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

**GB/T 223.90-2021**

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**Iron, steel and alloy - Determination of silicon content -  
Inductively coupled plasma atomic emission spectrometric  
method**

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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 of Standardization Documents"

Drafting.

This document uses the redrafting method to amend and adopt ISO /T R17055.2002 "Determination of Silicon Content in Steel by Inductively Coupled Plasma Principles"

Sub-Emission Spectroscopy.

A chapter "Terms and Definitions" has been added to this document.

The technical differences between this document and ISO /T R17055.2002 and the reasons are as follows.

---Expanded the measurement range in Chapter 1 "Scope" to better meet the needs of the laboratory;

---Regarding normative reference documents, this document has made adjustments with technical differences to adapt to my country's technical conditions and adjust the situation.

Reflected in Chapter 2 "Normative Reference Documents", the specific adjustments are as follows.

\* Replace ISO 5725-1.1994 (see 9.2) with GB/T 6379.1 equivalent to the international standard;

\* Replace ISO 5725-2.1994 (see 9.2) with GB/T 6379.2, which is equivalent to the international standard;

\* Replace ISO 3696.1987 (see Chapter 5) with GB/T 6682 modified to adopt international standards;

\* Replace ISO 1042.1998 (see 6.1) with GB/T 12806, which is not equivalent to adopting

international standards;

\* Replace ISO 648.1977 with GB/T 12808 (see 6.1);

\* Replace ISO 14284.1996 (see Chapter 7) with GB/T 20066, which is equivalent to the international standard;

\* Deleted ISO 5725-3.1994 (see 9.2).

---Adjusted the reagents used in Chapter 5 and the concentration of the silicon stock solution, and added the method of preparing the silicon stock solution with hexafluorosilicate amine;

---Added two recommended analysis lines in "6.2.2 Analysis Spectral Lines" to provide operators with more choices;

---Modified "6.2.5 Limit of Detection (LOD) and Limit of Quantification (LOQ)", and replaced the "background equivalent concentration" in the international standard with "quantitative "Limited", consistent with the relevant international standards issued after.2004;

---Added "6.5 pipette" to ensure the accuracy of measuring the volume of the standard solution;

---Modified the calibration method in Chapter 8 "Test Procedures", using the calibration curve method to improve the operability of the standard;

---Added the requirements for the control of sample dissolution temperature in "8.3.1 Preparation of sample solution" to ensure that the silicon is not in the process of dissolving the sample.

Volatilize;

--- Modify "9.2 Precision", reorganize the precision test to determine the precision to meet the requirements of product quality control.

This document has made the following editorial changes.

---In order to be consistent with the existing series of standards, the standard name is changed to "Determination of the silicon content of steel and alloy inductively coupled plasma

Sub-Emission Spectroscopy;

---Added Appendix A (normative) "Methods of Measuring Instrument Performance Index".

This document was proposed by the China Iron and Steel Association.

This document is under the jurisdiction of the National Steel Standardization Technical Committee (SAC/TC183).

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The 725th Research Institute of China Shipbuilding Industry Corporation, Tianjin Iron and Steel Group Co., Ltd.

## 1 Scope

This document specifies the method for determining silicon content by inductively coupled plasma atomic emission spectrometry.

This document applies to pig iron, cast iron, non-alloy steel, low alloy steel and alloy steel with a mass fraction of 0.01% to 5% of silicon content.

Determination.

## 2 Normative references

The contents of the following documents constitute the indispensable clauses of this document through normative references in the text. Among them, dated quotations

Only the version corresponding to that date is applicable to this document; for undated reference documents, the latest version (including all amendments) is applicable to

This document.

GB/T 6379.1 Measurement method and accuracy of results (accuracy and precision) Part 1. General rules and definitions (GB/T 6379.1-

2004, ISO 5725-1:1994, IDT)

GB/T 6379.2 Accuracy of measurement methods and results (accuracy and precision) Part 2. Determine the repeatability of standard measurement methods

Basic methods of performance and reproducibility (GB/T 6379.2-2004, ISO 5725-2:1994, IDT)

GB/T 6682 Analytical laboratory water specifications and test methods (GB/T 6682-2008, ISO 3696:1987, MOD)

GB/T 12806 Laboratory glassware single mark volumetric flask (GB/T 12806-2011, ISO 1042.1998, NEQ)

GB/T 12808 Single-marked pipette for laboratory glassware

GB/T 20066 Sampling and sample preparation methods for the determination of the chemical composition of steel and iron (GB/T 20066-2006, ISO 14284.

1996, IDT)

### 3 Terms and definitions

There are no terms and definitions that need to be defined in this document.

### 4 Principle

The sample is dissolved in a mixed acid of hydrochloric acid, nitric acid, and hydrofluoric acid. If necessary, add internal standard elements and dilute to a certain volume. The solution is filtered

(If necessary) After atomization into the inductively coupled plasma torch, the emission intensity of the silicon analysis line is measured, and the internal standard element line is measured at the same time

The emission intensity.

### 5 Reagents and materials

Unless otherwise stated, only use the analytical reagents and secondary water specified in GB/T 6682 in the analysis.