

Chambers Science and Technology Dictionary

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electron affinity

chemical properties of the atom. Electrons also exist independently and are responsible for many electric effects in materials. Due to their small mass, the wave properties and relativistic effects of electrons are marked. The *positron*, the antiparticle of the electron, is an equivalent particle but with a positive charge. Either electrons or positrons may be emitted in β -decay. Electrons, muons, and neutrinos form a group of fundamental particles called *leptons*.

electron affinity (*Chem.*). The energy required to remove an electron from a negatively charged ion to form a neutral atom.

electron affinity (*Electronics*). (1) Tendency of certain substances, notably oxidizing agents, to capture an electron. (2) See *work function*.

electron attachment (*Phys.*). Formation of negative ion by attachment of free electron to neutral atom or molecule.

electron beam (*Electronics*). A stream of electrons moving with the same velocity and direction in neighbouring paths and usually emitted from a single source such as a cathode.

electron-beam analysis (*Eng.*). Scanning a microbeam of electrons over a surface *in vacuo* and analysing the secondary emissions to determine the distribution of selected elements.

electron beam valve (tube) (*Electronics*). One in which several electrodes control one or more electron beams.

electron-beam welding (*Eng.*). Heating components to be welded by a concentrated beam of high-velocity electrons *in vacuo*.

electron binding energy (*Phys.*). Same as *ionization potential*.

electron camera (*Image Tech.*). Generic term for a device which converts an optical image into a corresponding electric current directly by electronic means, without the intervention of mechanical scanning.

electron capture (*Phys.*). That of shell electron (K or L) by the nucleus of its own atom, decreasing the atomic number of the atom without change of mass. The capture is accompanied by the emission of *neutrino*.

electron charge/mass ratio (*Electronics*). A fundamental physical constant, the mass being the rest mass of the electron: $e/m = 1.759 \times 10^{11} \text{ C kg}^{-1}$.

electron cloud (*Chem.*). (1) The density of electrons in a volume of space, as the position and velocity of an electron cannot be simultaneously specified. (2) The nature of the valence electrons in a metal, where their non-attachment to specific nuclei gives rise to electronic conduction.

electron conduction (*Electronics*). That which arises from the drift of free electrons in metallic conductors when an electric field is applied. See *n-type* and *p-type semiconductor*.

electron coupling (*Electronics*). That between two circuits, due to an electron stream controlled by the one circuit influencing the other circuit. Such coupling tends to be unidirectional, the second circuit having little influence on the first.

electron-deficient (*Chem.*). A substance which does not have enough valence electrons to form 'normal' chemical bonds. Usually, the term is used for the compounds of boron, but all metallic bonding is of this type.

electron density (*Phys.*). The number of electrons per gram of a material. Approx. 3×10^{23} for most light elements. In an ionized gas the equivalent electron density is the product of the ionic density and the ratio of the mass of an electron to that of a gas ion.

electron device (*Electronics*). One which depends on the conduction of electrons through a vacuum, gas or semiconductor.

electron diffraction (*Electronics*). Investigation of crystal structure by the patterns obtained on a screen from electrons diffracted from the surface of crystals or as a result of transmission through thin metal films.

electron discharge (*Electronics*). Current produced by the passage of electrons through otherwise empty space.

electron-discharge tube (*Electronics*). Highly-evacuated

electronic flash

tube containing two or more electrodes between which electrons pass.

electron dispersion curve (*Phys.*). A curve showing the electron energy as a function of the wave vector under the influence of the periodic potential of a crystal lattice. Experiments and calculations which determine such curves give important information about the energy gaps, the electron velocities and the density of states.

electron drift (*Electronics*). The actual transfer of electrons in a conductor as distinct from energy transfer arising from encounters between neighbouring electrons.

electronegative (*Phys.*). Carrying a negative charge of electricity. Tending to form negative ions, i.e., having a relatively positive electrode potential.

electronegativity (*Chem.*). The relative ability of an atom to retain or gain electrons. There are several definitions, and the term is not quantitative. It is, however, useful in predicting the strengths and the polarities of bonds, both of which are greater when there is a significant electronegativity difference between the atoms forming the bond. On the commonly used scale of Pauling, the range of values is from less than 1 (alkali metals) to 4 (fluorine).

electron-electron scattering (*Phys.*). A possible process that contributes to the electrical resistivity of metals. Important at low temperatures in transition metals.

electron emission (*Electronics*). The liberation of electrons from a surface.

electron gas (*Electronics*). The 'atmosphere' of free electrons in *vacuo*, in a gas or in a conducting solid. The laws obeyed by an electron gas are governed by Fermi-Dirac statistics, unlike ordinary gases to which Maxwell-Boltzmann statistics apply.

