



## Standard Terminology Relating to Nuclear Materials<sup>1</sup>

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**absorbance, *A***—*in spectrochemical analysis*, the logarithm to the base 10 of the reciprocal of the transmittance.

$$A = \log (1/T) \quad (1)$$

**absorptivity, *a***—*in spectrochemical analysis*, the absorbance (*A*) divided by the product of the cell path length (*b*) and the concentration (*c*).

$$a = A/bc \quad (2)$$

**abundance sensitivity (isotopic measurement)**—the ratio of the ion beam intensity of the major isotope, *M*, to the background current at the adjacent mass positions.

$$\text{Abundance sensitivity} = \frac{\text{ion current at mass } M}{\text{ion current at } M \pm 1} \quad (3)$$

**accelerator**—*as used in a furnace*, a material used to promote the rapid and complete reaction of a sample.

**accelerator (for pyrohydrolysis)**—a substance that speeds a reaction, in this case, a pyrohydrolysis.

**acceptance test**—a test, or series of tests, conducted by the procuring agency, or an agent thereof, to determine whether an individual lot of materials conforms to the purchase order or contract or to determine the degree of uniformity of the material supplied by the vendor, or both.

DISCUSSION—Specifications usually state sampling technique, test procedures, and minimum requirements for acceptance.

**accountability**—a term used to designate the internal control system used for nuclear materials, but does not include physical protection.

**actinide series**—the series of elements beginning with actinium, Element No. 89, and continuing through lawrencium, Element No. 103.

**aliquant**—a representative portion of a whole that divides the whole leaving a remainder.

**aliquant (solution)**—a measured quantity of a homogeneous, liquid mixture that, when taken by either weight or volume, is not an evenly divisible portion of the total mixture.

**aliquot**—a representative portion of a whole that divides the whole exactly without leaving a remainder.

**alpha activity**—the spontaneous emission of doubly charged helium ions from the nucleus.

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

**analytical reagent grade**—reagents of high purity that meet ACS specifications, as published by the American Chemical Society.

**apparent density**—the mass of a material divided by its apparent volume including closed pores.

**archive sample**—any sample retained for record or for future use.

**atomic absorption spectrometry**—the measurement of the light absorbed at the wavelength of resonance lines by the unexcited atoms of an element.

**atomic weight**—the mean weight of the atom of an element in relation to <sup>12</sup>C = 12.000.

**background intensity**—in spectrochemical analyses, the optical density or darkening of the photographic plate or film near the spectrographic line being measured, or the intensity of light measured with a phototube near the spectrographic line being measured.

**bagout port**—*in the nuclear industry*, an opening in a glovebox to which a bag is attached and in which material and equipment can be encased, then removed without possible contamination of the surrounding environment.

**barn**—a unit of area equal to 10<sup>−24</sup> cm<sup>2</sup>, used to express the probability of the occurrence of a specific nuclear interaction.

**batch**—a quantity of material made in a production sequence that is expected to be uniform in isotopic, physical, and chemical characteristics.

**beta activity**—the spontaneous emission of electrons from a nucleus.

**bias**—a persistent positive or negative deviation of the method average from the correct value or accepted reference value. (Also referred to as “constant” or “systematic error.”)

**binder**—a cementing medium; either a material added to the powder to increase the green strength of the compact, and that is expelled during sintering; or a material (usually of relatively low melting point) added to a powder mixture for the specific purpose of cementing together powder particles that alone would not sinter into a strong body.

**boron equivalent**—*in the nuclear industry*, the absorptive capacity for thermal neutrons of weights of various elements expressed in terms of the weight of natural boron.

**branching**—*in the nuclear industry*, the existence of two or

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more modes by which a radionuclide can undergo radioactive decay.

**bulk density**—the mass of a material divided by its exterior volume.

**burnable neutron absorber**—a neutron absorber, such as boron, purposely included in a reactor to help control long-term reactivity changes by its progressive burnup. (Also referred to as burnable poison.)

**burnable poison**—See **burnable neutron absorber**.

**calibration**—the determination of the values of the significant parameters by comparison with values indicated by a reference instrument or by a set of reference standards.

