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NUCLEAR MATERIALS*

**GLOSSARY OF TERMS USED IN
NUCLEAR ANALYTICAL CHEMISTRY**

Prepared for publication by

M. de BRUIN

Interuniversity Reactor Institute
2629 JB Delft, The Netherlands

Comments on these recommendations are welcome and should be sent within 8 months from August 1982 to the present Secretary of the Commission

Prof. E. A. SCHWEIKERT
Center for Trace Characterization
Texas A & M University
College Station, Texas 77843
USA

Comments from the viewpoint of languages other than English are especially encouraged. These may have special significance regarding the publication in various countries of translations of the nomenclature eventually approved by IUPAC.

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GLOSSARY OF TERMS USED IN NUCLEAR ANALYTICAL CHEMISTRY

This glossary lists close to 400 terms and definitions commonly used in radiochemistry, with emphasis on radioanalytical chemistry. Part of the definitions have been taken, sometimes with minor modifications, from existing glossaries of such organizations as the International Organization for Standardization and the International Electrotechnical Commission. In cases where no acceptable definition could be found, a new definition is proposed.

DIRECTIONS FOR USE

The terms are listed in alphabetical order. A term may consist of more than one word. The meanings of the different types of notation are as follows:

Carrier, isotopic. The term consists of two parts separated by a comma. This notation is used for terms in which the part after the comma normally precedes the part before the comma; the words are rearranged in order to facilitate the search. Both forms of these terms are listed in the glossary: 'Carrier, isotopic' and 'isotopic carrier'.

Geometry (,counting). The term consists of two parts, the second part, preceded by a comma, being placed between parentheses. This notation is used for terms which basically consist of the first part, which is sometimes preceded by the part between parentheses. Terms in this notation are listed only once.

Energy (of a radiation). The term consists of two parts, the second part being placed between parentheses. This notation is used for terms which basically consist of the first part which is sometimes followed by the part between parentheses.

THE GLOSSARY

Absolute counting. A measurement under such well-defined conditions that the *activity* of a sample can be derived directly from the observed *count rate*.

Absolute full energy peak efficiency. see: *full energy peak efficiency, absolute*

Absolute photopeak efficiency. see: *photopeak efficiency, absolute*

Absorbed dose. see: *dose, absorbed*

Absorber. A substance used to absorb energy from any type of *radiation*.

Absorption (,energy). A phenomenon in which *radiation* transfers to matter which it traverses some or all its energy.

Absorption coefficient (,energy). Of a substance, for a parallel beam of electromagnetic *radiation* of specified energy: the quantity μ in the expression $\mu \Delta x$ for the fraction of the energy removed by *absorption* in passing through a thin layer of thickness Δx of that substance. In general, a specification is added of the type of interaction in the energy absorption process (e.g. photoelectric, Compton, pair, total). For radiation consisting of charged *particles*, *stopping power* is preferred.

Note: A list of existing glossaries consulted during the preparation of these recommendations is given at the end.

Abundance, isotopic. The relative number of *atoms* of a particular *isotope* in a mixture of the isotopes of an element, expressed as a fraction of all the atoms of the element.

Abundance, natural isotopic. Of a specified *isotope* of an element, the *isotopic abundance* in the element as found in nature.

Accuracy. A quantity referring to the differences between the mean of a set of results or an individual result and the value which is accepted as the true or correct value for the quantity measured.

Activation. The process of inducing *radioactivity* by *irradiation*. In general, a specification is added of the type of incident *radiation* (e.g. nuclear, neutron, photon) or its energy (e.g. thermal, fast).

Activation analysis (,nuclear). A method of elemental analysis based on the measurement of characteristic *radiation* from *nuclides* formed directly or indirectly by *activation*. In general, a specification is added of the type of the incident *radiation* (e.g. neutron, photon) and its energy (e.g. thermal, fast).

Activation analysis, instrumental. A method of *activation analysis* in which element specificity is obtained by using appropriate *irradiation* conditions, *radiation* measurement techniques and mathematical techniques for the interpretation of the measurement results.

Activation analysis, non destructive. An *activation analysis* procedure in which after the *irradiation*, no chemical and physical operations are applied which cause a change of any properties of the sample.

Activity. The number of *nuclear decays* occurring in a given quantity of material in a small time interval, divided by that time interval.
Synonymous with: *disintegration rate*.

Activity concentration. For a specified *isotope*, the *activity* of a material divided by its volume.

Activity, specific. For a specified *isotope*, the *activity* of a material divided by its mass.

Alpha decay. *Radioactive decay* in which an *alpha particle* is emitted.

Alpha particle. A helium-4 *nucleus* emitted during a *nuclear transformation*.

Amplifier, biased linear pulse. A *pulse amplifier* which, within the limits of its normal operating characteristics, has a constant gain for that portion of an input pulse that exceeds the threshold value and that produces no output for pulses whose amplitude is below the threshold.

Amplifier, linear pulse. A pulse amplifier which, within the limits of its normal operating characteristics, delivers an output pulse of amplitude proportional to that of the input pulse.

Analog to digital converter (,pulse). A *pulse amplitude analyzer* which, for each pulse processed, produces an integer proportional to the height of that pulse.

Analytical quality control. Procedures which give insight in the *precision* and *accuracy* of analysis results.

Analytical radiochemistry. That part of analytical chemistry in which the application of *radioactivity* is an essential step in the analytical procedures.
Synonymous with: *radioanalytical chemistry*.

Annihilation. An interaction between a *particle* and its *antiparticle* in which they both disappear.

Annihilation radiation. *Radiation* resulting from *annihilation*.

Anti-Compton gamma-ray spectrometer. see: *spectrometer, anti-Compton gamma-ray*

Antiparticle. Of a given *particle*, a *particle* with the same rest mass, where the two can *annihilate*.

Artificial radioactivity. see: *induced radioactivity*

Atom. The smallest part of an element, with no net electric charge, which can enter into chemical combinations.

Atomic mass. Rest mass of an *atom* in its nuclear and atomic *ground state*.

Atomic mass, relative. The ratio of the mass per atom of an element, averaged over a specified nuclidic composition, to 1/12 of the mass of an atom of nuclide ^{12}C . The term atomic weight is also used for this quantity.

Atomic mass unit. A special unit of mass, equal to 1/12 of the rest mass of an *atom* of nuclide ^{12}C in its nuclear and atomic *ground state*.

Atomic number. Number of *protons* contained in a *nucleus*.
Synonymous with: *proton number*.

Attenuation. The reduction of a *radiation* quantity upon passage of radiation through matter resulting from interactions of the radiation with the matter it traverses.

Attenuation coefficient. Of a substance, for a parallel beam of specified *radiation*: the quantity μ in the expression $\mu\Delta x$ for the fraction removed by *attenuation* in passing through a thin layer of thickness Δx of that substance. According as Δx is expressed in terms of length, mass per unit area, moles or atoms per unit, μ is called respectively the linear, mass, molar, or atomic *attenuation coefficient*.

Auger effect. The emission of an *electron* from an *atom* accompanying the filling of a vacancy in an inner electron shell.

Auger electron. *Electron* originating in the *Auger effect*.

