Designation: B 490 – 92 (Reapproved 2003)

Standard Practice for Micrometer Bend Test for Ductility of Electrodeposits[1]

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1. Scope

1.1 This practice describes a procedure for measuring the ductility of electrodeposited foils.[2]

1.2 This practice is suitable only for the evaluation of electrodeposits having low ductility.

1.3 The obtained ductility values must only be considered semi-quantitative because this test has a significant operator dependence.

1.4 This practice is best used for in-house process control where measurements are always made by the same operator. A change in ductility value can be used as an indication of possible changes in the electroplating solution.

1.5 *This standard does not purport to address the safety problems, 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:* [3]

B 177 Guide for Engineering Chromium Electroplating

3. Summary of Practice

3.1 This practice consists of measuring the bend of a foil held between the jaws of a micrometer; these are closed until fracture or cracks appear.

4. Significance and Use

4.1 This practice is useful as one method of controlling some electroplating solutions. It serves to indicate the presence of contamination or some other adverse condition.

4.2 Ductility measurements are of particular value when electroplated parts are to be subjected to moderate stress such as that involved in bolting an electroplated bumper to an automobile.

NOTE 1—The foils used in this practice are typically 25 to 40 µm thick. Foils in this thickness range do not have the same properties as bulk metal. For example, a nickel electrodeposit 0.5 mm thick, prepared in purified bright nickel electroplating solutions for which this test is being used, had less than 3 % elongation in a tension test, and could not be bent to a 90° angle without complete fracture. However, foils 25 to 40 µm thick, electroplated at the same time, had micrometer ductility values in the 10 to 25 % range.

5. Apparatus

5.1 *Micrometer*, 25-mm with flat jaws to measure the thickness and to compress the foil.

5.2 *Hand or Power Shear*, grinding wheel, or hack saw, to trim the edges of the electroplated panel and to separate the foil from the basis metal.

5.3 *Pair of Sharp Scissors* to cut the test specimens.

6. Test Specimens

6.1 An electrodeposit shall be prepared using a basis metal with a smooth surface from which the electrodeposit can be readily separated. A stainless steel or nickel electroplated steel panel may be used for this purpose, prepared as in 6.2.

6.2 A piece of cold-rolled steel, of any convenient size, such as 100 by 150 mm, shall be properly cleaned, acid dipped, and electroplated with approximately 7.5 µm of nickel. After rinsing, the specimen shall be cleaned anodically for 15 s in a hot alkaline cleaner, rinsed, acid dipped in about 1 *N* sulfuric acid (about 27 mL of concentrated sulfuric acid added to about 900 mL of cold water, mixed, and diluted with cold water to 1 L), and immediately placed in the electroplating solution of the metal to be tested. An electrodeposit 25 to 40 µm thick shall be electroplated on the prepared surface. The deposit shall be plated at an average current density and under conditions (agitation, temperature, etc.) approximating those used on parts plated in the solution being tested.

[1] This practice 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 a discussion of this test see Mohrnheim, A. F., "The Bend Test for Measuring the Strain Limit of Surfaces," *Plating*, Vol 50, 1963, pp. 1094–1099.

[3] 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.