



Designation: E135 – 23

# Standard Terminology Relating to Analytical Chemistry for Metals, Ores, and Related Materials<sup>1</sup>

This standard is issued under the fixed designation E135; 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.

## 1. Scope

1.1 This is a compilation of terms commonly used in analytical chemistry for metals, ores, and related materials. Terms that are generally understood or defined adequately in other readily available sources are either not included or their sources are identified.

1.2 A definition is a single sentence with additional information included in a discussion.

1.3 Definitions identical to those published by another standards organization or ASTM committee are identified with the name of the organization or the identifying document and ASTM committee.

1.4 Definitions specific to a particular field (such as *emission spectrometry*) are identified with an italicized introductory phrase.

1.5 *This international standard was developed in accordance with internationally recognized principles on standardization established in the Decision on Principles for the Development of International Standards, Guides and Recommendations issued by the World Trade Organization Technical Barriers to Trade (TBT) Committee.*

## 2. Referenced Documents

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

E1914 *Practice for Use of Terms Relating to the Development and Evaluation of Methods for Chemical Analysis* (Withdrawn 2016)<sup>3</sup>

E2437 *Practice for Designing and Validating Performance-Based Test Methods for the Analysis of Metals, Ores, and Related Materials* (Withdrawn 2014)<sup>3</sup>

<sup>1</sup> This terminology is under the jurisdiction of ASTM Committee E01 on Analytical Chemistry for Metals, Ores, and Related Materials and is the direct responsibility of Subcommittee E01.23 on Terminology and Editorial.

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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> The last approved version of this historical standard is referenced on www.astm.org.

E2438 *Practice for Implementing Standard Performance Based Test Methods for the Analysis of Metals, Ores, and Related Materials* (Withdrawn 2014)<sup>3</sup>

2.2 *ISO Standard:*<sup>4</sup>

ISO Guide 30 *Terms and Definitions Used in Connection with Reference Materials*

## 3. Significance and Use

3.1 Definitions given in Section 4 are intended for use in all standards on analytical chemistry for metals, ores, and related materials. The definitions should be used uniformly and consistently. The purpose of this terminology is to promote clear understanding and interpretation of the standards in which definitions are used.

## 4. Terminology Definitions

*analytical curve*—see **calibration curve**.

**analyte**, *n*—in methods of chemical analysis, the constituent determined by a chemical measurement process (Sept. 1, 2022).

**analytical gap**, *n*—in *atomic emission spectrometry*, the region between two electrodes in which the specimen is excited and from which radiant energy is used for analysis (Aug. 1, 2020).

**analytical line**, *n*—in *atomic spectrometry*, the particular wavelength of electromagnetic radiation used in determining the presence or concentration of an element (July 1, 2015).

*arc, condensed*—see **discharge, triggered capacitor**.

*noncapacitive ac arc, n*—in *atomic emission spectrometry*, a series of separate electrical discharges, individually self-initiating or initiated separately by another means, in which each current pulse has a polarity that is reversed from the previous one.

*arc line*—not recommended; see **atom line**.

<sup>4</sup> Available from American National Standards Institute (ANSI), 25 W. 43rd St., 4th Floor, New York, NY 10036, http://www.ansi.org.

**atom line**, *n*—in *atomic emission spectrometry*, a spectral line resulting from radiation emitted during electron transition as an excited atom returns to a lower energy level (Sept. 15, 2022).

**atomic emission spectrometry (AES)**, *n*—pertaining to emission spectrometry in the ultraviolet, visible, or infrared wavelength regions of the electromagnetic spectrum (Sept. 1, 2022).

*bandpass filter*—see under **filter**.

**between-laboratory standard deviation**,  $s_R$ , *n*—the standard deviation of results obtained on the same material using the same method in different laboratories (Sept. 1, 2022).

**buffer**, *n*—in *spectrometric analysis*, a substance that tends to minimize the effects of one or more elements on the emission of other elements (Sept. 15, 2022).

**burn**, *n*—in *atomic emission spectrometry*, that portion of a solid specimen from which atoms were volatilized or sputtered (Aug. 1, 2020).

**burn**, *vt*—in *atomic emission spectrometry*, to vaporize, or sputter, and excite a specimen with sufficient energy to generate spectral radiation (Aug. 1, 2020).