Auger yield. For a given excited state of a specified *atom*, the probability that the de-excitation occurs by the *Auger effect*.

Autoradiograph. A radiograph of an object containing *radioactive* substance, produced by itself when placed upon photographic plate or film.

Average life. The average life of an *atom* or *nuclear* system in a specified state. For an exponentially decaying system, it is the average time for the number of *atoms* or *nuclei* in a specified state to decrease by a factor e .
Synonymous with: *mean life*.

Background (of a device). The term employed to designate the value indicated by a *radiation* measuring device in the absence of the source whose radiation is to be measured, when the device is placed under its normal conditions of operation.

Background radiation. *Radiation* from any source other than the one it is desired to detect or measure.

Backscatter. Scattering of *radiation* in a generally backward direction. In the assay of *radioactivity*, it applies to the scattering of radiation into the radiation detector from any material except the sample and the *detector*.

Barn. A unit of area used in expressing nuclear *cross-sections*; 1 barn = 10^{-28}m^2 .

Becquerel. SI unit of *activity* equal to one *nuclear decay* per second (symbol Bq).

Beta decay. *Nuclear decay* in which a *beta particle* is emitted or in which orbital *electron capture* occurs.

Beta particle. A negative or positive *electron* which has been emitted by a nuclear *particle* in a *nuclear transformation*.

Biased linear pulse amplifier. see: *amplifier, biased linear pulse*

Biological half-life. For a substance the time required for the amount of that substance in a biological system to be reduced to one half of its value by biological processes, when the rate of removal is approximately exponential.

Branching decay. *Nuclear decay* which can proceed in two or more different ways.

Branching fraction. In *branching decay* the fraction of nuclei which decay in a specified way.

Branching ratio. The ratio of the *branching fractions* for two or more specified modes of decay.

Bremsstrahlung. The electromagnetic *radiation* associated with the acceleration of deceleration of charged *particles*.

Bremsstrahlung, inner. *Bremsstrahlung* which may accompany the emission or absorption of a charged *particle* by a *nucleus*.

Burn-up. Induced *nuclear transformation* of *atoms* during reactor operation.

Burn-up fraction. The fraction of an initial quantity of a given *nuclide* that has undergone *burn-up*.

Burn-up, specific. The total energy released through induced *nuclear transformations* divided by the mass of a nuclear fuel.

Capture. A process in which an atomic or nuclear system acquires an additional *particle*. In general a specification is added of the type of the captured particle or its energy.

Capture cross-section. The *cross-section* for *capture*.

Capture, electron. A *nuclear transformation* in which the nucleus captures an orbital *electron*. Often the shell, from which the electron is captured, is indicated. (K-, L-, etc.).

Capture gamma radiation. The *gamma radiation* emitted in *radiative capture*.

Capture, radiative. *Capture* of a *particle* by a *nucleus* followed by immediate emission of *gamma radiation*.

Carrier. A substance in appreciable amount which, when associated with a trace of a specified substance, will carry the trace with it through a chemical or physical process.

Carrier free. A preparation of a *radioactive isotope* which is free from stable isotopes of the element in question.

Carrier, hold back. A *carrier* used to prevent a particular species from following other species in a chemical operation.

Carrier, isotopic. A *carrier* which differs only in isotopic composition from the trace it has to carry.

Cerenkov detector. A charged *particle detector* based on the *Cerenkov effect*.

Cerenkov effect. Emission of *radiation* in the visible and ultraviolet spectrum arising when a charged *particle* crosses a medium with a velocity greater than that of light in the same medium.

Cerenkov radiation. *Radiation* resulting from the *Cerenkov effect*.

Chain fission yield. The fraction of *fissions* giving rise to *nuclei* of a *particle mass number*.

Characteristic X-radiation. *X-radiation* consisting of discrete wavelengths which are characteristic for the emitting element.

Chemical dosimeter. A dosimeter in which the *dose* is measured by observing the extent, under specified conditions, of a chemical reaction caused by the *ionizing radiation* to be measured.

Chemical isotope exchange. Exchange of *isotopes* between different types of molecules or ions in the course of a chemical reaction.

Chemical yield. The fraction of the amount of an element or chemical compound following a specified chemical reaction or separation.

Chemistry, nuclear. That part of chemistry which deals with the study of *nuclei* and nuclear reactions using chemical methods.

Chemistry, radiation. see: *radiation chemistry*

Coincidence, prompt. The occurrence of two or more events separated by a time interval which is less than a specified small value.

Coincidence circuit. An electronic circuit which produces a usable output pulse only when each of its inputs receives a pulse within a specified time interval.

Coincidence, delayed. The occurrence of two or more events separated by a short but measurable time interval.

Coincidence, true. A coincidence of events occurring in the same *atom* or in physically connected *atoms*.

Coincidence resolving time. The greatest time interval that can elapse between the occurrence of two or more consecutive signal pulses, in order that the measuring device processes them as a *coincidence*.

Collimation. The limiting of a beam of *radiation* to the required dimensions and angular spread.

Collimator. An arrangement of *absorbers* used for *collimation*.

Compton effect. The elastic scattering of a *photon* by an *electron* which afterwards occurs as a free electron. Part of the energy and momentum of the incident photon is transferred to the electron and the remaining part is carried away by the scattered photon.
Synonymous with: *Compton scattering*.

Compton electron. The energetic *electron* resulting from the Compton effect.

Conversion electron. *Electron* ejected from the *atom* in the process of *internal conversion*.

Conversion, internal. A transition between two energy states of a *nucleus* where the energy difference is given to an orbital *electron* which is thereby ejected from the *atom*.

Conversion coefficient, internal. For a transition between two specified energy levels of *nuclide*, the ratio of the *transition probabilities* for *internal conversion* and *gamma ray emission*.

Cooling, radioactive. Of a strongly *radioactive* material, the decrease of its *activity* by *nuclear decay*.

Count.

1. Information corresponding to a pulse processed for counting.
2. Number of pulses recorded during a measurement.

Counter tube. *Radiation detector* consisting of a gas-filled tube or valve whose gas amplification is much greater than one, and in which the individual ionizing events give rise to discrete electrical pulses. Often an expression is added indicating the geometry (e.g. end window), composition of the gas (e.g. helium) or the physical process essential for its operation (e.g. proton recoil, fission).

Counter tube, Geiger-Müller. A *counter tube* operated under such conditions that the magnitude of each pulse is independent of the amount of energy deposited in it.

Counter tube, proportional. A *counter tube* operated under such conditions that the magnitude of each pulse is proportional to the amount of energy deposited in it.

Counter, radiation. *Radiation* measuring assembly comprising a *radiation detector* in which individual ionizing events cause electrical pulses and the associated equipment for processing and counting the pulses. Often an expression is added indicating the type of the radiation detector (e.g. *scintillation*, *semiconductor*).

Counting efficiency. The ratio between the number of *particles* or *photons* counted with a *radiation counter* and the number of similar *particles* or *photons* emitted by the *radiation source*.

Counting loss. A reduction of the *counting rate* resulting from phenomena such as the *resolving time* or the *dead time*.

Counting rate. The number of *counts* occurring in unit time.

