

ICS 77.080.01

CCS H 11



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

GB/T 223.92-2023

**Iron, steel and alloys - Determination of the lanthanum, cerium,
praseodymium, neodymium and samarium contents -
Inductively coupled plasma mass spectrometry**

钢铁及合金 镧、铈、镨、钕、钐含量的测定 电感耦合等离子体质谱法

Issued on: September 7, 2023

Implemented on: April 1, 2024

**Issued by: State Administration for Market Regulation;
Standardization Administration of China**

Table of Contents

- 1 Scope
- 2 Normative reference documents
- 3 Terms and definitions
- 4 Principles
- 5 Reagents or materials

Foreword

This document complies with the provisions of GB/T 1.1-2020 "Standardization Work Guidelines Part

1. Structure and Drafting Rules of Standardization Documents" Drafting. This document is Part 92 of GB/T 223. The published parts of GB/T 223 are shown in Appendix A. Please note that some content in this document may be subject to patents. The publisher of this document assumes no responsibility for identifying patents. This document is proposed by the China Iron and Steel Industry Association. This document is under the jurisdiction of the National Steel Standardization Technical Committee (SAC/TC183). This document was drafted by: Inner Mongolia Baogang Steel Union Co., Ltd., Baotou Customs Comprehensive Technical Service Center, Gangyan Nanok Testing Technology Co., Ltd., Baoshan Iron and Steel Co., Ltd., Shanghai Materials Research Institute, Shougang Group Co., Ltd., Shanxi Taigang Stainless Steel Co., Ltd. Company, Luoyang Ship Materials Research Institute (No. 725 Research Institute of China State Shipbuilding Corporation), MCC Testing and Certification Co., Ltd., Baotou Rare Soil Research Institute, Marine Inspection and Testing Co., Ltd. The main drafters of this document. Wang Yanqiu, Yang Chunyan, Liang Zhengwei, Zhao Jing, Luo Qianhua, Julie, Chang Huan, Ren Yichen, Zhang Jianjun, Liu Gangyao, Wang Jingzhong, Zhang Pengxiang, Sun Xiaofei, Chen Zhongying, Zhao Mengying, Zhao Yanbing, Wang Xian'an, Liu Pan, Zhang Yi, Niu Huxia, Bao Xiangchun, Du Yuting, Wei Feng, Kang Jing.

Steel is the mainstay of the national economy, the lifeblood of the country, and the material guarantee for the country's survival and development. Standard system in the steel field Among them, the standard system for determination of chemical composition of steel and alloys is a very important part, which has been developed in ensuring the quality of steel and alloy products. Playing an important role, this series of method standards serve the production, trade and application of steel and alloys, and provide high-quality development for my country's steel industry. Provide technical support. GB/T 223 includes a series of standards for determination methods of chemical composition of steel and alloys, which

respectively stipulates the content of carbon, silicon, and other chemical components in steel and alloy products. Manganese, phosphorus, sulfur, nickel, chromium, molybdenum, copper, vanadium, aluminum, titanium, cobalt, tungsten, niobium, zirconium, tantalum, calcium, magnesium, zinc, iron, arsenic, lead, tin, antimony, bismuth, cadmium, Selenium, tellurium, cerium, boron, Method for determination of chemical components such as oxygen, nitrogen, hydrogen, total rare earth content and hydrochloric acid insoluble matter. In 1963, GB/T 223 released 12 national standards for the determination of chemical composition of steel for the first time. With the analysis in the field of steel and alloys, The development of technology and actual production needs, after years of continuous revision work, have formed a relatively complete standard system. See Appendix A for details of the constituent documents of GB/T 223. GB/T 223.92 provides a method for determining the content of lanthanum, cerium, praseodymium, neodymium and samarium in steel and alloys by inductively coupled plasma mass spectrometry. The method has filled the gaps in related domestic research fields and reached the international advanced level. Determination of lanthanum, cerium, praseodymium, neodymium and samarium content in steel and alloys Inductively coupled plasma mass spectrometry Warning

---Personnel using this document should have practical experience in regular laboratory work. This document does not address all possible security issues question. Users are responsible for taking appropriate safety and health measures and ensuring compliance with the conditions stipulated in relevant national regulations.

1 Scope

China's national method for determining five rare earth elements in iron, steel and alloys by inductively coupled plasma mass spectrometry. It is Part 92 of GB/T 223 and describes the determination of lanthanum, cerium, praseodymium, neodymium and samarium, applying to cast iron, steel and high-temperature alloys at mass fractions of 0.0001 to 0.0100 per cent for lanthanum, praseodymium and samarium, and 0.0002 to 0.0100 per cent for cerium and neodymium. Rare earths are added to steel and cast iron in quantities so small that they are usually described in parts per million, and they do work out of all proportion to that. In cast iron they are the nodularising and inoculating additions that turn flake graphite into spheroids and neutralise the trace elements that would poison the reaction. In steel they modify the shape of the sulfide inclusions, turning the elongated manganese sulfide stringers that make a plate weak through its thickness into small globular inclusions - which is what makes a steel resistant to lamellar tearing and to hydrogen-induced cracking in sour service. And in high-temperature alloys they improve the adherence of the protective oxide scale, which is what keeps a blade coating attached through thermal cycling. Because the effect is produced at these levels, the assay has to work there, and that is why mass spectrometry rather than emission: at the low end of this range the ICP-MS detection limits are two or three orders below what an emission spectrometer can distinguish from the background of an iron matrix. The standard fixes the dissolution, the separation or dilution

of the matrix, the isotopes measured and the interferences that afflict them, the internal standardisation, the calibration and the precision. Issued on 7 September 2023 and in force since 1 April 2024.

2. Determination of repeatability of standard measurement methods Basic methods of sex and reproducibility

2 Normative reference documents

The contents of the following documents constitute essential provisions of this document through normative references in the text. Among them, the dated quotations For undated referenced documents, only the version corresponding to that date applies to this document; for undated referenced documents, the latest version (including all amendments) applies to this document.

GB/T 6379.1 Accuracy of measurement methods and results (correctness and precision)
Part

GB/T 6379.2 Accuracy of measurement methods and results (correctness and precision)
Part

GB/T 6682 Specifications and test methods for water used in analytical laboratories

GB/T 20066 Methods for sampling and preparation of samples for determination of chemical composition of steel and iron

3 Terms and definitions

There are no terms or definitions to be defined in this document.

4 Principles

After the sample is decomposed with an appropriate acid, the diluted test solution is introduced into the inductively coupled plasma mass spectrometer through a peristaltic pump. The mass spectrometer simultaneously measures the relative mass spectrum signal intensity of lanthanum, cerium, praseodymium, neodymium, samarium and internal standard cesium. The calibration solution and calibration blank are matrix-matched with the major elements of the tested sample and acid used for sample decomposition, and internal standards are used to compensate for instrument drift. and matrix effects.

5 Reagents or materials

Unless otherwise stated, only reagents and materials confirmed to be of superior purity and with a mass fraction of less than 0.00001% of each element to be measured are used in the analysis. Secondary water specified in GB/T 6682.

5.1 Pure iron The mass fraction of each element to be measured is less than 0.00001%.

chinastandards.org · PREVIEW