



Designation: E363 – 83 (Reapproved 2003)<sup>ε1</sup>

## Standard Test Methods for Chemical Analysis of Chromium and Ferrochromium<sup>1</sup>

This standard is issued under the fixed designation E363; 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 ( $\epsilon$ ) indicates an editorial change since the last revision or reapproval.

<sup>ε1</sup> NOTE—Warnings were moved from notes to section text editorially December 2002.

### 1. Scope

1.1 These test methods cover the chemical analysis of chromium and ferrochromium having chemical compositions within the following limits:

| Element    | Concentration, % |
|------------|------------------|
| Aluminum   | 0.25 max         |
| Antimony   | 0.005 max        |
| Arsenic    | 0.005 max        |
| Bismuth    | 0.005 max        |
| Boron      | 0.005 max        |
| Carbon     | 9.00 max         |
| Chromium   | 51.0 to 99.5     |
| Cobalt     | 0.10 max         |
| Columbium  | 0.05 max         |
| Copper     | 0.05 max         |
| Lead       | 0.005 max        |
| Manganese  | 0.75 max         |
| Molybdenum | 0.05 max         |
| Nickel     | 0.50 max         |
| Nitrogen   | 6.00 max         |
| Phosphorus | 0.03 max         |
| Silicon    | 12.00 max        |
| Silver     | 0.005 max        |
| Sulfur     | 0.07 max         |
| Tantalum   | 0.05 max         |
| Tin        | 0.005 max        |
| Titanium   | 0.50 max         |
| Vanadium   | 0.50 max         |
| Zinc       | 0.005 max        |
| Zirconium  | 0.05 max         |

1.2 The analytical procedures appear in the following order:

|   | Sections |
|---|----------|
| Arsenic by the Molybdenum Blue Photometric Method         | 9-19     |
| Lead by the Dithizone Photometric Method                  | 20-30    |
| Chromium by the Sodium Peroxide Fusion-Titrimetric Method | 31-37    |

1.3 *This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of whoever uses this standard to consult and establish appropriate safety and health practices and deter-*

*mine the applicability of regulatory limitations prior to use. Specific hazard statements are given in Section 5.*

### 2. Referenced Documents

#### 2.1 ASTM Standards:<sup>2</sup>

- A101 Specification for Ferrochromium
- A481 Specification for Chromium Metal
- E29 Practice for Using Significant Digits in Test Data to Determine Conformance with Specifications
- E32 Practices for Sampling Ferroalloys and Steel Additives for Determination of Chemical Composition
- E50 Practices for Apparatus, Reagents, and Safety Considerations for Chemical Analysis of Metals, Ores, and Related Materials
- E60 Practice for Analysis of Metals, Ores, and Related Materials by Molecular Absorption Spectrometry
- E173 Practice for Conducting Interlaboratory Studies of Test Methods for Chemical Analysis of Metals<sup>3</sup>
- E360 Test Methods for Chemical Analysis of Silicon and Ferrosilicon<sup>3</sup>
- E361 Test Methods for the Determination of Arsenic and Lead in Ferromanganese<sup>3</sup>

### 3. Significance and Use

3.1 These test methods for the chemical analysis of metals and alloys are primarily intended to test such materials for compliance with compositional specifications. It is assumed that all who use these test methods will be trained analysts capable of performing common laboratory procedures skillfully and safely. It is expected that work will be performed in a properly equipped laboratory.

### 4. Apparatus, Reagents, and Photometric Practice

4.1 Apparatus and reagents required for each determination are listed in separate sections preceding the procedure. The

<sup>1</sup> These test methods are under the jurisdiction of ASTM Committee E01 on Analytical Chemistry for Metals, Ores, and Related Materials and are the direct responsibility of Subcommittee E01.01 on Iron, Steel, and Ferroalloys.

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<sup>2</sup> 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.

<sup>3</sup> Withdrawn. The last approved version of this historical standard is referenced on www.astm.org.

apparatus, standard solutions, and certain other reagents used in more than one procedure are referred to by number and shall conform to the requirements prescribed in Practices E50, except that photometers shall conform to the requirements prescribed in Practice E60.

4.2 Photometric practices prescribed in these test methods shall conform to Practice E60.

## 5. Safety Hazards

5.1 For precautions to be observed in the use of certain reagents in these test methods, refer to Practices E50.

## 6. Sampling

6.1 For procedures for sampling the material, and for particle size of the sample for chemical analysis, refer to Practices E32.

## 7. Rounding Calculated Values

7.1 Calculated values shall be rounded to the desired number of places as directed in 6.4 to 6.6, Rounding Procedure, of Practice E29.

## 8. Interlaboratory Studies

8.1 These test methods have been evaluated in accordance with Practice E173, unless otherwise noted in the precision and bias section.

### ARSENIC BY THE MOLYBDENUM BLUE PHOTOMETRIC METHOD

## 9. Scope

9.1 This method covers the determination of arsenic in chromium and ferrochromium in concentrations from 0.001 to 0.005 %.

## 10. Summary of Method

10.1 See Section 10 of Test Methods E360.

## 11. Concentration Range

11.1 See Section 11 of Test Methods E360.

## 12. Stability of Color

12.1 See Section 12 of Test Methods E360.

## 13. Interferences

13.1 See Section 13 of Test Methods E360.

## 14. Apparatus

14.1 See Section 14 of Test Methods E360.

## 15. Reagents

15.1 Proceed as directed in 15.1 through 15.9 of Test Methods E360.

## 16. Preparation of Calibration Curve

16.1 Proceed as directed in 16.1 through 16.5 of Test Methods E360.

**TABLE 1 Statistical Information—Arsenic**

| Ferroalloy Type | Arsenic Found, % | Repeatability ( $R_1$ , E173) | Reproducibility ( $R_2$ , E173) |
|-----------------|------------------|-------------------------------|---------------------------------|
| 1. 70Cr-1Si-5C  | 0.0015           | 0.0001                        | 0.0005                          |

## 17. Procedure

17.1 Proceed as directed in 17.1 through 17.4 of Test Methods E360.

## 18. Calculation

18.1 Proceed as directed in Section 18 of Test Methods E360.

## 19. Precision and Bias

19.1 Nine laboratories cooperated in testing this method and obtained the data summarized in Table 1. Samples with arsenic concentrations near the upper limit of the scope were not available for testing. The user is cautioned to verify, by the use of reference materials, if available, that the precision and bias of this method is adequate for the contemplated use.

### LEAD BY THE DITHIZONE PHOTOMETRIC METHOD

## 20. Scope

20.1 This method covers the determination of lead in chromium and ferrochromium in concentrations from 0.001 to 0.05 %.

## 21. Summary of Method

21.1 See Section 21 of Test Methods E361.

## 22. Concentration Range

22.1 See Section 22 of Test Methods E361.

## 23. Stability of Color

23.1 See Section 23 of Test Methods E361.

## 24. Interferences

24.1 See Section 24 of Test Methods E361.

## 25. Apparatus

25.1 See Section 25 of Test Methods E361.

## 26. Reagents

26.1 Proceed as directed in Section 26 of Test Methods E361.

## 27. Preparation of Calibration Curve

27.1 Proceed as directed in 27.1 through 27.5 of Test Methods E361.

## 28. Procedure

28.1 *Test Solution:*

28.1.1 Transfer a sample, selected in accordance with 28.1.1 of Test Methods E361 and weighed to the nearest 0.1 mg, to a 250-mL beaker. Add 30 mL of HCl (1 + 1) and heat until dissolution is nearly complete. In the case of high-carbon