

GLOSSARY OF TERMS

Commonly Used in Adsorption



Abrasion Number

The abrasion number of granular carbon defines the resistance of the particles to degrade on handling. It is calculated by contacting a carbon sample with steel balls on a Ro-Tap machine and determining the percent ratio of the final mean particle diameter to the original mean particle diameter.

Activated Carbon

Activated carbon is a crude form of graphite, with a random or amorphous structure, which is highly porous over a broad range of pore sizes, from visible cracks and crevices to cracks and crevices of molecular dimensions.

Acid-Washed Activated Carbon

Carbon which has been contacted with an acid solution with the purpose of dissolving ash in the activated carbon.

Adsorbate

That which is adsorbed on the adsorbent.

Adsorbent

Any solid having the ability to concentrate significant quantities of other substances on its surface. Activated carbon is an adsorbent.

Adsorber

A vessel designed to hold granular carbon.

Adsorption

The phenomenon whereby molecules adhere to a surface with which they come in contact.

Adsorption Isotherms

A measurement of adsorption determined at a constant temperature by varying the amount of carbon used or the concentration of impurity in contact with the carbon.

Adsorption Pores

The finest pores in the carbon structure. Pores which have adsorption capabilities.

Apparent Density

The weight per unit volume of activated carbon.

Ash

The mineral oxide constituents of activated carbon. It is normally defined as a weight percent basis after a given amount of sample is oxidized.

Backwash

An operating method used to remove suspended solids from the carbon bed. Water is pumped into the bottom of the adsorber, flows upward through the carbon bed, and exits through the backwash outlet. The upward flow expands the bed and removes the suspended solids, carbon fines, and entrained air. The percent bed expansion and time required for backwashing is a function of the backwash rate and water temperature.

Bed Depth

The amount of carbon expressed in length units, which is parallel to the flow of the stream and through which the stream must pass.

Butane Number

The volume of butane adsorbed per unit weight of activated carbon after air saturated with butane is passed through a carbon bed at a given temperature and pressure.

Carbon Column

A column filled with granular activated carbon whose primary function is the preferential adsorption of a particular type or types of molecules.

Carbon Tetrachloride Activity

The maximum percentage increase in weight of a bed of activated carbon after air saturated with carbon tetrachloride is passed through it at a given temperature.

Chemi-Sorption

Adsorption where the forces holding the adsorbate to the adsorbent are chemical (valence) instead of physical (London's).

Color Bodies

Those complex molecules which impart color (usually undesirable) to a solution.

Countercurrent Efficiency

The unique advantage of a carbon column that permits partially spent activated carbon to adsorb impurities before the semi-processed stream comes in contact with fresh carbon. This allows the maximum capacity of the activated carbon to be utilized.

Critical Bed Depth

In a carbon column the critical bed depth is the depth of granular carbon which is partially spent. It lies between the fresh carbon and the spent carbon and is the zone where adsorption takes place. In a single column system, this is the amount of carbon that is not completely utilized. See MASS TRANSFER ZONE.

Cross Sectional Bed Area

The area of activated carbon through which the stream flow is perpendicular.

Deaeration

The process of removing air (gases) from a bed of carbon particles. In a volume of 1 m³ of activated carbon, there is approximately 40% of void space, 40% of pore volume, and 20% of carbon skeleton.

Desorption

The opposite of adsorption. A phenomenon where an adsorbed molecule leaves the surface of the adsorbent.

Eductor

A device with no moving parts used to force an activated carbon water slurry through pipes to the desired location.

Heat of Adsorption

The heat given off when molecules are adsorbed.

Hardness Number

The hardness number is the resistance of a granular carbon to the degradation action of steel balls in a Ro-Tap machine. It is calculated by using the weight of granular carbon retained on a particular sieve after the carbon has been in contact with steel balls.

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Iodine Number

The iodine number is the milligrams of iodine adsorbed by one gram of carbon at a filtrate concentration of 0.02N iodine.

Make Up Carbon

Fresh granular activated carbon which must be added to a column system after a regeneration cycle or when deemed necessary to bring the total amount of carbon to specification.

Macropore

See TRANSPORT PORES

Mass Transfer Zone

The adsorption gradient that exists in the carbon bed. It corresponds to the gradual transition of the carbon from "fresh" (or "virgin") to "spent" (or "exhausted"). Also referred to as the MTZ.

Mesh Size

The particle size of granular activated carbon as determined by the U.S. Sieve Series. Particle size distribution within a mesh series is listed in the specifications table on our product literature for each carbon.

Micropore

See ADSORPTION PORES

Molasses Number

The molasses number is calculated from the ratio of the optical densities of the filtrate of a molasses solution treated with a standard activated carbon and the activated carbon in question.

Methylene Blue Number

The methylene blue number is the milligrams of methylene blue adsorbed by one gram of carbon in equilibrium with a solution of methylene blue having a concentration of 1.0 mg per liter.

Moisture

The percent by weight of water adsorbed on activated carbon.

Moving Bed

A unique application with granular carbons in which a single carbon column offers the efficiency of several columns in series. This is accomplished by the removal of spent carbon from one end of the carbon bed and the addition of fresh carbon at the other end with little or no interruption in the process.

Particle Density

The weight per unit volume of granular activated carbon not including the voids between the particles and cracks larger than 0.1 mm. It is determined by the displacement of mercury.

Pore Volume

The volume of the internal void spaces in a granule, smaller than 0.1 mm and large enough to allow access to helium. It is measured as the difference in the volumetric displacement by granular activated carbon in mercury and in helium at standard conditions.

Pulse Bed

See MOVING BED

Real Density

The density of the skeleton of a carbon granule. This is determined by helium displacement.

Specific Heat

The quantity of heat required to raise the temperature of a unit weight of granular activated carbon through a particular interval of temperature divided by the corresponding quantity for water. For Calgon Carbon's granular activated carbon, this value is 0.25. It should be noted that the thermal conductivity of granular activated carbon is extremely low.

Surface Area

The surface area of granular activated carbon is empirically determined by the Brunauer, Emmett and Teller Method (BET Method), which uses the adsorption of nitrogen at liquid nitrogen temperature in the calculation. Surface area is usually expressed in square meters per gram of carbon. Our carbons range from 700 to 1,200 square meters per gram.

Transport Pores

Pores larger than the largest adsorption pores. They function as a diffusion path to transport adsorbates. Adsorption does not occur in these locations even at near saturated conditions.

Void

The percent by volume of the interstices to total bed volume.

Wave Front

The carbon loading gradient that exists in the critical bed depth. It corresponds to the gradual transition of the carbon from "fresh" (or "virgin") to "spent" (or "exhausted"). See MASS TRANSFER ZONE.



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