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# NATIONAL STANDARD OF THE PEOPLE'S REPUBLIC OF CHINA

# GB/T 46122.4-2025

## Fireworks - Test methods for determination of specific chemical substances - Part 4: Determination of lead and lead compounds - X-ray fluorescence spectrometry

烟花爆竹 特定化学物质检测方法 第4部分：铅和铅化合物含量的测定 X射线荧光光谱法

**(English Translation)**

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## Foreword

This document is in accordance with the provisions of GB/T 1.1-2020 "Guidelines for standardization work Part 1: Structure and drafting rules for standardization documents" Drafting.

This document is Part 4 of GB/T 46122 "Test Methods for Specific Chemical Substances in Fireworks and Firecrackers". GB/T 46122 has been published.

The following sections.

--- Part 1: General provisions;

--- Part 2: Determination of hexachlorobenzene content - Gas chromatography method;

--- Part 3: Determination of lead and lead compound content - Flame atomic absorption spectrometry;

--- Part 4: Determination of lead and lead compound content - X-ray fluorescence spectrometry;

--- Part 5: Determination of lead and lead compounds content - Inductively coupled plasma atomic emission spectrometry;

--- Part 6: Determination of zirconium content of particles less than 40 μm - Inductively coupled plasma atomic emission spectrometry;



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--- Part 7: Determination of chlorate content - Chemical titration method;

--- Part 8: Determination of arsenic content - Hydride generation-atomic fluorescence spectrometry;

--- Part 9: Determination of mercury content - Hydride generation-atomic fluorescence spectrometry;

--- Part 10: Determination of nitrogen content in nitrocellulose - Ferrous sulfate titration method;

--- Part 11: Determination of phosphorus content - Inductively coupled plasma atomic emission spectrometry;

--- Part 12: Determination of picric acid and picric acid salts content - High performance liquid chromatography method.

This document is equivalent to ISO 22863-4:2021 "Fireworks and firecrackers - Detection methods for specific chemical substances - Part 4: X-ray fluorescence Determination of lead and lead compounds by XRF spectrometry.

The following minimal editorial changes have been made to this document.

--- To coordinate with the existing standard, the name of the standard was changed to "Test Methods for Specific Chemical Substances in Fireworks and Firecrackers Part 4: Lead and Determination of compound content by X-ray fluorescence spectrometry.

## Introduction

As the importance of fireworks and firecrackers product safety and environmental protection gradually deepens, the chemical substances used in fireworks and firecrackers products are Requirements are made, especially for the use of toxic and harmful chemicals and those that increase the risk of combustion and explosion of products. International Standardization the Fireworks and Firecrackers Technical Committee organized the development of ISO 22863 (all parts). GB/T 46122 adopts ISO 22863 (all parts).

The standardization of the testing methods for fireworks and firecrackers is to improve the safety and environmental performance of fireworks and firecrackers products and promote the development of the industry.

GB/T 46122 is planned to consist of 12 parts.

--- Part 1: General. The purpose is to determine the methods of specimen dissection, sampling and sample preparation.

--- Part 2: Determination of hexachlorobenzene content by gas chromatography. The purpose is to determine the content of hexachlorobenzene in fireworks and firecrackers.

Methods, procedures and presentation of results.



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--- Part 3: Determination of lead and lead compounds content Flame atomic absorption spectrometry.

Method, procedure and presentation of results for the determination of lead and lead compounds in fireworks and firecrackers by absorption spectroscopy.

--- Part 4: Determination of lead and lead compounds content X-ray fluorescence spectrometry. The purpose is to determine the use of X-ray fluorescence Method, procedure and result presentation of the determination of lead and lead compounds in fireworks and firecrackers by spectroscopy.

--- Part 5: Determination of lead and lead compounds content Inductively coupled plasma atomic emission spectrometry. The purpose is to determine the Method, procedure and results for determination of lead and lead compounds in fireworks and firecrackers by inductively coupled plasma atomic emission spectrometry Results statement.

--- Part 6: Determination of zirconium content in particles less than 40 μm by inductively coupled plasma atomic emission spectrometry.

Method for determining zirconium content in fireworks and firecrackers with particle size less than 40 μm by inductively coupled plasma atomic emission spectrometry, Procedure and result presentation.

--- Part 7: Determination of chlorate content Chemical titration analysis method. The purpose is to determine the use of chemical titration analysis method for fireworks Method, procedure and presentation of results for the determination of chlorate content in firecrackers.

--- Part 8: Determination of arsenic content by hydride generation-atomic fluorescence spectrometry.

Method, procedure and result presentation of determination of arsenic content in fireworks and firecrackers by electron fluorescence spectrometry.

--- Part 9: Determination of mercury content by hydride generation-atomic fluorescence spectrometry.

Method, procedure and result presentation of determination of mercury content in fireworks and firecrackers by electron fluorescence spectrometry.

--- Part 10: Determination of nitrogen content in nitrocellulose by ferrous sulfate titration. The purpose is to determine the the method, procedure and result expression of the determination of nitrogen content in nitrocellulose in fireworks and firecrackers are given in this paper.

--- Part 11: Determination of phosphorus content by inductively coupled plasma atomic emission spectrometry.



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Method, procedure and presentation of results for determination of phosphorus content in fireworks and firecrackers by plasma atomic emission spectrometry.

--- Part 12: Determination of picric acid and picrates by high performance liquid chromatography.

Method, procedure and result presentation for the determination of picric acid and picrates in fireworks and firecrackers by spectroscopy.

Detection methods for specific chemical substances in fireworks and firecrackers Part 4: Determination of lead and lead compounds X-ray fluorescence spectrometry

## 1 Scope

This document describes a method for the determination of lead and lead compounds in pyrotechnic compositions of fireworks and firecrackers by X-ray fluorescence spectrometry (XRF).

This method is applicable to the determination of lead and lead compounds in fireworks and firecrackers.

## 2 Normative references

The contents of the following documents constitute the essential clauses of this document through normative references in this document.

For referenced documents without a date, only the version corresponding to that date applies to this document; for referenced documents without a date, the latest version (including all amendments) applies to this document.

ISO 22863-1 Fireworks-Test methods for specific chemical substances in fireworks and firecrackers Part 1: General Note. GB/T 46122.1-2025 Fireworks and firecrackers - Detection methods for specific chemical substances - Part 1: General (ISO 22863-1:2020, IDT)

## 3 Terms and Definitions

For the purposes of this document, the terms and definitions given in ISO 22863-1 apply.

## 4 Principles of the Method

In XRF analysis, an X-ray source irradiates the sample. The source can be an X-ray tube or a sealed radioactive isotope.

When the source X-rays are irradiated, they may be scattered or absorbed by the sample atoms. When an atom absorbs the source X-rays, the incident radiation will Electrons are



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