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GLOSSARY

Activated Carbon

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Glossary – Activated Carbon

Abrasion resistance

The property of a particle to resist attrition or wearing away by friction.

Absorption

A process in which fluid molecules are taken up by a liquid or solid and distributed throughout the body of that liquid or solid.

Accelerated adsorption tests

Adsorption tests in which the end point is hastened by testing at conditions more severe than those anticipated in services.

Accelerated service life

The elapsed time unit the end point is reached in an accelerated adsorption test.

Acid-extractable material

Substances dissolved by an acid under specified conditions.

Activated carbon

A family of carbonaceous substances manufactured by processes that develop adsorptive properties.

Activation

A generic term used to describe the capacity to adsorb in general; also, the adsorptive capacity of an adsorbent as measured by a standard test.

Adsorbate

Any substance that is or can be adsorbed.

Adsorbent

Any solid having the ability to concentrate significant quantities of other substances on its surface.

Adsorption

A process in which fluid molecules are concentrated on a surface by chemical or physical forces, or both.

Adsorption wave

See mass transfer zone

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Adsorption zone

See mass transfer zone

Ash

Residue after the combustion of a substance under specified conditions.

As is basis

As received

Breakpoint

The appearance in the effluent of a specified concentration of an adsorbate.

Breakthrough

The first appearance in the effluent of an adsorbate of interest under specified conditions.

Channeling

The great flow of fluid through passages of lower resistance which can occur in fixed beds or columns of particles due to nonuniform packing, irregular sizes and shapes of the particles, gas pockets, wall effects, and other causes.

Chemical adsorption

See chemisorption.

Chemisorption (chemical adsorption)

The binding of an adsorbate to the surface of a solid by forces whose energy levels approximate those of a chemical bond.

Coadsorption

The adsorption of two or more components on an adsorbent, each affecting the absorbability of the other.

Contact batch operation

An adsorption process in which an adsorbent is dispersed in a fluid to be treated and then separated when practical equilibrium is attained.

Continuous moving bed

An adsorption process characterized by flow of a fluid through a continuously moving bed of granular adsorbent with continuous withdrawal of spent adsorbent and continuous addition of reprocessed or virgin adsorbent.

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Countercurrent adsorption

An adsorption process in which the flow of fluid is in a direction opposite to the movement of the adsorbent.

Critical bed depth

The minimum depth of an adsorbent bed required to contain the mass transfer zone.

Crushing strength

The property of a particle to resist physical breakdown when contained and subject to a slowly increasing continuously applied force.

Degassing

Removal of gases.

Density, absolute or true

The mass under specified conditions of a unit volume of a solid sorbent excluding it pore volume and inter-particle voids.

Density, apparent (density, bulk)

The mass under specified conditions of a unit volume of a solid sorbent including its pore volume and inter-particle voids.

Density, block

See density, particle.

Density, bulk

See density, apparent.

Density, particle (density, block)

The mass under specified conditions of a unit volume of a solid sorbent including its pore volume but excluding inter-particle voids.

Desorption

The separation of an adsorbate as such from a sorbent.

Differential heat of adsorption

The heat evolved during the adsorption of an incremental quantity of adsorbate at a given level of adsorption.

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Dosage

The quantity of substance applied per unit weight or volume of the fluid being treated.

Dry basis

Exclusive of any moisture which may be present.

Dust

An imprecise term referring to particulates capable of temporary suspension in air or other gases; also, particles smaller than an arbitrarily selected size.

Dynamic adsorptive capacity

The quantity of a given component adsorbed per unit of adsorbent from a fluid, or fluid mixture moving through a fixed bed at the break-point for that component.

Effective size

The particle size, in millimeters, which corresponds to 10 percent finer on the cumulative particle size distribution curve.

Electrical conductivity of a particulate substance

The current flowing through a unit cross section for an imposed unit potential gradient under specified conditions of packing.

Electrophoresis

Migration of dispersed solid, liquid or gaseous material to one of two electrodes under the influence of an impressed direct-current voltage.

End point

The occurrence in the effluent of the maximum permissible concentration of an adsorbate of interest.

Equilibrium adsorptive capacity

The quantity of a given component adsorbed per unit of adsorbent from a fluid or fluid mixture at equilibrium temperature and concentration of pressure.

Expanded bed

A bed of granular particles through which a fluid flows upward at a rate sufficient to slightly elevate and separate the particles without changing their relative positions.

Filterability

The rate at which particles can be separated from a slurry by means of a permeable medium under specified conditions.

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Fines

Particles smaller than the smallest nominal specification particle size.

Fixed bed

A bed of granular particles through which a fluid flows without causing substantial movement of the bed.

Fluidized bed

A bed of granular particles in which the fluid flows upward at a rate sufficient to suspend the particles completely and randomly in the fluid phase.

Freundlich adsorption isotherm
A logarithmic plot of quantity of component adsorbed per unit of adsorbent versus concentration of that component at equilibrium and at constant temperature, which approximates the straight line postulated by the Freundlich adsorption equation. $X/M = kCn$

where: X = quantity adsorbed,
M = quantity of adsorbent
C = concentration
k and n = constants

Granular activated carbon

Activated carbon in particle sizes predominantly greater than 80 mesh.