- Cross-section (,microscopic). A measure of the probability of a specified interaction or reaction between an incident *radiation* and a target *particle* or system of *particles*. It is the reaction rate per target *particle* for a specified process divided by the *flux density* of the incident *radiation*. In general, a specification is added of the type of radiation (e.g. *neutron, photon*), the energy of the incident radiation (e.g. *thermal, epithermal, fast*) and the type of interaction or reaction (e.g. *activation, fission, scattering*).
- Cross-section, activation. The *cross-section* for the formation of a *radionuclide* by a specified reaction.
- Cross-section, capture. The *cross-section* for capture.
- Cross-section, effective thermal. A fictitious *cross-section* for a specified reaction which, when multiplied by the *2200-metre-per-second flux density*, gives the correct reaction rate.
Synonymous with: *Westcott cross-section*.
- Cross-section, macroscopic. The *cross-section* per unit volume of a given material for a specified process. For a pure *nuclide*, it is the product of the *microscopic cross-section* and the number of target nuclei per unit volume, for a mixture of nuclides, it is the sum of such products.
- Cross-section, Westcott. see: *cross-section, effective thermal*
- Crystal diffraction spectrometer. see: *spectrometer, crystal diffraction*
- Cumulative fission yield. The fraction of *fissions* which have resulted in the production of a given *nuclide*, either directly or indirectly, up to a specified time. If no time is specified, the yield is considered to be the asymptotic value.
- Curie. A unit of *activity* equal to exactly 3.7×10^{10} *nuclear decays* per second or 3.7×10^{10} *Becquerel*.
- Cyclotron. A *particle* accelerator in which the particles travel in a succession of semicircular orbits of increasing radii under the influence of a magnetic field and are accelerated at the beginning of each such orbit by traversing an electric field produced by a high-frequency generator.
- Dating, radioactive. The determination of the *radioactive age* of an object from its content of *radioactive* substances and of their *daughter products*.
- Daughter product. Any *nuclide* which follows a specified *radionuclide* in a *decay chain*.
- Dead time. Constant and known value imposed on the *resolving time* by a *paralysis circuit*, usually in order to make the correction for *resolving time losses* more accurate.
- Dead time correction. Correction to be applied to the observed number of pulses in order to take into account the number of pulses lost during the *resolving* or *dead time*.
- Decay chain. A series of *nuclides* in which each member transforms into the next through *nuclear decay* until a stable *nuclide* has been formed.
Synonymous with: *radioactive chain* and *radioactive series*.
- Decay constant. For a *radionuclide*: the probability λ for the *nuclear decay* of one of its nuclei in unit time. It is given by $\lambda = -\frac{1}{N_t} \frac{dN}{dt}$, in which N_t is the number of nuclei of concern existing at time t .
Synonymous with: *disintegration constant*.
- Decay curve. A graph showing the relative amount of radioactive substance remaining after any time interval.
- Decay, radioactive. *Nuclear decay* in which *particles* or *gamma radiation* are emitted or the *nucleus* undergoes spontaneous *fission*.
- Decay, nuclear. A spontaneous *nuclear transformation*.
- Decay, scheme. A graphical representation of the energy levels of the members of a *decay chain* showing the way along which *nuclear decay* occurs.
- Detection efficiency. The ratio between the number of *particles* or *photons* detected and the number of similar particles or photons emitted by the *radiation source*.

Detector, $1/v$. A neutron *detector* for which the *cross-section* of the detection reaction varies inversely with neutron speed.

Detector, diffused junction semiconductor. A *semiconductor detector* in which the P-N or N-P junction is produced by diffusion of donor or acceptor impurities.

Detector efficiency (,intrinsic). The ratio of the number of *particles* or *photons* detected to the number of similar particles or photons which have struck the envelope limiting the sensitive volume of a *radiation detector*.

Detector, foil. see: *foil detector*

Detector, liquid scintillator. A *scintillator detector* of which the scintillating medium is a liquid. The sample is often dissolved in the scintillating liquid.

Detector, radiation. An apparatus or substance for the conversion of *radiation* energy to a form of energy which is suitable for indication and or measurement.

Detector, scintillation. see: *scintillation detector*

Detector, semiconductor. see: *semiconductor detector*

Diffused junction semiconductor detector. see: *semiconductor detector, diffused junction*

Discriminator. A basic function unit comprising an electronic circuit which gives an output pulse for each input pulse whose amplitude lies above a given threshold value.

Disintegration constant. see: *decay constant*

Disintegration, nuclear. *Nuclear decay* involving a splitting into more *nuclei* or the emission of *particles*.

Disintegration rate. see: *activity*

Dose. A general term denoting the quantity of *radiation* or energy absorbed. For special purposes, it must be appropriately qualified c.q. absorbed, maximum permissible, mean lethal.

Dose, absorbed. The energy imparted to matter by *ionizing radiation* in a suitable small element of volume divided by the mass of that element of volume.

Dose equivalent (,effective). The *absorbed dose* multiplied by the *quality factor* and the product of all other modifying factors N , aimed at expressing on a common scale, for different types of radiations and distributions of *absorbed dose*, the biological effects associated with an *exposure*.

Effective cadmium cut-off (energy). In a given experimental configuration, the energy value determined by the condition that the *detector* response would be unchanged if the cadmium cover surrounding the *detector* was replaced by a fictitious cover opaque to *neutrons* with energy below this value and transparent to *neutrons* with energy above this value.

Effective thermal cross-section. see: *cross-section, effective thermal*

Efficiency (of a counter). see: *counting efficiency*

Efficiency, intrinsic. see: *detector efficiency*

Effluent, radioactive. Any solid, liquid or gaseous *radioactive* waste material discharged from a system.

Elastic scattering. see: *scattering, elastic*

Electron. A stable *elementary particle* having an electric charge of $+1.60219 \times 10^{-19} \text{C}$ and a rest mass of $9.1095 \times 10^{-31} \text{kg}$. When used without specification the term means the negatively charged electron, which is also called the negaton. Its *anti-particle*, the positively charged electron, is called *positron*.

Electron capture. see: *capture, electron*

Electron, Compton. see: *Compton electron*

Electron, conversion. see: *conversion electron*

Elementary particle. see: *particle, elementary*

Energy (of a radiation). Energy of the individual *particles* or *photons* of which a *radiation* consists.

Energy dispersive X-ray fluorescence analysis. A method of *X-ray fluorescence analysis* where element specificity is obtained by measuring the *energy spectrum* of the induced *X-radiation*.

Energy flux density. see: *flux density, energy*

Energy resolution. A measure, at given energy, of the smallest difference between the energies of two *particles* or *photons* capable of being distinguished by a radiation spectrometer.

Energy threshold. The limiting kinetic energy of an incident *particle* or energy of an incident *photon* (both expressed in the laboratory system) below which a specified process cannot take place.

Enrichment. Any process by which the *isotopic abundance* of a specified *isotope* in a mixture of isotopes of an element is increased.

Enrichment factor. For a material enriched in a specified *isotope*, the ratio between the *isotopic abundance* and the *natural abundance* of that *isotope*.

