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Standard Test Method for Apparent Porosity in Cemented Carbides[1]

This standard is issued under the fixed designation B276; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon (ε) indicates an editorial change since the last revision or reapproval.

This standard has been approved for use by agencies of the U.S. Department of Defense.

1. Scope

1.1 This test method specifies procedures for the metallographic determination of apparent porosity in cemented carbides.

NOTE 1—The term "apparent porosity" is construed to mean all microstructures observed on a properly prepared, unetched surface, including structures resulting from uncombined carbon, non-metallic inclusions, etc., as well as true, inherent porosity.

1.2 *This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use.*

2. Referenced Documents

2.1 *ASTM Standards:*[2]

B243 Terminology of Powder Metallurgy

B665 Guide for Metallographic Sample Preparation of Cemented Tungsten Carbides

2.2 *ASTM Adjunct:*[3]

ADJB0276A Apparent Porosity (4 prints of 4 photomicrographs each)

3. Terminology

3.1 *Definitions*—Definition of powder metallurgy terms can be found in Terminology B243.

4. Significance and Use

4.1 Cemented carbide materials may contain small voids that, depending on the application, may affect the performance of the product. To assist users in specifying the maximum acceptable level of porosity, this test method illustrates a broad range of porosity levels for each of three porosity types. This test method is not intended to be used as a specification, but the levels shown here may be cited in specifications written by producers and users of cemented carbides.

5. Interferences

5.1 Lack of adequate pressure on the specimen during polishing may result in material being torn from the surface of the specimen. This condition may be erroneously interpreted as porosity.

6. Apparatus

6.1 A metallographic microscope permitting observation and measurement up to a magnification of 200×.

6.2 Equipment for the metallographic preparation of test specimens.

7. Specimen Preparation

7.1 Where possible, specimens should be metallographically mounted in a plastic material, so that they can be polished without rounding the edges. Larger specimens may be polished without mounting. When the specimens are too large, they shall be sectioned using a diamond cut-off wheel or by fracturing (appropriate safety precautions shall be utilized when fracturing a specimen). The area selected for examination should represent, as nearly as possible, the entire cross section.

7.2 The specimen shall be prepared for metallographic examination. A suitable procedure is described in Practice B665.The surface to be examined shall be unetched and free of grinding and polishing marks.

8. Procedure

8.1 Pore size shall be defined as the maximum dimension of the pore. Make special reference to the presence of cracks and slits, as well as nonmetallic inclusions.

8.2 Classification of Type "A" and "C" apparent porosity is based entirely on comparison of the microstructures found with the illustrations in Figs. 1, 3 and 4 of ADJB0276A[3] with due consideration to the difference in field of view of the microscope compared to the area of the illustrations. This can be

[1] This test method is under the jurisdiction of ASTM Committee B09 on Metal Powders and Metal Powder Products and is the direct responsibility of Subcommittee B09.06 on Cemented Carbides.

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[2] For referenced ASTM standards, visit the ASTM website, www.astm.org, or contact ASTM Customer Service at service@astm.org. For *Annual Book of ASTM Standards* volume information, refer to the standard's Document Summary page on the ASTM website.

[3] Available from ASTM International Headquarters. Order Adjunct No. ADJB0276A.