Cameron Carbon INCORPORATED

Activated Carbon & Related Technology

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Tel: +1 (410) 942-0240 • Fax: +1 (410) 942-0242
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GLOSSARY OF TERMS

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 service.

accelerated service life—the elapsed time until 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—any process whereby a substance is treated to develop adsorptive properties.

activity—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.**

adsorption zone—see **mass transfer zone.**

ash—residue after the combustion of a substance under specified conditions.

as is basis—as received.

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

channeling—the greater 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 adsorbability 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.

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 subjected to a slowly increasing continuously applied force.

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GLOSSARY OF TERMS

degassing—removal of gases.

density, absolute or true—the mass under specified conditions of a unit volume of a solid sorbent excluding its 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.

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 breakpoint for that component.

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, or 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.

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

$$X/M = kC^n$$

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 measured by specific tests.

heat of adsorption—the heat evolved during adsorption.

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 or 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.

Langmuir adsorption theory—the surface of an adsorbent has only uniform energy sites and adsorption is limited to a monomolecular layer.

macropore—in activated carbon, a pore having a diameter greater than 5000 Å.

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.

micropore—in activated carbon, a pore having a diameter less than 40 Å.

moisture content—the water content of a substance as measured under specified conditions.

monomolecular layer—an adsorbed film, 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.

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.

service time—see **service life.**

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.

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surface area (B.E.T.)—the surface area of a solid calculated by the B.E.T. (Brunauer, Emmett, 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.

synthetic test solution—a solution of two or more components prepared under specified conditions for use in evaluation of adsorbents.

threshold odor test—a method of evaluating the odor level in a fluid by dilution under specified conditions with an odor-free fluid.

transitional pore—in activated carbon, a pore having a diameter between 40 and 5000 Å.

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.