Epicadmium neutrons. see: *neutrons, epicadmium*

Epithermal neutrons. see: *neutrons, epithermal*

Equilibrium, radioactive. Among the members of a *decay chain*, the state which prevails when the ratios between the *activities* of successive members remain constant.

Equilibrium, secular. Radioactive equilibrium where the *half life* of the *precursor isotope* is so long that the change of its *activity* can be ignored during the period of interest and all activities remain constant.

Escape peak, double. In a *gamma-ray spectrum*, the peak due to *pair production* in the *detector* and escape, from the sensitive part of the detector, of two *photons* of 511 keV resulting from *annihilation*.

Escape peak, single. In a *gamma-ray spectrum*, the peak due to *pair production* in the *detector* and escape, from the sensitive part of the detector, of one of the *photons* of 511 keV resulting from *annihilation*.

Escape peak, X-ray. In a *gamma* or *X-ray spectrum*, the peak due to the *photoelectric effect* in the *detector* and escape, from the sensitive part of the detector, of the *X-ray photon* emitted as a result of the *photoelectric effect*.

Excitation. Process causing the transition of a system from one state to another of higher energy.

Excitation energy. Minimum energy required to bring a system to a specified higher energy level.

Excited state. State of a system with energy higher than that of the *ground state*.

Exponention decay. Variation of a quantity (generally the *activity* of a quantity of a *radionuclide*) according to the law $A = A_0 e^{-\lambda t}$ where A and A_0 are the values of the quantity being considered at time t and zero respectively, and λ is an appropriate constant.

Exposure. For *X-* or *gamma radiation* in air: the sum of the electrical charges of all the *ions* of one sign produced when all *electrons* liberated by *photons* in a suitably small element of volume of air completely stopped, divided by the mass of the air in the volume element.

Extrapolated range. The distance from a *radiation source*, calculated by extrapolation to zero of the *flux density*, of the tangent to the *flux density* versus distance curve, taken at the point where the *flux density* has decreased to one half of its initial value.

Fall out, radioactive. The deposition on the ground of *radioactive* substances from nuclear explosions and other injections of *radioactive material* into the atmosphere.

Fast neutrons. see: *neutrons, fast*

Fertile.

1. Of a *nuclide*: capable of being transformed, directly or indirectly, into a *fissile nuclide* by *neutron capture*.
2. Of a material: containing one or more *fertile nuclides*.

Film badge. A package containing one or more small photographic films for approximate measurement of *radiation exposure*, used for the purpose of monitoring personnel.

Filter (of a radiation). Material interposed in the path of heterogeneous *radiation* to modify the spectral distribution of the *radiation*.

Fissile.

1. Of a *nuclide*: capable of undergoing *fission* by interaction with (slow) *neutrons*.
2. Of a material: containing one or more *fissile nuclides*.

Fission fragments. *Nuclei* resulting from *fission* and possessing kinetic energy acquired from the *fission* process.

Fission neutrons. see: *neutrons, fission*

Fission, nuclear. The division of a *nucleus* into two or more parts with masses of equal order of magnitude, usually accompanied by the emission of *neutrons, gamma radiation* and, rarely, small charged nuclear fragments.

Fission products. *Nuclides* produced by *fission* and the *daughter products* of these *nuclides*.

Fission, spontaneous. Nuclear *fission* which occurs without the addition of *particles* or energy to the *nucleus*.

Fission, thermal. *Fission* caused by *thermal neutrons*.

Fission yield. The fraction of *fissions* leading to *fission products* of a given type.

Fission yield, chain. The fraction of *fissions* giving rise to nuclei of particle *mass number*.

Fission yield, cumulative. The fraction of *fissions* which have resulted in the production of a *nuclide* either directly or indirectly, up to a specified time. If no time is specified, the yield is considered to be the asymptotic value.

Fission yield, direct. The fraction of *fissions* giving rise to a particular *nuclide* before any *nuclear decay* has occurred.

Fissionable. see: *fissile*

Fluorescence. *Luminescence* which occurs essentially only during *irradiation*.

Fluorescence yield. For a given *excited state* of a specified *atom*, the ratio of the number of excited *atoms* which emit a *photon* to the total number of excited states.

Flux density, energy. For mono-directional *radiation*, the energy traversing in a time interval a small area perpendicular to the direction of the energy flow, divided by that time interval and by that area.

Flux density, neutron. see: *flux density, particle*

Flux density, particle, photon. At a given point in space, the number of *particles* or *photons* incident in a time interval on a suitably small sphere centered at that point, divided by the cross-sectional area of that sphere and by that time interval. The *particle flux density* is identical with the product of the *particle density* and the average speed of the *particles*.

Flux density, 2200-metre-per-second. A fictitious *flux density* as the product of the total number of neutrons per cubic metre and a neutron speed of 2200 metres per second.

Flux depression. The lowering of the *particle flux density* in the neighborhood of a sample due to *absorption* of *particles* in the sample.

Flux monitor. A known amount of *activatable* material *irradiated* together with a sample; the *induced radioactivity* is used as a measure for a particular *flux density* during the *irradiation*.

- Flux perturbation. The lowering of the *flux density* in a sample as a result of both *flux depression* and *self shielding*. Sometimes a specified *flux density* can increase as a result of the change of the *energy* of the *particles* in the sample, e.g., the increase of the *thermal neutron flux density* in hydrogen containing material.
- Foil detector. A small piece of foil used to measure *flux densities* by *activation*.
- Fuel cycle. The sequence of steps, such as utilization, reprocessing, and refabrication, through which *nuclear fuel* may pass.
- Fuel element. The smallest structurally discrete part of a reactor which has fuel as its principal constituent.
- Fuel, nuclear. Material containing *fissile nuclides*, when placed in a reactor, enables a chain reaction to be achieved.
- Fuel reprocessing. The processing of *nuclear fuel*, after its use in a reactor, to remove *fission products* and recover *fissile* and *fertile* material.
- Full energy peak. Of a *spectrum of radiation*, the part of the spectral response curve corresponding to the total *absorption* in a detecting material of the energy of the detected *radiation*.
- Full energy peak efficiency, absolute. Of a *radiation spectrometer*, the *counting efficiency* when considering only the events recorded in the *full energy peak*.
- Full energy peak efficiency, intrinsic. The *detector efficiency* when considering only events where the total *energy of the radiation* is absorbed in the sensitive volume of the *detector*.
- Full width at half maximum. In a distribution curve comprising a single peak, the distance between the abscissa of the two points on the curve whose ordinates are half of the ordinate of the peak.
- Fusion, nuclear. The process in which *nuclei* undergo *nuclear fission reactions*.
- Fusion reaction, nuclear. A reaction between two light *nuclei* resulting in the production of a nuclear species heavier than either initial *nucleus*.
- Gamma cascade. Two or more different *gamma rays* emitted successively from one *nucleus* when it passes through one or more energy levels.
- Gamma quantum. A *photon* of *gamma radiation*.
- Gamma radiation. Electromagnetic *radiation* emitted in the process of *nuclear transformation* or *particle annihilation*.
- Gamma radiation, capture. see: *capture gamma radiation*
- Gamma-ray spectrometer. A measuring assembly for determining the energy *spectrum* of *gamma rays*.
- Gamma-ray spectrometer, Anti-Compton. A *gamma-ray spectrometer* in which the effect of the *Compton scattering* is at least partly compensated.
- Geiger-Müller counter tube. see: *counter tube, Geiger-Müller*
- Geiger-Müller region. The range of operating voltage of a *counter tube* in which each ionizing event gives rise to an output pulse having amplitude independent of the number of *ions* initially produced in the sensitive volume by that ionizing event.
- Geiger-Müller threshold. The minimum voltage necessary for a *counter tube* to operate in the *Geiger-Müller region*.
- Geometric attenuation. The reduction of a *radiation* quantity due to the effect only of the distance between the point of interest and the source, excluding the effect of any matter present.
- Geometry (,counting). A term used colloquially to signify the arrangement in space of the various components in an experiment, particularly the *source* and the *detector* in *radiation* measurements.

