



Standard Test Method for Analysis of Nickel Alloys by Inductively Coupled Plasma Atomic Emission Spectrometry (Performance-Based Method)¹

This standard is issued under the fixed designation E2594; 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 describes the inductively coupled plasma atomic emission spectrometric analysis of nickel alloys, such as specified by Committee B02, and having chemical compositions within the following limits:

Element	Application Range (%)
Aluminum	0.01–1.00
Boron	0.001–0.050
Calcium	0.001–0.05
Carbon	0.10–0.20
Chromium	0.01–33.0
Cobalt	0.10–20.0
Copper	0.01–3.00
Iron	0.01–50.0
Lead	0.001–0.01
Magnesium	0.0001–0.100
Manganese	0.01–3.0
Molybdenum	0.01–30.0
Niobium	0.01–6.0
Nickel	25.0–80.0
Nitrogen	0.001–0.20
Oxygen	0.0001–0.003
Phosphorous	0.001–0.030
Sulfur	0.0001–0.010
Silicon	0.01–1.50
Tantalum	0.005–0.10
Tin	0.001–0.020
Titanium	0.001–6.0
Tungsten	0.01–5.0
Vanadium	0.01–1.0
Zirconium	0.01–0.10

1.2 The following elements may be determined using this test method. The test method user should carefully evaluate the precision and bias statements of this test method to determine applicability of the test method for the intended use.

Element	Quantification Range (%)
Aluminum	0.060–1.40
Boron	0.002–0.020
Calcium	0.001–0.003
Copper	0.010–0.52

¹ This test method is under the jurisdiction of ASTM Committee E01 on Analytical Chemistry for Metals, Ores, and Related Materials and is the direct responsibility of Subcommittee E01.08 on Ni and Co and High Temperature Alloys.

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Element	Quantification Range (%)
Magnesium	0.001–0.10
Manganese	0.002–0.65
Niobium	0.020–5.5
Phosphorous	0.004–0.030
Tantalum	0.010–0.050
Tin	0.002–0.018
Titanium	0.020–3.1
Tungsten	0.007–0.11
Vanadium	0.010–0.50
Zirconium	0.002–0.10

1.3 This test method has only been interlaboratory tested for the elements and ranges specified. It may be possible to extend this test method to other elements or different concentration ranges provided that method validation is performed that includes evaluation of method sensitivity, precision, and bias as described in this document. Additionally, the validation study must evaluate the acceptability of sample preparation methodology using reference materials or spike recoveries, or both. The user is cautioned to carefully evaluate the validation data against the laboratory's data quality objectives. Method validation of scope extensions is also a requirement of ISO/IEC 17025.

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

1.5 *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.* Specific warning statements are given in 8.2.6.3 and safety hazard statements are given in Section 9.

2. Referenced Documents

2.1 *ASTM Standards:*²
D1193 Specification for Reagent Water

² 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.