Designation: E322 – 12

# Standard Test Method for Analysis of Low-Alloy Steels and Cast Irons by Wavelength Dispersive X-Ray Fluorescence Spectrometry[1]

This standard is issued under the fixed designation E322; 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 X-ray fluorescence spectrometric analysis of low-alloy steels and cast irons for the following elements in the ranges indicated:

| Elements | Mass Fraction Range, % |
|---|---|
| Manganese | 0.20 to 1.50 |
| Nickel | 0.10 to 1.00 |
| Chromium | 0.10 to 1.00 |
| Molybdenum | 0.04 to 0.40 |
| Copper | 0.05 to 0.30 |
| Vanadium | 0.03 to 0.25 |

NOTE 1—These mass fraction ranges can be extended by the use of suitable reference materials. The detection limit for the elements is lower than the listed minimum value. The ranges represent the actual levels at which this test method was tested.

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:*[2]

E135 Terminology Relating to Analytical Chemistry for Metals, Ores, and Related Materials

E350 Test Methods for Chemical Analysis of Carbon Steel, Low-Alloy Steel, Silicon Electrical Steel, Ingot Iron, and Wrought Iron

E351 Test Methods for Chemical Analysis of Cast Iron—All Types

E882 Guide for Accountability and Quality Control in the Chemical Analysis Laboratory

E1361 Guide for Correction of Interelement Effects in X-Ray Spectrometric Analysis

E1621 Guide for X-Ray Emission Spectrometric Analysis

## 3. Terminology

3.1 For definition of terms used in this test method, refer to Terminology E135.

## 4. Summary of Test Method

4.1 The sample is finished to a clean, uniform surface, and then irradiated by an X-ray beam of high energy. The secondary X rays produced are dispersed by means of a crystal and the intensities are measured by a detector at selected wavelengths. The results are obtained by relating measured intensities to an appropriate calibration curve.

## 5. Significance and Use

5.1 This test method is comparative and intended for use as a routine method to test materials for compliance with compositional specifications. It is assumed that all who use this test method 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 under appropriate quality control practices, such as those described in Guide E882.

## 6. Apparatus

6.1 *Specimen Preparation Equipment:*

6.1.1 *Disk or Belt Sander,* capable of providing test specimens with a uniform, clean surface finish, or other equivalent finishing device.

6.2 *Excitation Source:*

6.2.1 *X-ray Generator,* with a full-wave rectified power supply, or constant potential power supply.

6.2.2 *X-ray Tube,* with a high-purity tungsten target. Other targets may be used provided they produce data that meets the precision and bias in Section 14.

6.3 *Spectrometer:*

6.3.1 *Analyzing Crystal,* lithium fluoride LiF(200), flat or curved having a 2d spacing of 0.40276 nm; or LiF(220), flat or curved having a 2d spacing of 0.28473 nm.

[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 E01.01 on Iron, Steel, and Ferroalloys.

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[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.