**calibration curve**—the graphical or mathematical representation of a relationship between the assigned (known) values of standards and the measured responses from the measurement system.

**calibration standard**—a standard having an accepted value (reference value) for use in calibrating a measurement instrument or system.

**carrier gas**—a gas that is inert in the analysis that is used to sweep gaseous products through the analysis system.

**certificate of test**—a written, printed, or signed document attesting to the validity of the test performed.

**certified reference material**—a reference material with one or more property values that are certified by a technically valid procedure, accompanied by or traceable to a certificate or other documentation that is issued by a certifying body. A certifying body is a technically competent body (organization or firm, public or private) that issues a reference material certificate. A reference material certificate is a document certifying one or more property values for a certified reference material, stating that the necessary procedures have been carried out to establish their validity. (ISO definition: ISO Guide 30, *Terms and Definitions Used in Connection with Reference Materials*.)<sup>2</sup>

**chemical assay**—a chemical measurement of the quantity of one or more components of a material.

**chemical separation**—the removal, isolation, or separation of the desired substance from the remainder of the sample by methods that involve difference(s) in the chemical properties of the substances involved.

**clean room**—an area in which the temperature, humidity, and airborne contamination particulate are controlled as required.

**colorimetric**—See the preferred term, **spectrophotometry**.

**colorimetry**—See the preferred term, **spectrophotometry**.

**compaction**—in ceramics or powder metallurgy, the preparation of a compact or object produced by the compression of a powder, generally while confined in a die, with or without the inclusion of lubricants, binders, etc., and with or without the concurrent applications of heat.

**comparator, spectral**—an instrument for the inspection and wavelength measurement of spectrograms. (E 135, E-2)

**composite lot sample**—a single sample prepared by combining samples from several containers in the same ratio as the quantities in the containers sampled.

**concurrent analysis**—an analysis performed at the same or nearly the same time, or in immediate sequence, often in relationship or association to another analysis. In analytical chemistry, a term used to describe a series of measurements in which reference material samples are analyzed in tandem with samples whose chemical composition or particular chemical property(ies) are being determined.

**“cone and quartering” method**—a form of sampling in which a powder is piled into a conical heap, spread into a circular cake, and divided into quarters, of which a diagonally opposite pair are taken as samples.

**DISCUSSION**—The procedure can be repeated until powder samples of the desired size are obtained.

**controlled fission**—*in the nuclear industry*, fission under conditions of continuous adjustment of control rods and of other control mechanisms in a reactor that compensates for the changes in reactivity.

**controlled potential coulometry**—the measurement of the number of coulombs required for an electrochemical reaction occurring under conditions where the working electrode potential is precisely controlled.

**control rod**—*in the nuclear industry*, a device used to control chain reactions, usually a neutron-absorbing material.

**copper spark method**—*in emission spectroscopy*, a method using high voltage spark excitation for the determination of elemental constituents of material deposited, usually by evaporation, on a pair of copper electrodes.

**coulometer**—an electrolytic cell or electronic device arranged to measure the quantity of electricity by the chemical action produced in accordance with Faraday’s law.

**counter electrode (electrochemical)**—an electrode in an electrochemical cell that is used to transfer current to or from a working or a reference electrode, or both.

**criticality**—*in the nuclear industry*, the condition wherein a system or medium is capable of sustaining a nuclear chain reaction.

**criticality controls**—those mechanisms which provide a high level of assurance that the probability of occurrence of a critical excursion is acceptably low.

**critical mass**—*in the nuclear industry*, the minimum mass of fissile material that can be made critical with a specified geometrical arrangement and material composition.

**current efficiency**—the proportion, usually expressed as a percentage, of the current that is effective in carrying out a specific process in accordance with Faraday’s law.

**daughter**—a nuclide, stable or radioactive, formed by radioactive decay. A synonym for decay product.

**dead time correction**—an adjustment to the elapsed counting time of a detector system to compensate for the time the system is processing signals and cannot accept new signals.

