



Standard Test Method for Determining the High Stress Abrasion Resistance of Hard Materials¹

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1. Scope

1.1 This test method was developed for ranking the high-stress abrasion resistance of cemented carbides, but it has been successfully used on ceramics, cermets, and metal matrix hardfacings with a hardness over 55 HRC. The feature of this test method that discriminates it from other abrasion tests is that the abrasive is forced against the test specimen with a steel wheel with sufficient force to cause fracture of the abrasive particles. Some abrasion tests use rubber wheels to force abrasive against test surfaces (Test Methods [G65](#), [G105](#), [G75](#)). A rubber wheel produces low-stress abrasion while a steel wheel produces high-stress abrasion.

1.2 In summary, this is a high-stress laboratory abrasion test for hard materials using a water slurry of aluminum oxide particles as the abrasive medium and a rotating steel wheel to force the abrasive across a flat test specimen in line contact with the rotating wheel immersed in the slurry.

1.3 The values stated in SI units are to be regarded as standard. No other units of measurement are included in this standard.

1.4 *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

- [B311 Test Method for Density of Powder Metallurgy \(PM\) Materials Containing Less Than Two Percent Porosity](#)
- [G65 Test Method for Measuring Abrasion Using the Dry Sand/Rubber Wheel Apparatus](#)

¹ This test method is under the jurisdiction of ASTM Committee [G02](#) on Wear and Erosion and is the direct responsibility of Subcommittee [G02.30](#) on Abrasive Wear.

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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.

[G75 Test Method for Determination of Slurry Abrasivity \(Miller Number\) and Slurry Abrasion Response of Materials \(SAR Number\)](#)

[G105 Test Method for Conducting Wet Sand/Rubber Wheel Abrasion Tests](#)

[G40 Terminology Relating to Wear and Erosion](#)

3. Terminology

3.1 *Definitions*: For definitions of terms found in this test method, please refer to Terminology [G40](#).

3.2 *Definitions of Terms Specific to This Standard*:

3.2.1 *abrasive wear, n*—wear due to hard particles or hard protuberances forced against and moving along a solid surface.

3.2.2 *high-stress abrasion, n*—progressive material removal from a hard solid surface by the action of hard particles rolling or sliding on that surface with sufficient force to cause fracture of the particles.

3.2.3 *slurry, n*—a suspension of solid material in liquid.

4. Summary of Test Method

4.1 The test specimen is a flat that is held in a vertical position tangent to a rotating steel wheel immersed in water slurry of aluminum oxide particles.

4.2 The normal force holding the test specimen against the wheel is high enough to cause fracture of abrasive particles that travel through the wheel/test specimen contact. The test metric is the volume of material worn from the test specimen in specified test duration and under specified test conditions.

4.3 The test specimen is weighed to determine mass loss which is converted to a volume loss using the density of the test material.

4.4 The slurry used in the test is composed of a specified mass of 30-mesh aluminum oxide in a specified volume of water.

4.5 There may be a corrosion component to the material removal, but it is considered to be negligible since the test time is only ten or twenty minutes (600 or 1200 seconds).

5. Significance and Use

5.1 The extraction of minerals from the Earth's mantle usually requires fracturing rock with tools made from metals,