**calibrate**, *vt*—(1) to establish the relationship between the response of an instrument and the amount of analyte; (2) to establish a table of corrections to improve the accuracy of equipment used to measure physical properties such as mass, volume, temperature, and so forth (Sept. 15, 2022).

**calibration**, *n*—the act, process, or result of establishing: (1) the relationship between the response of an instrument and the amount of analyte present; (2) a table of corrections to improve the accuracy of equipment used to measure physical properties such as mass, volume, temperature, and so forth (Sept. 15, 2022).

**calibration curve**, *n*—the graphical or mathematical representation of the relationship between the response of an instrument and the concentration or mass of the analyte (May 15, 2016).

*condensed arc*—see under **discharge, triggered capacitor**.

**certified reference material (CRM)**, *n*—a reference material, accompanied by a certificate, one or more of whose property values are certified by a procedure which establishes traceability to an accurate realization of the unit in which the property values are expressed, and for which each certified value is accompanied by an uncertainty at a stated level of confidence (May 15, 2015).

DISCUSSION—Before the advent of the term certified reference material (CRM), the term standard reference material was used in many documents of ASTM International. This results from the use of the term Standard Reference Material (SRM) as the name for certified reference materials (CRM) issued by the National Institute of Standards and Technology (NIST), an agency of the United States government.

**counter electrode**, *n*—in *atomic emission spectrometry*, the electrode in an analytical pair that does not contain the specimen being analyzed (Aug. 1, 2020).

**detection limit**, *n*—the smallest net signal (or the derived property value, constituent mass fraction, etc.) obtained by a given measurement procedure, that can be distinguished from the background signal at a specified confidence level (Sept. 1, 2022). **E1914**

DISCUSSION—The detection limit may be designated as  $L_D$ . An equivalent alternative term is Limit of Detection with an acronym of LOD.<sup>5</sup>

**discharge, triggered capacitor**, *n*—a series of electrical discharges from capacitors initiated by a separate means and extinguished when the voltage across the analytical gap falls to a value that no longer is sufficient to maintain it (Sept. 15, 2022).

**division**, *n*—in *sample preparation*, a process which divides a sample into two or more subsamples without changing the composition (May 15, 2016).

**doré bead**, *n*—a gold and silver bead that results from cupellation and may contain platinum group metals (Sept. 1, 2022).

**drift correction**, *n*—in *spectrometric analysis*, the process of adjusting for a translational shift or a rotational shift, or both, of an instrument calibration (May 15, 2016).

*electrode gap*—not recommended; see **analytical gap**.

**error**, *n*—of a result, the difference between a result obtained on a material and its accepted reference value (May 15, 2016). **E1914**

**fatigue**, *n*—in *atomic emission spectrometry*, the decrease in response of a photoelectric radiant energy detector caused by the accumulated exposure of the detector to radiant energy (Sept. 15, 2022).

**filter**, *n*—in *atomic spectrometry*, a substance that attenuates the radiant power in a definite manner with respect to spectral distribution (Sept. 1, 2022).

*bandpass filter*—a filter that passes wavelengths (or frequencies) within a specified range and attenuates all wavelengths (or frequencies) outside that range.

*gross sample*—see under **sample** (May 15, 2016).

**homologous lines**, *n*—in *atomic emission spectrometry*, spectral lines that exhibit minimal change in their intensity ratios with variations in excitation conditions (Sept. 15, 2022).

**increment**, *n*—in *sampling*, a portion of material removed from a lot by a single operation (Sept. 15, 2022).

**inquartation**, *n*—in *fire assay*, the addition of silver to facilitate parting (May 15, 2015).

**interlaboratory study (ILS)**, *n*—a study initiated among multiple, independent laboratories to demonstrate the precision and bias of a test method. (May 15, 2023).

<sup>5</sup> For a complete discussion, refer to L. A. Currie (ed.), *Pure and Applied Chemistry*, Vol 67, No. 10, 1995, pp. 1699–1723.

**internal standard**, *n*—*in spectrometry*, a material present in or added to test samples that serves as an intensity reference for spectral measurements (May 15, 2019).

**internal standard line**, *n*—*in atomic spectrometry*, a spectral line of an internal standard, to which the radiant energy of an analytical line is compared (Sept. 15, 2022).

**ion line**, *n*—*in atomic emission spectrometry*, a spectral line resulting from radiation emitted during electron transition as an ionized atom decays to a lower, but still ionized, energy level; see **atom line** (Sept. 15, 2022).

