BS EN ISO 4499-4:2016

BSI Standards Publication

Hardmetals — Metallographic determination of microstructure

Part 4: Characterisation of porosity, carbon defects and eta-phase content

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National foreword

This British Standard is the UK implementation of EN ISO 4499-4:2016. It supersedes BS EN 24505:1993 which is withdrawn.

The UK participation in its preparation was entrusted to Technical Committee ISE/65, Sintered metal components.

A list of organizations represented on this committee can be obtained on request to its secretary.

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Hardmetals - Metallographic determination of microstructure - Part 4: Characterisation of porosity, carbon defects and eta-phase content (ISO 4499-4:2016)

Métaux-durs - Détermination métallographique de la microstructure - Partie 4: Caractérisation de la porosité, des défauts carbone et de la teneur en phase êta (ISO 4499-4:2016)

Hartmetalle - Metallographische Bestimmung der Mikrostruktur - Teil 4: Charakterisierung von Porosität, Kohlenstofffehlern und Anteil an Eta-Phase (ISO 4499-4:2016)

This European Standard was approved by CEN on 4 February 2016.

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EUROPEAN COMMITTEE FOR STANDARDIZATION
COMITÉ EUROPÉEN DE NORMALISATION
EUROPÄISCHES KOMITEE FÜR NORMUNG

CEN-CENELEC Management Centre: Avenue Marnix 17, B-1000 Brussels

European foreword

This document (EN ISO 4499-4:2016) has been prepared by Technical Committee ISO/TC 119 "Powder metallurgy".

This European Standard shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by September 2016, and conflicting national standards shall be withdrawn at the latest by September 2016.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CEN [and/or CENELEC] shall not be held responsible for identifying any or all such patent rights.

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Endorsement notice

The text of ISO 4499-4:2016 has been approved by CEN as EN ISO 4499-4:2016 without any modification.

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Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular the different approval criteria needed for the different types of ISO documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

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For an explanation on the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the WTO principles in the Technical Barriers to Trade (TBT) see the following URL: Foreword - Supplementary information.

The committee responsible for this document is ISO/TC 119, *Powder metallurgy*, Subcommittee SC 4, *Sampling and testing methods for hardmetals*.

This first edition of ISO 4499-4 cancels and replaces ISO 4505:1978, which has been technically revised.

ISO 4499 consists of the following parts, under the general title *Hardmetals — Metallographic determination of microstructure*:

— *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: Characterisation of porosity, carbon defects and eta-phase content*

Introduction

In standard WC/Co hardmetals, the chemistry, magnetic properties and density are generally controlled so that only two phases WC and Co are present.[1][2][3] The Co phase is an alloy and contains some W and C in solid solution. The WC phase is stoichiometric. If the composition is either high or low in total carbon content, then it is possible to see a third phase in the structure. For high C, this is graphite; for low C, it is eta phase (η); typically, an M_6C or $M_{12}C$ carbide where M is (Co_xW_y). This part of ISO 4499 is concerned with the detection and measurement of these microstructural features together with the measurement of porosity levels. Porosity is important since these materials are manufactured by a powder metallurgical route and although the technique of liquid phase sintering is used to consolidate the multiphase structure, low levels of porosity can arise in some instances and affect properties such as density and strength.

INTERNATIONAL STANDARD **ISO 4499-4:2016(E)**

Hardmetals — Metallographic determination of microstructure —

Part 4: Characterisation of porosity, carbon defects and eta-phase content

1 Scope

This part of ISO 4499 specifies methods for the metallographic determination of the presence, type, and distribution of porosity, uncombined carbon and eta-phase in hardmetals.

2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 4499-2:2008, *Hardmetals — Metallographic determination of microstructure — Part 2: Measurement of WC grain size*

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
η-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 100 µm diameter) rosettes or small micrometre-sized particles

4 Symbols and Units

ECD	Equivalent Circle Diameter of a specified phase, in micrometres (µm)
L	total line length in a specified phase, in millimetres (mm)
l_i	measured length of individual intercepts in a specified phase, in micrometres (µm)
$\sum l_i$	sum of the measured length of each individual intercept
l_x	arithmetic mean linear intercept in phase x, in micrometres (µm)