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Standard Practice for Micrometer Bend Test for Ductility of Electrodeposits¹

This standard is issued under the fixed designation B 490; 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.

~~^{ε1}Note—The units statement in subsection 1.5 was corrected editorially in April 2008.~~

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~~^{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

~~B177~~^{Guide for Engineering Chromium Electroplating} 456 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.}

~~Note—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.~~

~~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.

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 Mohrheim, 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.