Geometry factor. The average solid angle in steradians at the source subtended by the aperture or sensitive volume of the *detector*, divided by 4π .

Glove box. An enclosure in which material may be manipulated in isolation from the operator's environment. This manipulation is effected by gauntlet gloves or flexible plastic devices fixed to ports in the walls of the box.

Gray. SI unit of *absorbed dose*; $1\text{ Gy} = 1\text{ J/kg}$.

Ground state. The state of lowest energy of a system.

Growth curve (of activity). Curve giving the *activity* of a *radioactive nuclide* as function of time and showing the increase of the *activity* through the *decay* of the parent substance or as a result of *activation*.

G-value. The number of specified chemical events in an irradiated substance produced per 100 eV of energy absorbed from *ionizing radiation*.

Half life, radioactive. For a single *radioactive decay* process, the time required for the *activity* to decrease to half its value by that process.

Half-thickness. The thickness of a specified substance which, when introduced into the path of a given beam of *radiation*, reduced the value of a specified radiation quantity by one half.

Half-value layer & Half-value thickness. see: *half-thickness*

Heavy water. Water containing a significant fraction (up to 100%) of deuterium in the form of D_2O or HDO .

Hold back carrier. see: *carrier, hold back*

Hot atom. An *atom* in an *excited energy state* or having kinetic energy above the ambient thermal level, usually as a result of nuclear processes.

Hot cell. A heavily shielded enclosure for highly *radioactive materials*. It may be used for their handling or processing by remote means or for their storage.

Induced radioactivity. *Radioactivity* induced by *irradiation*.

Inelastic scattering. *Scattering* in which the total kinetic energy changes.

Infinite source thickness. For a specified *radiation*, the minimum thickness of a flat preparation of a *radioactive material* where the *intensity* of the specified *radiation* at the surface does not increase when the thickness is increased by adding more of similar *radioactive material*.

Inner Bremsstrahlung. see: *Bremsstrahlung, inner*

Instrumental activation analysis. see: *activation analysis, instrumental*

Intensity of radiation. The energy per unit time entering a small sphere in a time interval, divided by the area of the great circle of the sphere and the time interval. For mono-direction *radiation*, this reduces to the *energy flux density*.

Intercomparison, analytical. A procedure which gives insight in the accuracy of results of analytical procedures by comparing the results obtained in the analyses of identical samples at different laboratories and preferably with different analytical methods.

Internal conversion. see: *conversion, internal*

Internal conversion coefficient. see: *conversion coefficient, internal*

Intrinsic efficiency. see: *efficiency, intrinsic*

Intrinsic full energy peak efficiency. see: *full energy peak efficiency, intrinsic*

Intrinsic photopeak efficiency. see: *photopeak efficiency, intrinsic*

Inverse square law. The intensity of *radiation* from a point source in free space is inversely proportional to the square of the distance from the source. Presence of *absorbers* necessitates corrections to this law.

Ion. A atomic or molecular *particle* having a net electric charge.

Ionization. The formation of *ions* by addition or removal of electrons from *atoms*, molecules, or groups of molecules or by the division of molecules.

Ionization chamber. A *radiation detector* which employs an electric field for the collection at the electrodes of charges associated with the *ions* produced in the sensitive volume by ionizing radiation, without charge multiplication. The solid angle (2π , 4π) subtended when using the detector, is sometimes specified.

Ionization energy. The minimum energy required to ionize an *atom* or a *molecule* which is originally in the *ground state*.

Ionizing radiation. Any *radiation* consisting of directly or indirectly ionizing *particles* or a mixture of both or *photons* with energy higher than the energy of photons of ultra violet light or a mixture of both such *particles* and *photons*.

Irradiation. Exposure to *ionizing radiation*.

Isobars, nuclear. *Nuclides* having the same *mass number* but different *atomic numbers*.

Isomeric state. An nuclear state having a *mean life* long enough to be observed.

Isomeric transition. A spontaneous transition between two *isomeric states* of a *nucleus*.

Isomers, nuclear. *Nuclides* having the same *mass number* and *atomic number*, but occupying different nuclear energy states.

Istones. *Nuclides* having the same *neutron number* but different *atomic numbers*.

Isotopes. *Nuclides* having the same *atomic number* but different *mass numbers*.

Isotope dilution. Mixing of a given *nuclide* with one or more of its *isotopes*.

Isotope dilution analysis. A method of quantitative analysis based on the measurement of the *isotopic abundance* of a *nuclide* after *isotopic dilution* with the sample to be analyzed.

Isotope dilution analysis, substoichiometric. A method of *isotope dilution analysis* in which the final *isotopic abundance* is estimated from the amount of the *nuclide* present in a well known quantity of the relevant element separated from the sample, where this quantity is smaller than the total amount of that element present in the sample.

Isotope exchange. The exchange of places between *isotopes* of *atoms* in different valency states, in different molecules or ions, or in different sites in the molecule or ion.

Isotopic separation. Operation for the purpose of modifying an *isotopic abundance* in a mixture of *isotopes*.

Isotopic abundance. see: *abundance, isotopic*

Isotopic tracer. see: *tracer, isotopic*

Label. A marker, *tag* or indicator distinguishable by the observer but not by the system and used to identify a *tracer*.

Labelled. Made identifiable by a *label*.
Synonymous with: *tagged*.

Linear electron accelerator. An evacuated metal tube in which *electrons* pass through a series of small gaps (usually in the form of cavity resonators in the high frequency range) so arranged and spaced that, at a specific excitation frequency, the stream of *electrons* on passing through successive gaps gains additional energy from the electric field in each gap.

Linear energy transfer. The average energy locally imparted to a medium by a charged *particle* of specified energy, per unit distance traversed.

Linear pulse amplifier. see: *pulse amplifier, linear*

Liquid scintillator counter. A *radiation counter* comprising a *liquid scintillator detector*.