*laboratory sample*—see under **sample**.

**linear dispersion**, *n*—the derivative  $dx/d\lambda$ , where  $x$  is the distance along the spectrum and  $\lambda$  is the wavelength (May 15, 2016).

**line pair**, *n*—*in atomic emission spectrometry*, an analytical line and the internal standard line with which it is compared (May 15, 2016).

**lot**, *n*—*in sampling*, a collection of material regarded as a unit (Sept. 15, 2022).

**matrix**, *n*—withdrawn; see definition in the IUPAC Gold Book (<https://goldbook.iupac.org/>) (April 15, 2021). **E1914**

**method**, *n*—*in chemical analysis*, instructions used to produce a numerical result, which are detailed in a document referred to as “the method” (Sept. 1, 2022).

**minimum standard deviation**,  $s_M$ , *n*—the standard deviation of results on a test material obtained under conditions of minimum variability (Sept. 1, 2022).

**nebulizer**, *n*—a device for converting a sample solution into a gas-liquid aerosol for atomic absorption, emission, fluorescence, or mass analysis (Aug. 1, 2020).

*noncapacitive ac arc*—see under **arc**.

**normalization**, *n*—*in spectrometric analysis*, (1) the process of adjusting instrument output to conform to an established condition using one or more homogeneous specimens or reference materials; (2) the adjustment of the analysis total to 100 %, or some other total (May 15, 2015).

**parting**, *vt*—*in fire assay*, separating silver from gold by selectively dissolving the silver in acid (Aug. 1, 2020).

**performance-based method**, *n*—a test method that defines: (1) the general approaches for sampling, sample preparation, and making measurements on a specified type of material; and (2) maximum allowable uncertainties for each measured constituent over its validated calibration range and provides measurement performance criteria (Jan. 1, 2020).

**polychromator**, *n*—a device for simultaneously isolating several rays of monochromatic radiation from a beam of polychromatic radiation (Sept. 15, 2022).

**preburn period**, *n*—*in atomic emission spectrometry*, the time interval after the initiation of a discharge during which the

emitted radiation energy is not recorded for analytical purposes (Sept. 15, 2022).

**premix burner**, *n*—*in flame atomic absorption and atomic emission spectrometry*, a burner in which the fuel gas is mixed with the oxidizing gas before reaching the combustion zone (April 15, 2021).

*prepared sample*—see under **sample**.

**primary X-rays**, *n*—*in spectrometry*, the emergent beam from the X-ray source (July 1, 2015).

**profile**, *vt*—*in atomic emission spectrometry*, to scan and set the deflection of the grating, or actual or apparent position of the entrance slit, or actual or apparent location of the exit slits, to produce optimum measurement of intensity (Sept. 15, 2022).

**proof**, *n*—*in fire assay*, a synthetic verifier having a precious metal content similar to that expected in the test sample (May 15, 2016).

**proof correction**, *n*—*in fire assay*, the adjustment to the final assay obtained by analyzing the proof concurrently with the test sample (May 15, 2016).

**radiant power**,  $P$ , *n*—the rate at which energy is transported in a beam of radiant energy, preferably expressed in watts (July 1, 2015).

**reciprocal linear dispersion**, *n*—the derivative  $d\lambda/dx$ , where  $\lambda$  is the wavelength and  $x$  is the distance along the spectrum (May 15, 2019).

**reference material (RM)**, *n*—a material, sufficiently homogeneous and stable with respect to one or more specified properties, which has been established to be fit for its intended use in a measurement process (May 15, 2019). **ISO Guide 30**

**repeatability**, *n*—see **within-laboratory standard deviation**. **E1914**

**repeatability index**,  $r$ , *n*—an estimate of the maximum difference expected for results on the same test material on different days in the same laboratory, a difference not expected to be exceeded an average of more than once in 20 comparisons (95 % probability) (May 15, 2019). **E1914**

**repeatability standard deviation**, *n*—see **within-laboratory standard deviation**. **E1914**

**reproducibility**, *n*—see **between-laboratory standard deviation**. **E1914**

**reproducibility index**,  $R$ , *n*—an estimate of the maximum difference expected for results on the same material in two laboratories, a difference not expected to be exceeded an average of more than once in 20 comparisons (95 % probability) (May 15, 2019). **E1914**

**reproducibility standard deviation**, *n*—see **between-laboratory standard deviation**. **E1914**