**density**—the mass of a unit volume of the material at any given temperature. The unit of mass is expressed in grams, the unit of volume in cubic centimetres (unless otherwise specified), and the temperature scale in degrees Celsius. The SI unit of density is kilogram per cubic metre.

**density (film or line)**—the quantitative measure of film blackening.

$$D = \log I_0/I \quad (4)$$

<sup>2</sup> Available from American National Standards Institute, 11 W. 42nd St., 13th Floor, New York, NY 10036.

where:

$D$  = density,

$I_o$  = light intensity incident on the film, and

$I$  = light intensity transmitted.

**depleted uranium**—less than the accepted value of the weight percent of the isotope  $^{235}\text{U}$  in natural uranium.

**detection limit**—a stated limiting value which designates the lowest concentration or mass that can be estimated or determined with confidence and which is specific to the analytical procedure used.

**detector efficiency**—in the measurement of radioactivity, the fraction of particles or photons striking the detector that gives rise to a detected response. (In many cases, it is defined to mean relative efficiency, the product of detector efficiency and detector geometry.)

**detector geometry**—in the measurement of radioactivity, the fraction of emissions from the source (particles or photons) that impinge on the detector. Also called solid angle.

**dilution factor**—for a specified constituent, the ratio of the quantity of a diluted material to the quantity of the undiluted material.

**electrical calibration**—the calibration of an instrument by use of known quantities of electrical energy.

**electrolytic cell**—a unit apparatus in which electrochemical reactions are produced by applying electrical energy, or that supplies electrical energy as a result of chemical reactions and that includes two or more electrodes and one or more electrolytes contained in a suitable vessel.

**emulsion calibration curve**—the plot of a function of the relative transmittance of the emulsion versus a function of the exposure.

**end point**—in chemical analysis, that stage during a titration at which a marked change is observed. This could be a change in indicator color, potential, or some other indicating parameter.

**end point inflection**—the largest change in observed property per unit quantity of titrant. This is indicative of the end point.

**enriched uranium**—greater than the accepted value of the weight percent of the isotope  $^{235}\text{U}$  in natural uranium.

**equivalent boron content (EBC)**—*in the nuclear industry*, the concentration of natural boron that would provide a thermal neutron absorption cross section equivalent to the concentration of a specific impurity element.

**equivalent boron content (EBC) factor**—the ratio of the product of the atomic weight of boron and a specified impurity thermal neutron absorption cross section to the product of the boron thermal neutron absorption cross section and the atomic weight of a specified impurity element.

$$\frac{(\text{at. wt. of boron}) (\sigma \text{ of impurity})}{(\sigma \text{ of boron}) (\text{at. wt. of impurity})} \quad (5)$$

This factor is used to convert an impurity element concentration to a neutron absorption equivalent to natural boron.

**equivalent uranium content (EUC)**—a concentration of  $^{238}\text{U}$  that would provide a fast neutron absorption cross section equivalent to the concentration of a specific impurity element.

**equivalent weight**—the weight of an element that will combine with, react with, or replace one atomic weight of hydrogen or one half atomic weight of oxygen.

**filler**—a general term for a material that is inert under the conditions of use and serves to occupy space and may improve physical properties.

**fissure**—a surface irregularity in the form of a narrow opening or crack.

**fluorination**—the process of chemically reacting a material with fluorine or a fluorine-containing compound to produce a desired product, for example, the reaction of  $\text{UO}_3$  with fluorine to produce  $\text{UF}_6$ .

**fuel assembly**—*in the nuclear industry*, a grouping of fuel elements that is not taken apart during the charging and discharging of a reactor core.

**fuel element**—*in the nuclear industry*, the smallest structurally discrete part of a reactor that has fuel as its principal constituent.

**gamma activity**—the spontaneous emission from the nucleus of high energy, short wavelength, electromagnetic radiation.

**germanium detector, lithium drifted**—a semi-conductor detector that can be used for high-resolution gamma-ray spectrometry.

*historical sample*—See preferred term, **archive sample**.

**integrator (count rate)**—a device for obtaining the time integral of the counts as from a radioactive material.

**intensity**—ideally, the radiant power per unit area. In spectrochemical analysis, the radiant power as measured by a photographic or photoelectric receiver, or as estimated visually.

