Designation: B490 – 09

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

1.6 *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]

B456 Specification for Electrodeposited Coatings of Copper Plus Nickel Plus Chromium and Nickel Plus Chromium

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 or when exposed to a wide range of fluctuating temperatures (thermal shock).

5. Apparatus

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

5.2 Tools such as a hand or power shear, grinding wheel, file or hack saw, to initiate separation of 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. Proper preparation of the surface from which the foil must be separated undamaged is critical. The deposit shall be electroplated at an average current density and under conditions (agitation, temperature, etc.) approximating those used on parts electroplated in the solution being tested. The deposit thickness shall be 25-30 µm. The panels are prepared as in 6.2.

6.2 The test panel must be properly passivated before plating to allow for separation of the subsequent deposit. Stainless steel, brass or nickel dipped in a chromic acid solution (see Note 1) for approximately 1 minute can be used as the basis metal. The panel should be properly rinsed before plating. Entering the solution with current on is recommended to prevent activation of the basis metal. When testing nickel deposits, other than rinsing, no post treatments shall be used. An alternative method is described in Note 2.

NOTE 1—For convenience, an ordinary hexavalent chromium electroplating solution can be used for preparing the basis metal.

NOTE 2—As an alternative basis metal, a piece of cold-rolled steel of any convenient size, such as 100 by 150 mm, shall be properly cleaned, rinsed, acid dipped, rinsed and electroplated with approximately 7.5 µm of nickel. After rinsing, the specimen shall be cleaned anodically for

[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.