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Standard Test Method for Microhardness of Electroplated Coatings[1]

This standard is issued under the fixed designation B578; 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 covers the determination of the hardness of metallic coatings upon various substrates. The measurements are made with the Knoop indenter under a test load of 0.245 N (25 gf) or 0.981 N (100 gf).

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:*
E384 Test Method for Knoop and Vickers Hardness of Materials[2]

3. Special Requirements

3.1 In addition to the requirements listed herein, the test method shall be performed in accordance with Test Method E384.

3.1.1 The measurement shall be made on the cross section with the long diagonal of the indentation parallel to the substrate using a Knoop indenter.

NOTE 1—When a nondestructive test is necessary, the measurement may be made normal to the surface provided that the whole of the indentation is clearly delineated in the field of the microscope at the magnification specified in Test Method E384, and the coating thickness is at least 0.7 that of the long diagonal. The outlines of the indentation must be sharp and undistorted by any mechanical effects resulting from the thinness of the coating such as "butterfly" fractures, etc. Values obtained from measurements made normal to the electroplated surface may not be equivalent to those obtained on microsections and are not, therefore, reportable according to Section 6.

3.1.2 The thickness of the coating shall be at least 38 µm for soft coatings such as gold, copper, and silver, and 25 µm for hard coatings such as nickel, cobalt, iron, and hard gold. This is approximately equivalent to 0.6 times the length of the long Knoop diagonal.

3.1.3 Make the indentation near the center of the cross section of the coating.

3.2 No single test load is applicable to all coatings. Use a load of 0.245 N for soft coatings (from 50 to 300 HK) and a load of 0.981 N for hard coatings (greater than 300 HK).

3.2.1 A load of less than 0.245 N is not recommended. However, when the length of the diagonal is great enough at a load of 0.245 N, which may occur for very soft coatings such as tin and indium, a lighter load or a lower magnification shall be specified provided the requirements of 3.3 are met. When testing extremely hard coatings, a load greater than 0.981 N may be used provided this is specified in the purchase order. The Knoop hardness number decreases appreciably with loads from 0.245 N to 0.981 N especially for the higher hardness numbers.

3.3 Measure the length of the long diagonal to within 0.25 µm or 0.4 %, whichever is larger, at the magnification specified in Test Method E384.

3.4 When readings are taken in a direction parallel to the substrate, space them from each other by at least the length of the long diagonal. When two readings are taken in the direction of the short axis, separate them by at least the length of the diagonal

[1] This test method is under the jurisdiction of ASTM Committee B08 on Metallic and Inorganic Coatings and is the direct responsibility of Subcommittee B08.10 on Test Methods.

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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.