



Designation: C859 – 24

Standard Terminology Relating to Nuclear Materials¹

This standard is issued under the fixed designation C859; 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 terminology standard covers terms, definitions, descriptions of terms, nomenclature, and explanations of acronyms and symbols specifically associated with standards under the jurisdiction of Committee C26 on Nuclear Fuel Cycle. The content of this terminology standard may also be applicable to documents not under the jurisdiction of Committee C26, in which case this terminology standard may be referenced in those documents.

1.2 While subcommittees within Committee C26 are free to only provide terms and definitions within individual standards, each subcommittee may request the addition of utilized terms and definitions to this terminology standard if it believes that such serves the broader interest of Committee C26 and the nuclear fuel cycle profession. Therefore, terms and definitions proposed for inclusion in Terminology C859 need not be used in more than one committee standard before being considered.

1.3 In general, technical terms that are defined in common dictionaries would not also be defined in this terminology standard unless there is a need to emphasize a specific definition in making appropriate use of a Committee C26 standard.

1.4 Subcommittee C26.10 (Nondestructive Assay) also has a terminology standard applicable to its standards: Terminology C1673.

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.*

¹ This terminology is under the jurisdiction of ASTM Committee C26 on Nuclear Fuel Cycle and is the direct responsibility of Subcommittee C26.01 on Editorial and Terminology.

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2. Referenced Documents

2.1 ASTM Standards:²

C1108 Test Method for Plutonium by Controlled-Potential Coulometry

C1156 Guide for Establishing Calibration for a Measurement Method Used to Analyze Nuclear Fuel Cycle Materials

C1673 Terminology of C26.10 Nondestructive Assay Methods

3. Terminology

3.1 Definitions:

absorbed dose, D, [L² T⁻²], *n*—absorbed dose is the mean energy imparted by ionizing radiation to a unit mass of specified material.

DISCUSSION—The SI unit for absorbed dose is the gray (Gy), defined as 1 J/kg.

abundance sensitivity, *n*—in methods of chemical analysis, the ratio of the ion beam intensity of the major isotope, *M*, to the background current at the adjacent mass positions.

$$\text{Abundance sensitivity} = \frac{\text{ion current at mass } M}{\text{ion current at } M \pm 1} \quad (1)$$

accelerated test, *n*—for the prediction of long term behavior of materials, a test that results in an increase either in the rate of an alteration mode or in the extent of reaction progress, when compared with expected service conditions.

DISCUSSION—Changes in the expected alteration mechanism(s) caused by the accelerated test conditions, if any, must be accounted for in the use of the accelerated test data.

accuracy, *n*—the closeness of agreement between a measurement result and an accepted reference. (E170)

activity, A, [T⁻¹], *n*—the measure of the rate of spontaneous nuclear transformations of a radioactive material. The SI unit

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.

for activity is the becquerel (Bq), defined as one transformation per second. The original unit for activity was the curie (Ci), defined as 3.7×10^{10} transformations per second.

alpha radiation, *n*—is the spontaneous emission of an alpha particle, composed of two protons and two neutrons with a positive charge of plus two, during the nuclear transformation process.

DISCUSSION—An alpha particle is the same as a helium-4 atom with no electrons.

alteration, *n*—any change in the form, state, or properties of materials.

alteration layer, *n*—*in materials interaction with water*, a layer of alteration phases at the surface of the specimen.

DISCUSSION—Several distinct layers may form at the surface and within cracks in the material. Layers may be composed of discrete crystallites.

alteration mechanism, *n*—the series of fundamental chemical or physical processes by which alteration occurs.

alteration mode, *n*—*for the prediction of long-term behavior of materials*, a particular form of alteration, for example: general corrosion, localized corrosion.

alteration phase, *n*—*in materials interactions with their environment*, a solid phase formed as a result of material interactions, that replaces some amount of the original phase; may form by precipitation from solution of in-situ transformation of a chemically altered solid.

alteration product, *n*—see alteration phase.

aluminum-based spent nuclear fuel, *n*—irradiated nuclear fuel or target elements or assemblies, or both, that are clad in aluminum or aluminum-rich alloys.

DISCUSSION—The microstructures contain a continuous aluminum-rich matrix with fissile-rich particles dispersed in this matrix.

aluminum-based spent nuclear fuel form or waste form, *n*—any metallic form produced from aluminum-based spent nuclear fuel and having a microstructure containing a continuous aluminum-rich matrix with uranium-rich particles dispersed in this matrix.

DISCUSSION—This term may include the fuel itself or the product from the melt-dilute process.

analog, *n*—for the prediction of long term behavior of materials, a material, process, or system whose composition, and environmental history are sufficiently similar to those anticipated for the materials, processes, or systems of interest to permit use of insight gained regarding its condition or behavior to be applied to the material, process, or system of interest.

analysis (physical or chemical), *n*—the determination of physical or chemical properties or composition of a material.

analyte, *n*—in method of chemical analysis, a sample component whose presence and concentration is of interest.

analytical sample, *n*—a portion of a material (solid, liquid, or gas) used in chemical, physical, or radiological analysis.

annealing, *n*—*in glass leach tests*, a controlled cooling process for glass designed to reduce thermal residual stress to an acceptable level, and, in some cases, modify structure.

artificial aging, *n*—any short time treatment that is designed to duplicate or simulate the material/property changes that normally occur after prolonged exposure and radioactive decay.

attribute test, *n*—for the prediction of long-term behavior of materials, a test conducted to provide material property data that are required as input to behavior models, but are not themselves responses to the environment, such as density, thermal conductivity, mechanical properties, radionuclide content of waste forms, and so forth.

back-reaction, *n*—reaction between dissolved components and a material to re-form bonds that are broken during dissolution of this material.

becquerel (Bq), [T⁻¹], *n*—the SI unit of measure for activity, defined as one transformation per second.

beta radiation, *n*—an electron that was generated in the atomic nucleus during decay and has a negative charge of one.

bias of a measurement process, *n*—a consistent or systematic difference between a set of test results obtained from the process when measuring a property, and the accepted reference value of the property being measured.

bounding model, *n*—for the prediction of long term behavior of materials, a model that yields values for dependent variables or effects that are expected to be either always greater than or always less than those expected for the variables or effects to be bounded.

calcine, *v*—to fire or heat a granular or particulate solid at less than fusion temperature but sufficiently to remove most of its chemically combined volatile matter (for example, H₂O, CO₂) and otherwise to develop the desired properties for use.

calibration, *n*—the set of operations that establishes, under specified conditions, a relationship between a set of values measured or indicated by an instrument or system to a corresponding set of known values, typically derived from appropriate reference standards or established physical constants.

DISCUSSION—The calibration relationship can be expressed by a statement, function, diagram or table.

DISCUSSION—Test Method C1108 is an example of calibration using established physical constants.

DISCUSSION—Additional details on calibration requirements for measurement methods used for the nuclear fuel cycle can be found in Guide C1156.

DISCUSSION—Some applications or test methods will require the performance of metrologically traceable calibrations.

canyon, *n*—*in the nuclear industry*, a long, narrow, remotely operated, radiological facility.

DISCUSSION—A large, heavily-shielded facility where nuclear material is processed or stored.