**intensity (line)**—the light intensity of an image of a slit formed in the focal plane of a spectrograph or spectrometer and having a width approximately equal to that formed by monochromatic radiation. Also see **spectral line**.

**internal standard**—a material present in or added to samples that serves as an intensity reference for spectral measurements.

**internal standard line**—a spectral line of an internal standard, with which the radiant energy of an analytical line is compared.

**iodometry**—an application of iodine chemistry to oxidation-reduction titrations for the quantitative analysis of chemical compounds.

**isotope**—nuclides having the same atomic number but different mass numbers.

**isotopic assay**—the determination of the percentage (by weight or by atoms) of isotopic constituents of an element.

**isotopic composition**—the relative amounts, expressed in atom or weight fraction of the various isotopes of an element in a sample or material.

**isotope ratios**—the relative amounts of two isotopes of an element, expressed as a ratio, in a sample or material.

**linear dispersion**—*in spectrochemical analysis*, the derivative  $dx/d\lambda$  where  $x$  is the distance along the spectrum and  $\lambda$  is the wavelength. Linear dispersion is usually expressed as millimetres per angstrom.

**lot**—a quantity of material that is thought to be uniform in one or more stated properties such as isotopic, chemical, or

physical characteristics.

**matrix material (preparation of reference materials)**—the principal materials in which one or more constituents may be dispersed.

**measurement control standard**—a material or item used for monitoring the performance of a measurement system.

**mechanical properties**—those properties of a material which are associated with elastic and inelastic reaction when force is applied, or which involve the relationship between stress and strain.

DISCUSSION—These properties have often been referred to as “physical properties,” but the term “mechanical properties” is preferred.

**moderator**—a material used to reduce neutron energy by scattering without appreciable capture.

**molar absorptivity**—*in spectrochemical analysis*, the product of the absorptivity,  $a$ , and the molecular weight of the substance.

**nanometre (nm)**—a unit,  $10^{-9}$  metre, used in the measurement of the wavelength of light. It is identical to the older term millimicron,  $m\mu$ .

**natural uranium**—uranium whose isotopic composition, as it occurs in nature, has not been altered.

**nephelometry**—measurement of the intensity of light scattered at 90 deg to the incident beam of light.

**neutron**—an elementary particle having no electric charge, a rest mass of  $1.67495 \times 10^{-27}$  kg and a mean life of 1000 s.

**neutron cross section**—a measure of the probability that a neutron will interact with a nucleus. The cross section is a function of the neutron energy and the structure of the interacting nucleus. Also see **barn**.

**neutron flux**—the number of neutrons passing per second through an area of one square centimetre.

**nondestructive assay (NDA)**—an elemental or isotopical analysis of a sample in which the chemical and physical properties of that sample remain essentially unaltered.

**normal uranium**—uranium containing the same weight percentage  $^{235}\text{U}$  as occurs in nature. It may be attained by blending uranium of different isotopic compositions or by processing in a diffusion plant. See **natural uranium**.

**nuclear grade**—material of a quality adequate for use in nuclear application.

**nuclear material license**—a permit issued by the Nuclear Regulatory Commission or a state to receive, process, store, or ship source or special nuclear material.

**nuclear poison**—a substance that, because of its high neutron absorption cross section, can reduce reactivity. The term is commonly called poison.

**nuclide**—an atomic species characterized by the constitution of its nucleus, specifically by the number of protons and neutrons.

**optical emission spectrograph**—a spectrograph for recording electromagnetic radiation in one or more of the following regions: ultraviolet, visible, or infrared.

**oxygen/uranium ratio**—the mole ratio of oxygen to uranium in a sample of uranium oxide.

**particle size**—the controlling lineal dimension of individual particles.

**pellet**—a briquet or compact, usually cylindrical, formed by pressing a powder in a die. The pellet may or may not have been sintered following compaction.

