



**NATIONAL STANDARD OF THE
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**Hardmetals - Metallographic determination of microstructure -
Part 4: Characterisation of porosity, carbon defects and
eta-phase content**

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Table of Contents

Foreword...	3
Introduction...	4
1 Scope...	6
2 Normative References...	6
3 Terms and Definitions...	6
4 Symbols and Units...	7
5 Principle...	7
6 Apparatus...	7
7 Calibration of Measurement Apparatus...	8
8 Preparation of Test Samples...	8
9 Procedure...	9
10 Uncertainty of Measurement...	14
11 Test Report...	14
Bibliography...	16

Foreword

This Document was drafted as per the rules specified in GB/T 1.1-2020 Directives for Standardization - Part 1: Rules for the Structure and Drafting of Standardizing Documents.

This Document is Part 4 of GB/T 3488 Hardmetals - Metallographic Determination of Microstructure. GB/T 3488 consists of the following parts:

- Part 1: Photomicrographs and Description;
- Part 2: Measurement of WC Grain Size;
- Part 3: Measurement of Microstructural Features in Ti (C, N) and WC/Cubic Carbide Based Hardmetals;
- Part 4: Characterization of porosity, Carbon Defects and Eta-Phase Content.

This Document equivalently adopts ISO 4499-4:2016 Hardmetals - Metallographic Determination of Microstructure - Part 4: Characterization of Porosity, Carbon Defects and Eta-Phase Content.

Please note some contents of this Document may involve patents. The issuing agency of this

Document shall not assume the responsibility to identify these patents.

This Document was proposed by China Nonferrous Metals Industry Association.

This Document shall be under the jurisdiction of National Technical Committee on Nonferrous

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Hardmetals - Metallographic Determination of

Microstructure - Part 4: Characterization of Porosity,

Carbon Defects and Eta-Phase Content

1 Scope

This Document specifies methods for the metallographic determination of the presence, type,

and distribution of porosity, carbon defects and eta-phase in hardmetals.

2 Normative References

The provisions in following documents become the essential provisions of this Document

through reference in this Document. For the dated documents, only the versions with the dates

indicated are applicable to this Document; for the undated documents, only the latest version

(including all the amendments) is applicable to this Document.

GB/T 3488.2-2018 Hardmetals - Metallographic determination of microstructure - Part 2: Measurement of WC grain size (ISO 4499-2:2008, IDT)

3 Terms and Definitions

For the purposes of this document, the following terms and definitions apply.

3.1 Carbon defects

Macroscopic precipitates of carbon (graphite) which can be in the form of large angular rosettes

or small flakes.

3.2 Eta-phase; eta-phase

Cubic carbide based on M₆C or M₁₂C structure where M is a mixture of Co and W usually in

equal proportions; and which can be present as large (up to 100µm diameter) rosettes or small

micrometer-sized particles.

large eta-phase rosettes. When the eta-phase is present as smaller particles (see Figure 6), it is

recommended to use a 5 % Murakami's solution for 20 min followed by washing the sample

with water. In both cases, the surface should be dried carefully with acetone or alcohol without

wiping.

9.1 General

If the porosity or uncombined carbon is not uniform over the area of the test piece section being

examined, the locations on the section to which the evaluation refers shall be identified, for

example, as top, bottom, edge, rim (case), core, etc.

It should be noted that the figures given in this Clause are only representing approximately

1/7 of the field of view in the microscope.

9.2 Determination of porosity

Pore size is defined as the maximum dimension of the pore in the section. Special reference

shall be made to the presence of cracks or slits.

9.2.1 Pores up to 10 μ m shall be assessed by scanning the surface of the test-piece section at a

magnification of either x100 or x200. An area fully representative of the test-piece section shall

be examined and compared with the range of photomicrographs shown in Figure 1 or Figure 2,

according to the chosen magnification. The porosity level shall be reported by reference to the

appropriate photomicrograph and designated as A02, A04, A06 or A08. If the level of A-type

pores is less than 50 % of that shown in Figure 1 (A02) or Figure 2 (A02), it shall be designated

as A00.

9.2.2 Pores within the range 10 μ m to 25 μ m shall be assessed by scanning the surface of the

test-piece section at a magnification of x100. An area fully representative of the test-piece section shall be examined and shall be compared with the range of photomicrographs shown in

Figure 3. The porosity level shall be reported by reference to the appropriate photomicrograph

and designated as B02, B04, B06 or B08.

If the number of B-pores appears to be less than or equal to that represented by B02, the number