



Designation: B665 – 19

Standard Guide for Metallographic Sample Preparation of Cemented Tungsten Carbides¹

This standard is issued under the fixed designation B665; 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 reappraisal. A superscript epsilon (ϵ) indicates an editorial change since the last revision or reappraisal.

1. Scope*

1.1 This guide prescribes a method for preparing cemented carbides for metallographic examination.

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, health, and environmental practices and determine the applicability of regulatory limitations prior to use.*

1.3 *This international standard was developed in accordance with internationally recognized principles on standardization established in the Decision on Principles for the Development of International Standards, Guides and Recommendations issued by the World Trade Organization Technical Barriers to Trade (TBT) Committee.*

2. Referenced Documents

2.1 *ASTM Standards:*²

B657 Guide for Metallographic Identification of Microstructure in Cemented Carbides

3. Significance and Use

3.1 This sample preparation procedure may be used to prepare metallographic samples for Guide **B657**. It does not include all variations of sample preparation.

4. Selection of Specimen

4.1 Cemented tungsten carbides are very often in the form of relatively small pieces; it is possible to select and mount the entire piece in such manner as to permit examination of the entire cross section. When pieces are too large for this, however, they should be sectioned, using a diamond cutoff wheel or electrical discharge machining (EDM), to allow

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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.

viewing of as much of a representative cross section as possible. For micrographs, the area selected should represent, as nearly as possible, the entire cross section.

5. Procedure

5.1 There are several acceptable methods for preparing cemented tungsten carbide surfaces for microscopical examination. Basically, they all use diamond wheels for grinding and diamond powders for lapping. The grinding practices differ, to a minor degree, with respect to grit size of diamond. In all practices, however, the final polish is produced by extremely fine diamond powder lapping, and in all practices care must be exercised to retain the microstructure in its true form and to avoid pull-out of the softer matrix material (usually cobalt). While it is accepted that other procedures may be used successfully, this procedure has proved satisfactory in many laboratories.

5.1.1 *Mounting*—Where possible, specimens should be mounted in a plastic material such as phenol-formaldehyde or poly(methyl methacrylate) to facilitate polishing without rounding the edges. Larger specimens may be polished without mounting. When specimens are too large, they may be sectioned using a diamond cut-off wheel or they may be fractured (appropriate safety precautions should be used when fracturing specimens). The area selected for examination should represent, as nearly as possible, the entire cross section.

5.1.2 *Rough Grinding*—The surface to be examined may require removal of surface damage from EDM or cutting. Specimens shall be ground flat utilizing a surface grinder with a resin-bonded diamond wheel (100 to 220 grit) operated at 4000 to 6000 surface feet per minute (20 to 30 m/s). After the surface is flat, several clean-up passes are required; the maximum depth of cut should be 0.0005 in. (13 μ m) per pass and copious amounts of coolant should be used.

5.1.3 *Polishing*—Polish in three steps using diamond powder with the addition of a lubricant, paste, or a commercially prepared slurry on a synthetic short-napped cloth (the reverse side of photographic paper, or manila file folders may also be used). For manual polishing, speeds of 500 to 600 rpm should be used; automatic polishing generally requires speeds of 100 to 300 rpm.

*A Summary of Changes section appears at the end of this standard