**performance test**—a test of capacity to achieve a desired result.

**pH**—the cologarithm (negative logarithm) of the hydrogen ion activity; less precisely, concentration.

**photometer**—an instrument for measuring photometric quantities, such as luminous intensity or luminous flux.

*photometry*—See the preferred term, **spectrophotometry**.

**plattner mortar (diamond mortar)**—a mortar consisting of a block, cylinder, and pestle made of surface-hardened tool steel having dimensions such that the cylinder fits snugly into a depression in the block and the pestle fits in the cylinder. The crushing is done with the pestle, generally with the aid of a hammer.

**plutonium-rich particle**—any area of a sample that has a plutonium content identifiably greater than the surrounding matrix.

**porosity**—the percentage of the total volume of a material occupied by both open and closed pores.

**pour density**—the mass of an amount of powder divided by its volume and measured by pouring the powder into a graduated container.

**precision**—a generic term used to describe the dispersion of a set of measured values.

**proportional counter**—a gas-filled tube operated in that range of applied voltage in which the electrical charge collected per isolated count is proportional to the electrical charge liberated by the initial ionizing event. The range of applied voltage depends upon the type and energy of the incident radiation.

**pulse-height analyzer**—an instrument for measuring the number of voltage pulses falling within each of one or more voltage ranges.

**pyrohydrolysis**—decomposition by the action of heat and water vapor.

**qualitative analysis**—an analysis in which some or all of the components of a sample are identified.

**quality assurance**—all planned and systematic actions necessary to provide adequate confidence that an item or a facility will perform satisfactorily in service.

**quality control**—those quality assurance actions which provide a means to control and measure the characteristics of an item, process, or facility to established requirements.

**quality verification tests**—tests performed to check the degree of conformance to a standard or specification.

**quantitative analysis**—a measurement in which the amount of one or more components of a sample is determined.

**radioactive decay**—the spontaneous transformation of a nuclide into one or more nuclides accompanied by the release of radiation.

**random sampling (simple random sampling)**—a technique for selecting a sample of  $n$  elements from a population of elements in such a way that each combination of  $n$  elements has the same probability of being selected.

**reactivity**—*in the nuclear industry*, a parameter giving the deviation from criticality of a nuclear chain-reacting

medium such that positive values correspond to increasing reaction intensity and negative values correspond to decreasing intensity.

**reagent blank**—the contribution to the analytical result caused by substances in the reagents (or apparatus) as determined by carrying through all of the operations of the analysis with the same quantities of reagents that are used in the actual analysis of a material but without addition of sample.

**reagent grade**—See **analytical reagent grade**.

**reciprocal linear dispersion**—in *spectrochemical analysis*, the derivative  $d\lambda/dx$  where  $\lambda$  is the wavelength and  $x$  is the distance along the spectrum. Also see **linear dispersion**.

**referee tests**—tests performed by an umpire or third party appointed to investigate and report the facts and to frequently make recommendations. See **third party**.

**reference material**—a material or substance one or more properties of which are sufficiently well established to be used for the calibration of an apparatus, the assessment of a measurement method, or assigning values to materials. (ISO definition: ISO Guide 30, *Terms and Definitions Used in Connection with Reference Materials*).<sup>2</sup>

**rejected material**—material that fails to meet specifications.

**relative standard deviation**—the standard deviation expressed as a percentage of the mean value.

**representative sample**—a generic term implying that the population has been properly sampled.

**residue bottle**—a storage vessel for small amounts of special nuclear materials that accumulate in the course of chemical analysis.

**resolving power**—the power of a lens or optical system to form separate images of close object points. The quantity  $\lambda/d\lambda$  is commonly used as the measure of the resolving power of a spectrograph.

**safety requirements**—those regulations designed to protect against personal injury or property damage resulting from system failure, breakage, or accident.

**sample thief**—a device used to obtain samples from containers of material.

**scintillator**—in *the nuclear industry*, a transparent substance that emits visible or near ultraviolet light when traversed by an ionizing particle.

**scrap**—in *the nuclear industry*, residues that contain sufficient quantities of source or special nuclear material to be worthy of recovery.