Liquid scintillator detector. see: *detector, liquid scintillator*

- Live time. For a measurement, the time during which a *radiation* measuring assembly is capable of processing events occurring in the *radiation detector*. It equals the clock time minus the integrated *resolving* or *dead time*.
- Luminescence. A phenomenon in which the *absorption* of primary *radiation* by a substance gives rise to the emission of electromagnetic *radiation* characteristic for that substance.
- Manipulator. A hand-operated or -controlled device for remotely handling *radioactive materials*.
- Mean life, radioactive. The average lifetime of a *radioactive nuclide*.
- Mean linear range. see: *range, mean linear*
- Mean mass range. see: *range, mean mass*
- Measured spectrum. see: *spectrogram*
- Metastable state. An *isomeric state* in an energy state higher than the *ground state*.
- Moderation. Reduction of the *neutron* energy by *scattering* without appreciable *capture*.
- Moderator. A material used to reduce *neutron* energy by *moderation*.
- Monitor, flux. see: *flux monitor*
- Mono-energetic radiation. *Radiation* consisting of *particles* of a single kinetic energy or *photons* of a single energy.
- Mössbauer effect. Resonance *absorption* of *gamma radiation* by nuclei arranged in a crystal lattice in such a way that the recoil momentum is shared by many atoms.
- Multiplication neutron. The process in which a *neutron* produces on the average more than one *neutron* in a medium containing *fissile* material.
- Multichannel pulse height analyzer. see: *pulse height analyzer, multichannel*
- N. In dosimetry, the factor designed to take into account all parameters influencing a *dose equivalent*, except the *absorbed dose* and type and energy of the *radiation*.
- Natural isotopic abundance. see: *abundance, natural isotopic*
- Natural radioactivity. Radioactivity of naturally occurring *nuclides* in materials where the *isotopic abundance* of that *nuclide* is *natural*.
- Neutron activation. see: *activation*
- Neutron density. The number of free neutrons divided by the containing volume. Partial densities may be defined for neutrons characterized by such parameters as energy and directions.
- Neutron temperature. The temperature assigned to a population of *neutrons* when this population is approximated by a Maxwellian distribution.
- Neutrons, cold. *Neutrons* with a *neutron temperature* considerably lower than normal room temperature.
- Neutrons, delayed. *Neutrons* emitted by *fission products* formed by *nuclear decay* (the observed delay is due to the preceding *nuclear decay* or *decays*).
- Neutrons, epithermal. *Neutrons* of kinetic energy greater than the *effective cadmium cut-off*.
- Neutrons, epithermal. *Neutrons* of kinetic energy greater than that of thermal agitation. The term is often restricted to energies just above thermal.
- Neutrons, fast. *Neutrons* of kinetic energy greater than some specified value. This value may vary over a wide range and will be dependent upon the application, such as reactor physics, shielding or dosimetry.
- Neutrons, fission. *Neutrons* originating in the *fission* process which have retained their original energy.

Neutrons, intermediate. Neutrons of kinetic energy between the energies of *slow* and *fast neutrons*. In reactor physics, the range might be 1 eV to 0.1 MeV.

Neutrons, prompt. Neutrons accompanying the *fission* process without measureable delay.

Neutrons, resonance. Neutrons the energy of which corresponds to the *resonance energy* of a specified *nuclide* or *element*. If the *nuclide* is not specified, the term refers to *resonance neutrons* of ^{235}U .

Neutrons, slow. Neutrons of kinetic energy less than some specified value. This value may vary over a wide range and depends on the application. In reactor physics, the value is frequently chosen to be 1 eV; in dosimetry, the *effective cadmium cut-off* is used.

Neutrons, thermal. Neutrons in thermal equilibrium with the medium in which they exist.

Non-destructive activation analysis. see: *activation analysis* (*,nuclear*)

Nuclear activation analysis. see: *activation analysis* (*,nuclear*)

Nuclear chemistry. see: *chemistry*, *nuclear*

Nuclear fission. see: *fission*, *nuclear*

Nuclear fusion. see: *fusion*, *nuclear*

Nuclear isomers. see: *isomers*, *nuclear*

Nuclear level. One of the energy values at which a *nucleus* can exist for an appreciable time ($> 10^{-22}$ s).

Nuclear particle. see: *particle*, *nuclear*

Nuclear reactor. see: *reactor*, *nuclear*

Nuclear transformation. see: *transformation*, *nuclear*

Nuclear transition. see: *transition*, *nuclear*

Nucleon. A *proton* or a *neutron*.

Nucleon number. Number of *nucleons* in a *nucleus*.

Nucleus. The positively charged central portion of an *atom*, excluding the orbital *electrons*.

Nuclide. A species of *atom* characterized by its *mass number*, *atomic number*, and nuclear energy state, provided that the *mean life* in that state is long enough to be observable.

Nuclidic mass. The rest mass of a *nuclide* expressed in *atomic mass units*.

Pair attenuation coefficient. The *attenuation coefficient* when only the *pair production* process is taken into account.

Pair production. The simultaneous formation of an *electron* and a *positron* as a result of the interaction of a *photon* of sufficient energy (> 1.02 MeV) with the field of a *particle*.

Partial decay constant. For a *radionuclide*: the probability in unit time for the *decay* of one of its *nuclei* by one of several modes of *decay*.

Particle. A *nuclear* or an *elementary particle*.

Particle density. The number of *particles* divided by the containing volume.

Particle flux density. see: *flux density*, *particle*

Particle, nuclear. A *nucleus* or any of its constituents in any of their energy states.

Particle, elementary. A *particle* in which, at the present, no structure can be observed at moderate energies.

Peak analysis. The extraction of relevant peak parameters (i.e. position, area) from a *measured spectrum*.

Peak area method. A method of peak analysis in which a peak area is calculated by subtracting an estimate of the underlying continuum in a relevant part of a *measured spectrum*.

Peak fitting. A method of *peak analysis* in which a relevant part of a spectrum is fitted with a theoretical response function.

Photoelectric attenuation coefficient. The *attenuation coefficient* when only the photoelectric process is taken into account.

Photoelectric effect. The complete *absorption* of a *photon* by an *atom* with the emission of an orbital *electron*.
Synonymous with: *Photo effect*.

Photoelectric peak. Of a spectrum of *gamma radiation*, the part of the spectral response curve corresponding to the *absorption* in the *radiation detector* by the *photoelectric effect* of the detected gamma energy. In most cases the peak also contains events caused by multiple processes and use of the expressions *total absorption peak* or *full energy peak* is to be preferred.
Synonymous with: *photopeak*.

Photon. A quantum of electromagnetic *radiation*.

Photon activation. see: *activation*

Photomultiplier tube. A vacuum tube or valve containing a photosensitive layer which serves as the cathode for an electron multiplier.

Photopeak. see: *photoelectric peak*

Photopeak efficiency, absolute. Of a *gamma-ray spectrometer*, the *counting efficiency* when only considering the events recorded in the *photopeak*.

Photopeak efficiency, intrinsic. The *detector efficiency* when only considering counts resulting from the *photoelectric effect*.

File-up. The processing by a *radiation spectrometer* of pulses resulting from the simultaneous *absorption* of independent *particles* or *photons* in a *radiation detector*. As a result they are counted as one single *particle* or *photon* with energy between the individual energies and the sum of these energies.

P.I.N. semiconductor detector. see: *semiconductor detector, P.I.N.*

Positron. A positively charged *electron*.

Precision. A measure for the reproducibility of measurements within a set, that is, of the scatter or dispersion of a set about its central value.

