Designation: B 39 – 79 (Reapproved 1999)

Standard Specification for Nickel[1]

This standard is issued under the fixed designation B 39; 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 specification covers refined nickel primarily produced from ore or matte or similar raw material. The principal commercial forms are cathodes, briquettes, and pellets.

1.2 The values stated in inch-pound units are to be regarded as the standard.

2. Referenced Documents

2.1 *ASTM Standards:*

E 29 Practice for Using Significant Digits in Test Data to Determine Conformance with Specifications[2]

E 39 Test Methods for Chemical Analysis of Nickel[3]

3. Ordering Information

3.1 Orders for material under this specification shall include the following information:

3.1.1 Name of material (nickel),

3.1.2 ASTM designation (B 39),

3.1.3 Form (state whether cathodes, briquettes, or pellets), and

3.1.4 Size (Section 5).

4. Chemical Composition

4.1 The nickel shall conform to the requirements of Table 1.

4.2 More restrictive compositions for certain products may be available. The user is referred to his nickel supplier.

5. Dimensions and Permissible Variations

5.1 The various forms and sizes commercially available are as follows:

5.2

Form	Size
Cathodes	1½ by 1¼ by ⅝ in. (38 by 32 by 16 mm)
Briquettes	pillow shaped, about by by in.(38 by 32 by 16 mm)
Pellets	roughly spherical, about ¼ in. (6.3 mm) diameter

TABLE 1 Chemical Requirements

Element	Composition, weight %
Nickel, min	99.80
Cobalt, max	0.15
Copper, max	0.02
Carbon, max	0.03
Iron, max	0.02
Sulfur, max	0.01
Phosphorus, less than	0.005
Manganese, less than	0.005
Silicon, less than	0.005
Arsenic, less than	0.005
Lead, less than	0.005
Antimony, less than	0.005
Bismuth, less than	0.005
Tin, less than	0.005
Zinc, less than	0.005

6. Sampling

6.1 *Cathodes*—Cathodes may be sampled using either of the following procedures:

6.1.1 *Template Drilling Procedure*:

6.1.1.1 Sampling of electronickel cathodes is done on one cathode removed for this purpose from every 60 cathodes produced. A template is used to drill successive cathodes diagonally from corner to corner. Using a suitable drill, one ⅝-in. (16-mm) hole is drilled through each cathode, starting at the first hole in the template and progressing diagonally, with holes at 3¼-in. (83-mm) centers. No lubricants shall be used. The drill shall be clean and the drilling speed shall be regulated to avoid excessive heating.

6.1.1.2 The 4 to 8-in. (102 to 203-mm) drilling spirals are cut to ¼-in. (6-mm) pieces. These cuttings are washed in boiling distilled water then quartered to provide the sample.

6.1.2 Alternatively, sheared cathodes may be sampled by taking pieces at random from the bottom, middle, and top of each package or container. The following number of pieces shall be taken from each drum (containing 500 to 700 lb (227 to 317 kg)):

Shipment Lot	1-in. (25.4-mm) squares	2-in. (50.8-mm) squares	4-in. (101.6-mm) squares and larger sizes
20 to 25 tons (18 000 to 23 000 kg)	4	2	1

[1] This specification is under the jurisdiction of ASTM Committee B-2 on Nonferrous Metals and Alloys and is the direct responsibility of Subcommittee B02.07 on Refined Nickel and Cobalt, and Alloys Containing Nickel or Cobalt or Both as Principal Constituents.

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[2] *Annual Book of ASTM Standards*, Vol 14.02.

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

15 to 20 tons (14 000 to 18 000 kg)	4	2	1
10 tons (9000 kg)	5	3	2
5 tons (4500 kg)	6	4	3

6.1.2.1 When the nickel is shipped in packages or containers other than drums, the number of pieces taken shall be adjusted proportionately to the change in package weight in relation to drums.

6.1.2.2 The sample shall be reduced further by shearing, milling, or shaping. One corner (weight about 2 g) shall be sheared from each 1-in. (25.4-mm) square when the sample contains 300 pieces or more. If the sample contains less than 300 pieces, two opposite corners shall be sheared from each square.

6.1.2.3 The 2-in. (50.8-mm) and 4-in. (101.6-mm) squares shall be sampled with a milling machine or shaper. On one edge of each square, a cleaning or smoothing cut and then a sampling cut shall be made to obtain 1 to 2 g of chips from a 2-in. square or 2 to 4 g from a 4-in. square. No lubricants shall be used. The cutting tool shall be clean and the speed and depth of cutting shall be regulated to avoid excessive heating.

6.1.2.4 The corner pieces, or the chips obtained in the above manner, shall be mixed thoroughly and reduced by sample splitter or by coning and quartering on a clean surface until the final sample is about 100 g.

6.2 *Briquettes*:

6.2.1 In all shipments of nickel briquettes, samples will be taken at the rate of 15 briquettes/2000 lb (910 kg). This represents a selection of 3 briquettes taken from the top, center, and bottom of each 400-lb (180-kg) drum.

6.2.2 Each briquette should be drilled through the center. No lubricants shall be used. The drill shall be clean and the drilling speed shall be regulated to avoid excessive heating. The drillings are thoroughly mixed and divided by split sampler until the sample for analysis is about 100 g.

6.3 *Pellets*:

6.3.1 One out of every ten 500-lb (225-kg) drums shall be selected for sampling. At least 30 pellets shall be taken from each of the selected drums. The selected pellets shall be mixed and divided until the sample for analysis is about 100 g.

6.3.2 Since the pellets dissolve readily in nitric acid (1 + 1), there is no need to prepare drillings. In carrying out the chemical analysis, at least 3 pellets should be dissolved and an appropriate portion taken for analysis. When small sample weights are required, at least 5 pellets shall be drilled completely through the center of each pellet and the drillings mixed.

6.4 *Sampling for Referee Analysis*—Where samples are required for referee analysis, the shipment will be resampled by one of the methods described above or on a basis agreed upon by buyer and producer. The samples obtained shall be divided into three parts for purchaser, manufacturer, and referee, respectively.

7. Chemical Analysis

7.1 Chemical analysis shall, in case of disagreement, be made in accordance with Methods E 39. Where no adequate method is given in Methods E 39 for analysis of a particular element, the analysis shall be made in accordance with a procedure agreed upon by the manufacturer and the consumer. Such procedure shall apply to referee analysis.

7.2 For purposes of compliance with the specified chemical composition limits, the reported analysis shall be rounded to the nearest unit in the right-hand place of figures used in expressing the limiting value, in accordance with the rounding method of Practice E 29.

7.3 Elements listed in Table 1 as less than a certain limit may be reported as less than that limit rather than a specific number.

8. Rejection and Rehearing

8.1 Material that fails to conform to the requirements of this specification may be rejected. Rejection should be reported to the producer or supplier promptly and in writing. In the case of dissatisfaction with the results of the test, the producer or supplier may make claim for a rehearing.

9. Packaging and Package Marking

9.1 The material shall be packaged in sound containers or shipped in bulk so that the product is not lost or contaminated in shipment.