



Standard Guide for Electroforming with Nickel and Copper¹

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1. Scope

1.1 This guide covers electroforming practice and describes the processing of mandrels, the design of electroformed articles, and the use of copper and nickel electroplating solutions for electroforming.

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:

- B 183 Practice for Preparation of Low-Carbon Steel for Electroplating²
- B 242 Practice for Preparation of High-Carbon Steel for Electroplating²
- B 252 Practice for Preparation of Zinc Alloy Die Castings for Electroplating and Conversion Coatings²
- B 253 Guide for Preparation of Aluminum Alloys for Electroplating²
- B 254 Practice for Preparation of and Electroplating on Stainless Steel²
- B 281 Practice for Preparation of Copper and Copper-Base Alloys for Electroplating and Conversion Coatings²
- B 311 Test Method for Density Determination for Powder Metallurgy (P/M) Materials Containing Less Than Two Percent Porosity²
- B 343 Practice for Preparation of Nickel for Electroplating with Nickel²
- B 374 Terminology Relating to Electroplating²
- B 489 Practice for Bend Test for Ductility of Electrodeposited and Autocatalytically Deposited Metal Coatings on Metals²
- B 490 Practice for Micrometer Bend Test for Ductility of Electrodeposits²

B 558 Practice for Preparation of Nickel Alloys for Electroplating²

B 571 Practice for Qualitative Adhesion Testing of Metallic Coatings²

B 578 Test Method for Microhardness of Electroplated Coatings²

B 636 Test Method for Measurement of Internal Stress of Plated Metallic Coatings with the Spiral Contractometer²

B 659 Guide for Measuring Thickness of Metallic and Inorganic Coatings²

B 849 Specification for Pre-Treatments of Iron or Steel for Reducing Risk of Hydrogen Embrittlement²

E 8 Test Methods of Tension Testing of Metallic Materials³

E 384 Test Method for Microhardness of Materials³

3. Summary of Electroforming Practice

3.1 Electroforming is defined (see Terminology B 374) as the production or reproduction of articles by electrodeposition upon a mandrel or mold that is subsequently separated from the deposit.

3.2 The basic fabrication steps are as follows: a suitable mandrel is fabricated and prepared for electroplating; the mandrel is placed in an appropriate electroplating solution and metal is deposited upon the mandrel by electrolysis; when the required thickness of metal has been applied, the metal-covered mandrel is removed from the solution; and the mandrel is separated from the electrodeposited metal. The electroform is a separate, free-standing entity composed entirely of electrodeposited metal. Electroforming is concerned with the fabrication of articles of various kinds.

4. Significance and Use

4.1 The specialized use of the electroplating process for electroforming results in the manufacture of tools and products that are unique and often impossible to make economically by traditional methods of fabrication. Current applications of nickel electroforming include: textile printing screens; components of rocket thrust chambers, nozzles, and motor cases; molds and dies for making automotive arm-rests and instrument panels; stampers for making phonograph records, video-discs, and audio compact discs; mesh products for making

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² *Annual Book of ASTM Standards*, Vol 02.05.

³ *Annual Book of ASTM Standards*, Vol 03.01.