Precursor. Of a *nuclide*, any *radioactive nuclide* which precedes that *nuclide* in a *decay chain*.

Proportional counter tube. see: *counter tube, proportional*

Proton number. see: *atomic number*

Pulse amplitude analyzer. A sub-assembly for determining this distribution function of a set of pulse in terms of their amplitude.
Synonymous with: *pulse height analyzer*.

Pulse amplitude selector. A circuit which gives an output pulse for each input pulse whose amplitude lies within a chosen interval.
Synonymous with: *single channel pulse height analyzer*

Pulse height analyzer. see: *pulse amplitude analyzer*

Pulse height analyzer, multi-channel. A *pulse amplitude analyzer* which includes a storage function to record the number of pulses received per channel.

Pulse height analyzer, single channel. see: *pulse amplitude selector*

Purity, isotopic. see: *abundance, isotopic*

Purity, radionuclidic. Of a material, that fraction of the total *activity* which is present in the form of the stated *radionuclide* (including its *daughter products*).

Purity, radiochemical. For a material, the fraction of the stated *isotope* present in the stated chemical form.

Quality factor. The *linear-energy-transfer*-dependent factor by which *absorbed dose* is multiplied to obtain *dose equivalent*.

Quenching. The process of inhibiting continuous or multiple discharges following a single ionizing event in certain types of *radiation detectors*, particularly in *Geiger-Müller counter tubes*.

Rabbit. A small container propelled pneumatically or hydraulically through a tube leading from the laboratory to a location in a *nuclear reactor* or other device where *irradiation* of a sample can take place.

Rad. A unit of *absorbed dose*. $1 \text{ rad} = 10^{-2} \text{ J/kg}$.

Radiation. A term embracing electromagnetic waves as well as fast moving *particles*.

Radiation, annihilation. see: *annihilation radiation*

Radiation, background. see: *background radiation*

Radiation, Cerenkov. see: *Cerenkov radiation*

Radiation chemistry. That part of chemistry which deals with the chemical effects of *ionizing radiation*, as distinguished from photochemistry associated with visible and ultraviolet electromagnetic radiation.

Radiation counter. see: *counter, radiation*

Radiation detector. see: *detector, radiation*

Radiation hazard. Hazard that exists in a region where there is a *radiation* field, other than what is considered to be normal *background radiation*.

Radiation, ionizing. see: *ionizing radiation*

Radiation, mono-energetic. see: *mono-energetic radiation*

Radiation, natural. *Radiation* originating from *natural radioactivity*.

Radiation source. An apparatus or material emitting or capable of emitting *ionizing radiation*.

Radiation spectrum. The components of *radiation* arranged in order of their wavelengths, frequencies or quantum energies. For *particle radiation* they are arranged in order of their kinetic energies.

Radiative capture. see: *capture, radiative*

Radioactive age. Of an object, the time, estimated from measurement of the isotopic composition, during which the content of a radioactive species within that object has remained unchanged except for *nuclear decay*.

Radioactive chain. see: *decay chain*

Radioactive contamination. A *radioactive* substance in a material or place where it is undesirable.

Radioactive dating. see: *dating, radioactive*

Radioactive decay. see: *decay, radioactive*

Radioactive equilibrium. see: *equilibrium, radioactive*

Radioactive fall out. see: *fall out, radioactive*

Radioactive half-life. see: *half-life, radioactive*

Radioactive series. see: *decay chain*

Radioactive source. Any quantity of radioactive material which is intended for use as a source of *ionizing radiation*.

Radioactive tracer. A *tracer* containing a *radioactive label*.

Radioactive waste. Unwanted *radioactive materials* obtained in the processing or handling of *radioactive materials*.

Radioactivity. The property of certain *nuclides* of showing *radioactive decay*.

Radioactivity, artificial. see: *induced radioactivity*

Radioactivity, induced. see: *induced radioactivity*

Radioactivity, natural. see: *natural radioactivity*

Radioanalytical chemistry. see: *analytical radiochemistry*

Radiochemical purification. Chemical separation applied to a *radioactive preparation* in order to improve the *radiochemical purity*.

Radiochemical purity. see: *purity, radiochemical*

Radiochemical separation. Separation by a chemical means of the *radioactive isotopes* of (a) specified element(s) from a mixture of *isotopes*.

Radiochemical yield. For the *isotopes* of a specified element, the yield of a *radiochemical separation*, expressed as a fraction of the *activity* originally present.

Radiochemistry. That part of chemistry which deals with *radioactive materials*. It includes the production of *radionuclides* and their compounds by processing *irradiation* or naturally occurring *radioactive materials*, the application of chemical techniques to nuclear studies, and the application of *radioactivity* to the investigation of chemical problems.

Radiochromatograph. A measuring assembly designed to measure the spatial or time distribution of the *activity* of a mixture of *radioactive components* after separation by a chromatographic method.

Radiocolloid. A colloid in which some *atoms* are *radioactive*.

Radioisotope. A *radioactive isotope* of a specified element.

Radiolysis. The chemical decomposition of materials by *ionizing radiation*.

Radionuclidic purity. see: *purity, radionuclidic*

Random coincidence. A coincidence of events occurring in not physically connected *nuclei*.

Range, extrapolated. see: *extrapolated range*

Range, mean linear. In a given material, for specified charged *particles* of a specified energy, the average displacement of the *particles* before they stop.

Range, mean mass. The *mean linear range* multiplied by the mass density of the material.

Ratemeter. An electronic sub-assembly which gives a continuous indication proportional to the average counting rate over a predetermined time interval (time constant).

Reactor, nuclear. A device in which a self-sustaining *nuclear fission* chain reaction can be maintained and controlled. The term is sometimes applied to a device in which a *nuclear fusion reaction* can be produced and controlled.

Recoil. The motion acquired by a *particle* through a collision with or the emission of another *particle* or electromagnetic *radiation*.

Reference material. A homogeneous material, available in sufficient amounts, which can be used for comparing analysis results obtained at different laboratories and/or with different techniques.

Relative atomic mass. see: *atomic mass, relative*

Relative counting. A measurement in which the *activity* of a sample is derived from the ratio between the *count rates* observed for the sample and for a source of known *activity*.

Relative biological effectiveness. The ratio of the appropriate value of the biological effectiveness of the radiation in question to that of *X-radiation* with an average *specific ionization* of 100 ion pairs per micron of water, for the particular biological effect under consideration and for the condition under which the radiation is received.

Rem. A unit of dose *equivalent*. $1 \text{ Rem} = 10^{-2} \text{ J/kg}$.

Resolving power. The central position of the response curve of a spectrometer of monoenergetic *radiation* divided by the width at one half of its height. Sometimes the width at 1/e-th of its height, sometimes the inverse of the above definition is used.

Resolving time. The smallest time interval which must elapse between the occurrence of two consecutive *ionizing* events or signal pulses, in order that the measuring device be capable of fulfilling its function of each of them separately.

Resolving time, coincidence. see: *coincidence resolving time*

Resolving time correction. Correction to be applied to the observed number of pulses in order to take into account the number of pulses lost during the *resolving time*.

Retention. Of atoms undergoing a *nuclear transformation*, that fraction which remains in or reverts to its initial chemical form.