**shape factor**—generally defined as the ratio of the major dimension of a particle to the minor dimension.

**shield (radiation)**—a device that, when placed in a radiation field, reduces (attenuates) the radiation flux.

**shipper–receiver difference**—in *the nuclear industry*, the difference between the quantity stated by the shipper as having been shipped and the quantity stated by the receiver as having been received.

**sinterable powder**—a powder in which the bonding of adjacent surfaces of particles can be accomplished by heating.

**sintering**—the bonding of adjacent surfaces of particles in a mass of powder or a compact by heating.

**sodium iodide detector, thallium activated, NaI(Tl)**—a

scintillation detector crystal used for detection of gamma rays.

**soluble boron in boron carbide**—the empirically determined boron that dissolves from boron carbide under specified test conditions.

**solvent extraction**—the selective separation of one or more constituents contained in a given solvent by intimately contacting the solvent with a second immiscible solvent in which the selected constituents(s) is more soluble.

**source material**—any material, except special nuclear material, that contains 0.05 or more of uranium, thorium, or any combination of the two.

**special nuclear material**—plutonium,  $^{233}\text{U}$ , uranium enriched in  $^{233}\text{U}$  or  $^{235}\text{U}$  to greater than its natural abundance, and any other materials defined as SNM under the Atomic Energy Act of 1954, as amended. This term does not include source materials.

**specific activity**—the number of nuclear disintegrations of a radionuclide per unit time per unit mass.

**specification**—a precise statement of a set of requirements to be satisfied by a material, product, system, or service indicating, whenever appropriate, the procedure by means of which it may be determined whether the requirements given are satisfied. As far as practicable, it is desirable that the requirements be expressed numerically in terms of appropriate units together with their limits.

**spectral comparator**—an instrument for the inspection and wavelength measurement of spectrograms.

**spectral line**—an image of a slit formed in the focal plane of a spectrograph or spectrometer and having a width approximately equal to that formed by monochromatic radiation.

**spectrochemical buffer**—in *spectrochemical analysis*, a substance which by its addition or presence tends to minimize the effects of one or more of the elements on the emission of other elements.

**spectrochemical carrier**—in *emission spectrochemical analysis*, a material added to a sample to facilitate its vaporization into the analytical gap.

**DISCUSSION**—The carrier may serve to sweep the entire sample rapidly into the gap or it may be limited in its action to assisting in the fractional distillation of the sample.

**spectrographic**—pertains to an analytical determination based upon an indirect measurement of properties of a spectrum (light emission, mass, energy) characteristic of the substance being analyzed. Measurements are usually made from a photographic display of the spectrum.

**spectrometric**—pertains to an analytical determination based upon the direct measurement of properties of a spectrum (usually light emission, mass, energy) characteristic of the substance being analyzed. Measurements are made of electrical signals produced that are proportional to the properties being measured.

**spectrophotometry**—a method for identification of substances and determination of their concentration by measuring light transmittance in different parts of the spectrum.

**sphincter seal**—in *the nuclear industry*, a ring-shaped closure through which cylindrical objects are introduced into a

glovebox without violating the contamination barrier.

**standard deviation**—the positive square root of the variance.

**standard deviation of the mean (sample)**—the sample standard deviation divided by the square root of the number of measurements used in the calculation of the mean.

*statistical bias*—See **bias**.

**step exposure (emission spectrographic)**—an emission spectrographic exposure using a step filter or step-sector disk that interrupts the radiation passing through the spectrograph slit and falling on the photographic emulsion. The length of time of the interruption varies in steps along the vertical length of the spectral line as determined by the “steps” in the filter or disk.

**stock solution**—a homogeneous liquid mixture from which aliquants, aliquots, or unmeasured portions can be taken as needed.

**stoichiometric**—having the precise weight relationship of the elements in a chemical compound; or (quantities of reacting elements or compounds) being in the same weight relationship as the theoretical combining weight of the elements involved.

**supernatant**—floating on the surface; often used to describe the liquid above a precipitate or solid.

**tap density**—the apparent density of a powder obtained when the receptacle is tapped or vibrated during loading under specified conditions.