electron gun (*Electronics*). Assembly of electrodes in a cathode-ray tube which produces the electron beam, comprising a cathode from which electrons are emitted, an apertured anode, and one or more focusing diaphragms and cylinders.

electronic (*Genrl.*). Pertaining to devices or systems which depend on the flow of electrons; the term covers most branches of electrical science other than electric power generation and distribution. Telecommunications, radar, and computers all use electronic components and techniques. Electronic engineering is a field which encompasses the application of electronic devices, as opposed to physical electronics which is the study of electronic phenomena in vacuum, in gases, or in solids.

electronic charge (*Phys.*). The unit in which all nuclear charges are expressed. It is equal to 1.602×10^{-19} coulombs.

electronic configuration (*Chem.*). The descriptions of the electrons of an atom or a molecule in terms of orbitals.

electronic control (*Elec. Eng.*). Method of control which is based on the use of electronic circuits, suitable transducers and actuators where necessary. Modern examples often incorporate programmable units for both accuracy and flexibility. Applications are widespread, e.g. other circuits, instruments, machinery etc.

electronic counter measures (*Telecomm.*). An offensive or defensive tactic using electronic systems and reflectors to impair the effectiveness of enemy guidance, surveillance or navigational equipment which depend on electromagnetic signals. Also *electronic warfare*, *EW*. Abbrev. *ECM*.

electronic engineering (*Electronics*). See *electronic*.

electronic engraving (*Print.*). The making of plates direct from the copy without the use of the camera or the etching bath. As the copy is scanned the plates are engraved. Some models produce sets of colour plates, applying the necessary colour correction electronically.

electronic flash (*Electronics*). Battery or mains device which charges a capacitor, the latter discharging through a tube containing neon or xenon when triggered. Used for photography and stroboscopy.

electronic flash (*Image Tech.*). A source of very brief illumination provided by a high-voltage discharge between electrodes in an envelope containing a rare gas, such as xenon. It may be used repeatedly.

hanging indentation

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hard-gloss paint

hanging indentation (*Print.*). Layout in which the first line of the paragraph is set *full-out* and the succeeding lines are indented one em or more, as employed in this dictionary.

hanging post (*Build.*). See **hingeing post**.

hangings (*Build.*). A term applied to materials such as wallpaper, used as wall coverings.

hanging sash (*Build.*). A sash arranged to slide in vertical grooves, and counterweighted so as to be balanced in all positions.

hanging steps (*Build.*). Steps which are built into a wall at one end and are unsupported at the other end. Also known as *cantilevered steps*.

hanging stile (*Build.*). That stile of a door to which the hinges are secured.

hanging valley (*Geol.*). A tributary valley not graded to the main valley. It is a product of large-scale glaciation and due to the glacial overdeepening of the main valley relative to the hanging valley. The two valleys are connected by rapids or waterfalls.

hanging wall (*Min.Ext.*). Rock above the miner's head, usually the country rock above the deposit being worked.

hang-over (*Telecomm.*). (1) The delay in restoration of speech-activated switches, as in the **vodas**, to ensure the non-clipping of weak final consonants of words. (2) Excessive prolongation of any *on-off* type of signal or current or voltage pulse.

hang-up (*Eng.*). See **hanging**.

hank (*Textiles*). A general term for a reeled length of yarn.

Hankel functions of the first and second kind (*Maths.*). See **Bessel functions** (of the third kind).

hapanthous (*Bot.*). See **hapaxanthic**.

hapaxanthic (*Bot.*). Flowering and fruiting once and then dying. See also **monocarpic**.

haplo- (*Genl.*). Prefix from Gk. *haploos*, single, simple.

haplobiont (*Bot.*). A plant which has only one kind of individual or form in its life-history. adj. **haplobiontic**.

haplodiploidy (*Zool.*). A means of sex determination where females develop from fertilized eggs and are therefore diploid and the males from unfertilized eggs and are haploid, e.g. Honeybees.

haplodont (*Zool.*). Having molars with simple crowns.

haploid (*Biol.*). Of the reduced number of chromosomes characteristic of the germ cells of a species, equal to half the number in the somatic cells. Cf. **diploid**.

haploidization (*Bot.*). In the **parasexual cycle** of fungi, the progressive loss of chromosomes from the diploid set by occasional non-disjunction until stable haploid nuclei are formed.

haplont (*Bot.*). Organism in which only the gametes are haploid, meiosis occurring at their formation and the vegetative cells being diploid. Cf. **diplont**.

haplophase (*Biol.*). The period in the life-cycle of any organism when the nuclei are haploid. Cf. **diplophase**.