Hardness

A generic term referring to the resistance of a particle to breakdown as measure by specific tests.

Heat of adsorption

The heat evolved during adsorpton.

Hydrolytic adsorption

The adsorption of a weakly ionized acid or base formed by the hydrolysis of some types of salts in aqueous solution.

Hysteresis loop

The divergence between the paths of the adsorption and desorption isotherms.

Ignition temperature (kindling point)

The lowest temperature at which combustion will occur spontaneously under specified conditions.

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Impact strength

The property of a particle to resist physical breakdown when subjected to a rapidly increasing applied force.

Integral heat of adsorption

The sum of the differential heats of adsorption from zero to a given level of adsorption.

Intermittent moving bed (pulse, slug)

An adsorption process characterized by upward flow of a fluid through a fixed bed of granular adsorbent with periodic withdrawal of spent adsorbent from the bottom of the bed and additions of reprocessed or virgin adsorbent to the top of the bed.

Irreversible adsorption

Adsorption in which the desorption isotherm is displaced toward higher equilibrium adsorption capacities from the adsorption isotherm.
Isobar - a plot of quantity adsorbed per unit of adsorbent against equilibrium temperature when concentration or pressure is held constant.

Isotere

A plot of equilibrium concentration of pressure against temperature when the quantity adsorbed per unit of adsorbent is held constant.

Isotherm

A plot of quantity adsorbed per unit of adsorbent against equilibrium concentration, or pressure, when temperature is held constant.

Langmuir isotherm

A plot of isothermal adsorption data which to a reasonable degree fit the Langmuir adsorption equation.

Macropore

Pores with widths exceeding 50 nanometers (500 angstrom units).

Mass transfer zone (adsorption wave) (adsorption zone)

The region in which the concentration of the adsorbate of interest in the fluid decreases from influent concentration to the lowest detectable concentration.

Mean particle diameter

The weighted average particle size, in millimeters, of a granular adsorbent computed by multiplying the percent retained in a size fraction by the respective mean sieve openings, summing these values and dividing by 100.

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Mesopore

Pores of widths between 2 and 50 nanometers (20 and 500 angstrom units).

Moisture content

The water content of a substance as measured under specified conditions.

Monomolecular layer

An adsorbed firm, one molecule thick.

Multimolecular layer

An adsorbed film more than one molecule thick.

Oven drying loss

The reduction in weight resulting when a substance is heated in an oven under specified conditions.
Physical adsorption (Van der Waals adsorption) - the binding of an adsorbate to the surface of a solid by forces whose energy levels approximate those of condensation.

Pore diameter

The diameter of a pore in a model in which the pores in a sorbent are assumed to be cylindrical in shape and which is calculated from data obtained by a specified procedure.

Pores

The complex network of channels in the interior of a particle of a sorbent.

Pore volume

Volume of the pores in a unit weight of a sorbent.

Pore volume distribution

The distribution of pore volume among pores of different size or diameter.

Powdered activated carbon

Activated carbon in particle sizes predominantly smaller than 80 mesh.

Preferential adsorption

Adsorption in which a certain component or certain components are adsorbed to a much greater extent than others.

Reactivation (revivification)

Oxidation processes for restoring the adsorptive properties of a spent sorbent.

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Regeneration

Distillation or elution-type processes for restoring the adsorptive properties of a spent sorbent.

Relative efficiency

The rating of the adsorptive capacity of an adsorbent based on a comparison of its performance with that of a reference adsorbent in a defined test.

Retentivity

The ability of an adsorbent to resist desorption of an adsorbate.

Reversible adsorption

Adsorption in which the desorption isotherm approximates the adsorption isotherm.

Revivification

See reactivation.

Service life (service time)

The elapsed time until the end point is reached in an adsorption process.

Sorption

A process in which fluid molecules are taken up by absorption and adsorption.

Split feed

A liquid-phase adsorption process in which a powdered adsorbent is added to the solution to be treated in two or more steps, with or without intermediate separation of the adsorbent.

Surface area (B.E.T.)

The total surface area of a solid calculated by the B.E.T. (Brunauer, Emmitt, Teller) equation, from nitrogen adsorption or desorption data obtained under specified conditions.

Surface area distribution

The distribution of surface area according to some parameter such as pores of different size or diameter.

Surface oxides

Oxygen containing compounds and complexes formed at the surface of an adsorbent.

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Synthetic test solution

A solution of two or more components prepared under specified conditions for use in evaluation of adsorbents.

Threshold concentration

The minimum concentration at which a substance can be detected by the taste or odor test method employed.

Uniformity coefficient

The ratio of the particle diameter corresponding to 60% finer on the cumulative particle size distribution curve to the particle diameter corresponding to 10% finer on the same distribution curve.

Van der Waals adsorption

See physical adsorption.

Water

Extractable material - substances dissolved from other substances by water under specified conditions.

Wettability

The rate at which particles can be made wet under specified conditions.