Roentgen. A unit of *exposure*. $1 \text{ R} = 2.58 \times 10^{-4} \text{ C/kg}$.

Resonance energy. The energy of a *particle* entering a nuclear reaction, this energy being just sufficiently high to lead to the formation of reaction products in one of their *excited states*.

Saturation. Of an irradiated element for a specified *isotope*, the steady state reached when the *disintegration rate* of the *nuclide* formed is equal to its production rate.

Saturation activity. For a specified *isotope*, the value of the *activity* of an irradiated element, when a state of *saturation* is reached.

Scaler. A sub-assembly for counting electrical pulses and containing one or more *scaling circuits*.

Scaling circuit. An electronic circuit which produces an output pulse for each time a specified number of pulses has been received at its input.

Scattering. A process in which a change in direction or *energy* of an incident *radiation* is caused by interaction with a *particle*, a system of *particles*, or a *photon*.

Scattering, Compton. see: *Compton effect*

Scattering, elastic. *Scattering* in which the total kinetic energy is unchanged.

Scattering, inelastic. *Scattering* in which the total kinetic energy changes.

Scavenging.

In *radiation chemistry*: binding radicals or free *electrons* with a *scavenger*.

In *radiochemistry*: the use of a precipitate to remove from solution by *absorption* or coprecipitation, a large fraction of one or more *radionuclides*.

Scavenger. A reagent used for *scavenging*.

Scintillation. Burst of *luminescence* of short duration caused by an individual high-energy *particle*.

Scintillation counter. *Radiation counter* incorporating a *scintillation detector*.

Scintillation detector. A *radiation detector* using a medium in which a burst of *luminescence radiation* is produced along the path of an *ionizing particle*.

Scintillation spectrometer. A measuring assembly incorporating a *scintillation detector* and a *pulse amplitude analyzer*, used for determining the *energy spectrum* of certain types of *radiation*.

Scintillator. A finite quantity of *scintillating material* intended to be the element sensitive to *radiation* in a *scintillation detector*.

Scintillating material. Any substance constituting an appropriate medium for the detection of radiation by means of the *scintillation* phenomenon.

Secondary radiation. Radiation emitted by any matter irradiated with electromagnetic or *ionizing radiation*.

Secular equilibrium. see: *equilibrium, secular*

Self-absorption. The *absorption* of radiation by the emitter.

Self-absorption factor. Of a radiation source, the ratio between a quantity of the radiation emitted by the source and this quantity of the radiation as produced by the *radioactive nuclei* present in the source.

Synonymous with: *source efficiency*.

Self shielding. The lowering of the *flux density* in the inner part of a sample due to *absorption* in the outer layers of the sample.

Semiconductor. Material whose conductivity, due to charges of both signs, is normally in the range between that of metals and insulators and in which the electric charge carrier density can be changed by external means.

Semiconductor detector. Radiation detector using a *semiconductor* in which free electric charges are produced along the path of an *ionizing particle*.

Semiconductor detector, diffused junction. A *semiconductor detector* in which the P-N or N-P junction is produced by diffusion of donor or acceptor impurities.

Semiconductor detector, P.I.N. A *semiconductor detector* consisting of a compensated region between a P and a N region. The compensated region is often referred to as 'intrinsic'.

Semiconductor detector, surface barrier. A *semiconductor detector* utilizing a junction due to a surface inversion layer.

Sensitive volume of a detector. That part of a radiation detector from which an output signal could originate.

Sievert. Unit of *dose equivalent*. 1 Sv = 1 J/kg.

Single channel pulse height analyzer. see: *pulse height analyzer*

Specific burn-up. see: *burn-up, specific*

Source efficiency. see: *self-absorption factor*

Specific activity. see: *activity, specific*

Specific ionization. The number of ion pairs formed per unit distance along the track of an *ionizing particle* passing through matter.

Spectrometer, alpha (beta, gamma-ray). A measuring assembly incorporating a radiation detector and a *pulse amplitude analyzer*, used for determining the energy spectrum of alpha (beta, gamma) radiation.

Spectrometer, anti-Compton gamma-ray. see: *gamma-ray spectrometer, anti-Compton*

Spectrometer, crystal diffraction. A *spectrometer*, in which diffraction by a crystal is used to obtain the energy spectra of electromagnetic radiation as well as of *slow neutrons*.

Spectrometer, scintillation. see: *scintillation spectrometer*

Spectrum analysis. The interpretation of the information present in an energy spectrum in terms of radiation energy and intensity.

Spectrum. see: *radiation spectrum*

Spectrum, measured. see: *spectrogram*

Spectrogram. A spectrum as recorded by a *spectrometer*.

Spontaneous fission. see: *fission, spontaneous*

Standard material. A *reference material* for which, for specified element concentrations, values are recommended by some official body. These values should be based on the consistent results obtained by using independent analytical techniques.

Standard reference material. Term exclusively used for a *standard material* issued by the National Bureau of Standards.

Stopping power. Of a substance, for charged *particles* of specified energy, the average energy loss in passing through a thin layer of that substance, divided by the thickness of that layer.

Surface barrier semiconductor detector. see: *semiconductor detector, surface barrier*

Szilard-Chalmers effect. The rupture of the chemical bond between an *atom* and a molecule of which the *atom* is a part, as a result of a *nuclear reaction* of that *atom*.

Tagged. see: *labelled*

Thermal column. A large body of *moderator*, adjacent to or inside a *reactor* to provide *thermal neutrons* for experiments.

Thermal fission. see: *fission, thermal*

Threshold energy. see: *energy, threshold*

Total absorption peak. see: *full energy peak*

Tracer. *Labelled* members of a population used to measure certain properties of that population.

Tracer, isotopic. A *tracer* which only differs in isotopic composition of the substance to be traced.

Track (,nuclear). Of an *ionizing particle*, its path as revealed by a *track detector*.

Track detector (,nuclear). A *detector* which makes the paths of *ionizing particles* visible, either directly (e.g. cloud chamber) or after suitable treatment (photographic emulsion, polymers).

Transformation, nuclear. The change of one *nuclide* into another with a different *proton number* or *nucleon number*.

Transition, nuclear. For a *nucleus* a change from one quantized energy state into another or a *nuclear transformation*.

Transition, isomeric. see: *isomeric transition*

Titration, radiometric. Titration with a *radioactive* reagent where the observed *activity* is used to indicate the equivalence point.

Westcott cross-section. see: *cross-section, effective thermal*

X-radiation, characteristic. see: *characteristic X-radiation*

X-ray fluorescence analysis. A method of analysis based on the measurement of the energies and intensities of *characteristic X-radiation* emitted by a sample during *irradiation*.

X-ray fluorescence analysis, energy dispersive. A method of *X-ray fluorescence analysis* involving the measurement of the *energy spectrum* of the emitted *radiation*.

X-ray fluorescence analysis, wavelength dispersive. A method of *X-ray fluorescence analysis* involving the measurement of the *wavelength spectrum* of the emitted *radiation*.

X-ray fluorescence. The emission of *X-ray radiation* by an *atom* as a result of the interaction of *radiation* with its orbital *electrons*.

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