

ICS 77.040.99
CCS H 24



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

GB/T 46224-2025

**Methods for evaluating the nodularity of carbides
(English Translation)**

Issued on: August 29, 2025

Implemented on: March 1, 2026

Issued by: State Administration for Market Regulation

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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 modified to adopt ISO 23825:2020 "Steels for cold heading and cold extrusion - Evaluation of the degree of carbide spheroidization".

Compared with ISO 23825:2020, this document has undergone many structural adjustments. A table comparing the changes in structural numbering between the two documents is provided.

See Appendix A.

The technical differences between this document and ISO 23825:2020, and the reasons therefor, are as follows.

---A quantitative imaging method has been added, and its applicable scope has been changed (see Chapter 1);

---Add normative references to GB/T 13298 (see 4.3) and GB/T 30067 (see Chapter 3) to

adapt to my country's technical conditions.

Increase operability.

---The terms and definitions for area ratio, area mean and standard deviation, and Delaunay triangulation (see 3.7) have been deleted. The following terms and definitions have been added.

Increase operability;

---The criteria for spherical carbides have been modified (see 3.4) to facilitate domestic application;

---The etching solution for sample preparation has been modified (see 4.3) to facilitate domestic application;

---The E series (see 6.1.3) has been removed to avoid duplication with other domestic standards;

---The handling of disputes regarding sphericity level assessment results has been changed (see 6.1.5), and the image-based quantitative method is more accurate;

---Specific operational steps are provided for both the spectral comparison method (see 6.2.1) and the image-based quantitative method (see 6.2.2), which are in line with national conditions and practical.

Convenient to use;

---The actual field of view size analyzed has been changed (see 6.2.1.2) for easier practical operation;

---The image-based quantitative analysis equipment is enhanced with a scanning electron microscope (see 6.2.2.1) to facilitate practical operation;

---The image-based quantitative method can achieve a magnification of up to 5000x (see 6.2.2.2), improving the ability to identify carbides in images;

---The image-based quantitative method provides specific quantitative evaluation indicators (see 6.2.2.4 and 6.2.2.5), which facilitates practical operation;

---The image-based quantitative method provides a representation of the results (see 7.2) for ease of use;

---The content related to automatic image processing in Appendix B has been removed to adapt to my country's technical conditions and increase operability;

---The image-based quantitative method provides application examples (see Appendix C) to facilitate understanding and application.

The following editorial changes have been made to this document.

---The standard title has been changed to "Method for Assessing the Degree of Carbide Spheroidization" to maintain consistency with the scope of this document;

---Table 1 steel series numbers 1~4 are changed to A~D.

Please note that some content in this document may involve patents. The issuing organization of this document assumes no responsibility for identifying patents.

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).

1 Scope

This document specifies the sampling and sample preparation, evaluation methods, result expression, and test report for assessing the degree of carbide spheroidization.

This document is primarily applicable to the evaluation of the spheroidization degree of carbides after spheroidizing annealing of steel with a carbon content not exceeding 0.80%, including the spectral comparison method.

It is applicable to cold heading steel and cold extrusion steel. Other steel grades can refer to this method for application.

2 Normative references

The contents of the following documents, through normative references within the text, constitute essential provisions of this document. Dated citations are not included.

For references to documents, only the version corresponding to that date applies to this document; for undated references, the latest version (including all amendments) applies.

This document.

GB/T 13298 Examination Methods for Metallic Microstructure GB/T 30067 Metallographic Terminology

3 Terms and Definitions

The terms and definitions defined in GB/T 30067 and the following terms and definitions apply to this document.

The maximum length of particulate matter in all directions is shown in Figure 1.

Figure 1. Schematic diagram of the maximum Fretette diameter of carbide particles.

roundness

The area of the carbide particle is divided by the area of the circle containing its maximum Ferret diameter, and calculated according to formula (1).

$$R=A/A_m=4A/\pi L_m^2 \quad (1)$$

In the formula.