**TFE fluorocarbon**—tetrafluoroethylene or its polymer, polytetrafluoroethylene (C<sub>2</sub>F<sub>4</sub>)<sub>n</sub>.

**theoretical density**—the density of a material calculated from the number of atoms per unit cell and measurement of the lattice parameters.

**thermal ionization**—a process in which ions are formed when an atom or molecule interacts with a heated surface. Ionization only occurs when the work function of the surface and the temperature of the surface provide the necessary ionization energy to the atom or molecule.

*thief*—See the preferred term, **sample thief**.

**third party**—a person or organization other than the principals. See **referee tests**.

**titration**—*in chemical analysis*, the determination of the reactive capacity, usually of a solution, especially, the analytical process of successively adding measured amounts of a reagent (as a standard solution) to a known volume or weight of a sample or sample solution until a desired end point is reached.

**tolerance interval**—an interval computed so that it will include at least a stated percentage of the population with a stated probability.

**tolerance limits**—bounds of a tolerance interval.

**total burn technique**—in emission spectrographic analyses, continued excitation of the sample until the electrode charge is consumed (totally burned).

**total equivalent boron content (TEBC)**—the sum of the individual equivalent boron content (EBC) values.

**total metal basis**—analytical results calculated by reference to the sum of the masses of uranium and plutonium rather than

the sum of their oxides.

**trace**—a constituent or impurity making up only a small portion of the sample, the upper limit of the trace or microconstituent being about 100 µg/g. This upper boundary is not rigidly fixed.

**transmittance (of light)**—that fraction of the emitted light of a given wavelength which is not reflected or absorbed, but passes through a substance.

**transuranium element**—an element above uranium in the periodic table, that is, with an atomic number greater than 92.

**trap (dust, sulfur, water, gas, etc.)**—any of various devices for preventing passage of dust, sulfur, water, gas, etc., often while allowing other matter to pass through.

**true density**—a term used when considering the density of a porous solid. It is defined as the ratio of the mass of the material to its true volume.

**true volume**—the volume of the solid material only, excluding the volume of any pores or voids.

**ultratrace**—conveniently used to designate the region below 1.

**umpire**—a laboratory of recognized capability chosen to resolve a difference, for instance, a disputed shipper-receiver difference.

**UNH**—uranyl nitrate hexahydrate, UO<sub>2</sub>(NO<sub>3</sub>)<sub>2</sub>·6H<sub>2</sub>O.

**uranium**—oxides of uranium, generally UO<sub>2</sub>.

**vapor pressure**—the pressure exerted by the vapor of a solid or liquid when in equilibrium with the solid or liquid.

**variance (sample)**—a measure of the dispersion of a set of results. Variance is the sum of the squares of the individual deviations from the sample mean divided by one less than the number of results involved. It may be expressed as

$$S^2 = \frac{\sum (x_i - \bar{x})^2}{n - 1} \quad (6)$$

**volumeter (powder)**—an apparatus for the measurement of the volume of a known mass of powder for the purpose of determining its density.

**volumetric**—chemical analysis based upon the reaction of a volume of standard solution with the material being analyzed.

**waste**—*in the nuclear industry*, any residue containing radioactive materials not currently considered useful or economically recoverable.

**working electrode (controlled-potential coulometry)**—the electrode in an electrochemical cell at which the chemical species of interest is quantitatively electrolyzed by controlling the potential of the electrode at a selected constant value.

**working reference material**—a reference material usually prepared by a single laboratory for its own use as a calibration standard, as a measurement control standard, or for the qualification of a measurement method.

**DISCUSSION**—Working reference material replaces the definitions for secondary standard and working standard.

*This standard is subject to revision at any time by the responsible technical committee and must be reviewed every five years and if not revised, either reapproved or withdrawn. Your comments are invited either for revision of this standard or for additional standards and should be addressed to ASTM Headquarters. Your comments will receive careful consideration at a meeting of the responsible technical committee, which you may attend. If you feel that your comments have not received a fair hearing you should make your views known to the ASTM Committee on Standards, 100 Barr Harbor Drive, West Conshohocken, PA 19428.*