganic fibers.

This standard applies to the determination of the concentration of inorganic fibrous particles such as asbestos in ambient air, and also applies to asbestos in the air of buildings.

Detection of the concentration of inorganic fibrous particles. For example, after the asbestos-containing building materials are removed and replaced, the asbestos fibrous particles remain in the air.

Determination of degree.

If no fiber is found at the time of detection (the number of fibers is 0), the upper limit of the 95% confidence interval is 2.99. If every square centimeter

1.0m³ of air was passed through the film, and the area of 1.0mm² on the film was analyzed by scanning electron microscopy.

At 0.010 m³, the detection limit is approximately 300 fibers per m³ of fiber.

The detection range of the fibrous particle concentration on the filter sample is about 3/cm² to 200 /cm². Concentration value in the air (fiber root

The number /m³) can be calculated depending on the sampling volume.

Note 1. In the calculation of the detection limit, the fiber background value on the filter membrane is not considered. Experience has shown that the unused filter background value can be compared to the above detection limits.

Ignore it.

Note 2. The concentration of asbestos fibers (length greater than 5 μm) measured in ambient air is generally less than 1000/m³, and in most cases less than 100/m³.

Therefore, the number of asbestos fibers measured in a single measurement is usually small, so the detection limit and the measurement should be expressed based on the total amount of asbestos fibers and other inorganic fibers.

Uncertainty (see Chapter 9).

2 Normative references

The following documents are indispensable for the application of this document. For dated references, only dated versions apply to this article.

Pieces. For undated references, the latest edition (including all amendments) applies to this document.

GB/T 27025 General requirements for testing and calibration laboratory capabilities (GB/T 27025-2008, ISO /IEC 17025.2005, IDT)

HJ/T 194 Technical Specifications for Manual Air Quality Monitoring