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AMERICAN SOCIETY FOR TESTING AND MATERIALS
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Standard Test Method for Nickel on Steel for Porcelain Enameling by Photometric Analysis¹

This standard is issued under the fixed designation C 715; 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.

1. Scope

1.1 This test method covers the determination of the amount of nickel deposited on sheet steel during its preparation for porcelain enameling. It is a photometric method commonly used on production parts and is suitable for determining the heavier nickel deposits that may be obtained during the processing of steel for one-coat enameling.

NOTE 1—An alternative X-ray emission spectrometry method is Test Method C 810.

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:

- C 810 Test Method for Nickel on Steel for Porcelain Enameling by X-Ray Emission Spectrometry²
- E 30 Test Methods for Chemical Analysis of Steel, Cast Iron, Open-Hearth Iron, and Wrought Iron³
- E 60 Practice for Photometric and Spectrophotometric Methods for Chemical Analysis of Metals³

3. Significance and Use

3.1 This test method is primarily used to control the nickel dipping operation to ensure that the desired level of nickel deposition is attained. It is also used to prepare test plates used for calibration in Test Method C 810.

4. Apparatus

4.1 *Photoelectric Photometer*, conforming to Practice E 60.

4.2 *Weighted Rubber Ring Assembly*, required to confine stripping agents to a definite area, consisting of a molded rubber ring and a metal outer ring. The rubber ring shall have an inside diameter of 1.35 in. (34.3 mm) in order to encircle an

area of 0.01 ft² (0.000929 m²), a wall configuration as shown in Fig. 1, and the lower portion beveled at a 45° angle (0.78 rad) to reduce the contact area and ensure a better seal. The metal outer ring shall weigh about 3.5 lb (1.5 kg), suitably machined to fit over the top of the rubber ring as shown in Fig. 1.

4.2.1 The exact area covered by the rubber ring will gradually increase as the rubber ring itself is consumed by the acid reagent used. In the most accurate analysis, the area etched by the rubber ring shall be calculated occasionally, factored against the prescribed area, and that number applied to the reading obtained from the graph.

4.3 *Aspirator*, consisting of a calibrated 500-mL flask, equipped with a two-hole stopper, an aspirator bulb, and a suction tube formed from 0.079-in. (2-mm) inside diameter capillary glass tubing.

5. Reagents and Materials

5.1 Reagent grade chemicals shall be used in all tests. Unless otherwise indicated, it is intended that all reagents shall conform to the specifications of the Committee of Analytical Reagents of the American Chemical Society.⁴ Other grades may be used, provided it is first ascertained that the reagent is of sufficiently high purity to permit its use without lessening the accuracy of the determination.

5.2 *Purity of Water*—Use distilled or deionized water.

5.3 *Ammonium Hydroxide (sp gr 0.90)*—Concentrated ammonium hydroxide (NH₄OH).

5.4 *Ammonium Persulfate*—(NH₄)₂S₂O₈.

5.5 *Dimethylglyoxime*—Prepare a 1 % solution of dimethylglyoxime in methyl alcohol or a 2.62 % solution of sodium dimethylglyoximate in water (store in a polyethylene bottle).

5.6 *Hydrochloric Acid (1+5)*—Dilute 1 vol of concentrated hydrochloric acid (HCl, sp gr 1.19) with 5 vol of water.

5.7 *Nickel Sulfate, Standard Solution*—Dissolve 0.448 g of nickel sulfate (NiSO₄·6H₂O) in water. When the material is completely dissolved, cautiously add 10 mL of concentrated H₂SO₄ and transfer the solution to the 1000-mL flask. When

¹ This test method is under the jurisdiction of ASTM Committee B-8 on Metallic and Inorganic Coatings and is the direct responsibility of Subcommittee B08.12 on Materials for Porcelain Enamel and Ceramic-Metal Systems.

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

³ *Annual Book of ASTM Standards*, Vol 03.05.

⁴ *Reagent Chemicals, American Chemical Society Specifications*, American Chemical Society, Washington, DC. For suggestions on the testing of reagents not listed by the American Chemical Society, see *Analar Standards for Laboratory Chemicals*, BDH Ltd., Poole, Dorset, U.K., and the *United States Pharmacopeia and National Formulary*, U.S. Pharmacopeial Convention, Inc. (USPC), Rockville, MD.