haplostele (*Bot.*). A protosteles in which the solid central core of xylem is circular in cross-section.

haplostemonous (*Bot.*). Having a single whorl of stamens. Cf. **diplostemonous**.

haplotype (*Biol.*). A particular set of *alleles* at several very closely linked loci.

haploxylic (*Bot.*). Said of a leaf containing one vascular strand.

haptén (*Immun.*). A substance which can combine with antibody but cannot itself initiate an immune response unless it is attached to a carrier molecule. Most haptens are small molecules (e.g. dinitrophenyl). Haptens are often conjugated chemically to carrier proteins for experimental purposes, since they provide easily recognized antigenic determinants.

hapteron (*Bot.*). A holdfast, i.e. a unicellular or multicellular organ attaching a plant to the substrate.

haptoneuma (*Bot.*). Appendage arising between the flagella of the motile cells of the Haptophyceae sometimes serving for temporary attachment to a surface.

Haptophyceae (*Bot.*). *Prymnesiophyceae*. Class of eukaryotic algae, flagellated and palmelloid sorts (often interconvertible). Motile cells usually with 2 equal,

smooth, flagella and a **haptoneuma**. Some sorts or stages bear **coccoliths**. Mostly phototrophic, some heterotrophic (both osmotrophic and phagotrophic). Mostly marine.

haptotropism (*Bot.*). *Thigmotropism*. A **tropism** like that of a tendril coiling round its support in which differential growth is determined by touch.

hard (*Electronics*). Adjective, synonymous with **high-vacuum**, which differentiates thermionic vacuum valves from gas-discharge tubes.

hard (*Glass*). Having a relatively high softening point.

hard (*Hyd.Eng.*). A layer of gravel or similar materials put down on swampy or sodden ground to provide a way for passage on foot.

hard and soft acids and bases (*Chem.*). A terminology used with Lewis acids and bases to indicate non-polarizable (hard) or polarizable (soft). In general, hard-hard and soft-soft interactions are stronger than hard-soft ones.

hard bast (*Bot.*). Sclerenchyma present in phloem.

hardboard (*Build.*). Fibre-board that has been compressed in drying, giving a material of greater density than **insulating board**.

hard bronze (*Eng.*). Copper-based alloy used for tough or dense castings; based of 88% copper plus tin with either some lead or zinc.

hard copy (*Comp.*). Computer output printed on paper.

hard core (*Build.,Civ.Eng.*). Lumps of broken brick, hard natural stone etc. used to form the basis of a foundation for road or paving or floors to a building.

hard disk (*Comp.*). Rigid magnetic disk. It normally allows a higher recording density than a floppy disk thus providing more storage for the same physical dimensions. May be stacked as **platters**. See **disk pack**.

hard drawn (*Eng.*). Term applied to wire or tube which has been greatly reduced in cross-section without annealing.

hardenability (*Eng.*). The response of a metal to quenching for the purpose of hardening, measured, most commonly, by the **Jominy (end quench) test**.

hardener (*Image Tech.*). Chemical (formalin, acrolein, chrome alum etc.) added to the fixing bath to toughen the emulsion of a film.

hardener (*Plastics*). An **accelerator**.

hardening (*Bot.*). Increasing resistance to cold as temperatures are gradually lowered either naturally or as the result of horticultural practice. Analogous hardening to drought, heat, wind etc. occurs.

hardening (*Eng.*). The process of making steel hard by cooling from above the critical range at a rate that prevents the formation of ferrite and pearlite and results in the formation of martensite. May involve cooling in water, oil or air, according to composition and size of article.

hardening media (*Eng.*). Liquids into which steel is plunged in hardening. They include cold water containing sodium chloride or hydroxide to increase the cooling power.

hardening of oils (*Chem.*). The hydrogenation of oils in the presence of a catalyst, usually finely divided nickel, in which the unsaturated acids are transformed into saturated acids, with the result that the glycerides of the unsaturated acids become hard. This process is of great importance for the foodstuffs industries, e.g. margarine is prepared in this way.

Harder's glands (*Zool.*). In most of the higher Vertebrates, an accumulation of small glands near the inner angle of the eye, closely resembling the lacrimal gland.

hard-facing (*Eng.*). (1) The application of a surface layer of hard material to impart, in particular, wear resistance. (2) A surface so formed. The composition is generally of high melting-point metals, carbides etc., applied by powder, wire or plasma arc spraying, or by welding.

hard glass (*Chem.*). Borosilicate glass, whose hardness is principally due to boron compounds. Resistant to heat and to chemical action.

hard-gloss paint (*Build.*). A popular class of paint that dries hard with a high gloss. It always contains some hard resin in the medium.