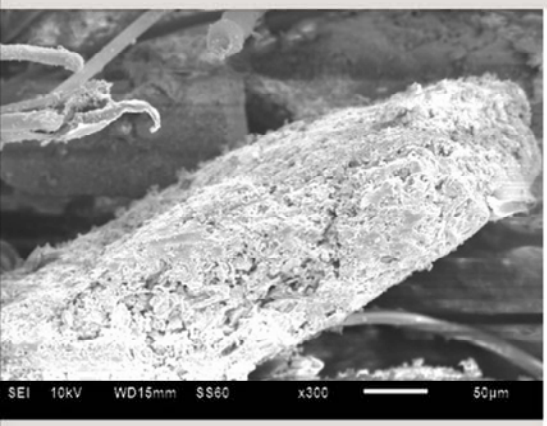
Aerolace®

ACTIVATED CARBON MEDIA



Activated Carbon Basics

Activated carbon is a porous material commonly used to remove chemical pollutant in air or liquid. Its high surface area to volume ratio, and its cost effectiveness makes it an ideal solution for chemical pollutant removal.

Activated carbon can be made from raw material such as coconut shell, coal, wood, bamboo, and palm nuts, of which coconut shell and coal are the most common. Factors to consider when choosing which type of carbon to use include:

- Cost
- Activation level
- Pore size range
- Hardness / dusting
- Functional group

Performance of activated carbon is directly related to its activation level, this is also known as the amount of specific area that is activated within the carbon granule. Performance of activated carbon can be measured in several different ways:

Performance Index	Measure Unit	Standard
BET	m^2/g	BET
Iodine Value	mg/g	ASTM D 4607
CTC activity	%w/w	ASTM D 3467
n-butane activity	%w/w	ASTM D 5742

A high performance activated carbon loaded fabric.

The Aerolace® technology utilizes an aerodynamic process to simultaneously integrate bi-component fiber and granular activated carbon to form a highly homogeneous filter media.

As granule and fiber pile up to form a sheet of filter media, air passages begin to form between adjacent granules. The unique Aerolace® process ensures that the air passages developed are small and even, this causes chemical molecules to travel through filter media with longer residence time, hence maximizes it opportunity to be adsorbed.

Advantages

a. Adhesive free, leaving the external surface area of activated carbon unobstructed

b. Reagent free, does not prematurely react with chemicals embedded within the media.

c. Adjustable micro structure. The patented manufacturing process is flexible for adjusting the structure of Aerolace® to best suit the converting and performance requirements of your filter.

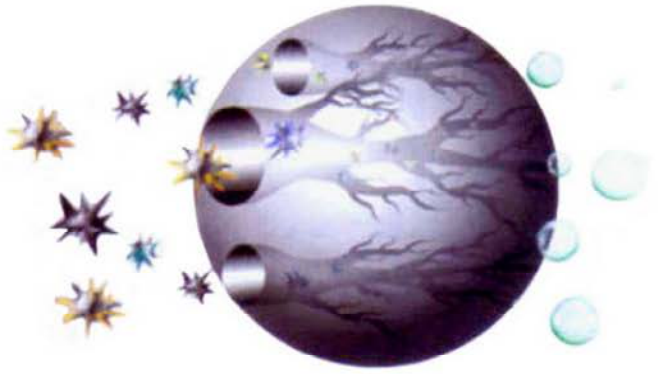
d. Carbon loading from $100g/m^2$ ~ $1,500g/m^2$ in one pass with no concern of layer separation.

e. Aerolace® is edge wrapped to ensure clean converting.

Mechanism

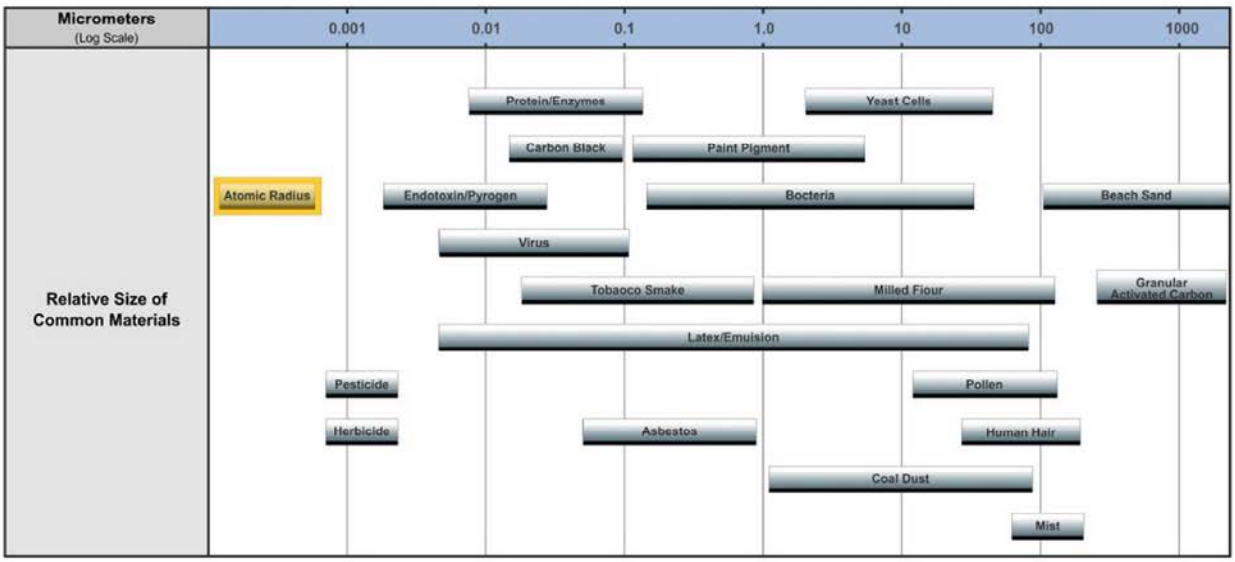
Most nuisance odors and chemical pollutions in the air exist in the form of molecules. The mechanism for capturing molecules in the air is by diffusion. Once diffused into the active surface of carbon granule, the molecule can be captured by either physical adsorption or chemical adsorption (chemisorption).

Physical adsorption is a reversible process. Pollutant is temporarily held within carbon's active surface by Van der Waal's force. When subjected heat, physically adsorbed pollutant will be desorbed and released back to the air. Activated carbon does not physically adsorb all gases equally well. In general, it is very effective for adsorbing organic compounds (VOC's) such as toluene, n-butane,…etc. For gases which can not be effectively adsorbed, several chemisorption solutions are available.



Chemisorption is an irreversible process, whereas activated carbon is first impregnated with a specific chemical targeting certain pollutant. When targeted pollutant is diffused into the carbon it will react with the impregnated chemical, hence turn the unstable pollutant into a stable substance. Commonly seen chemical reactions include:

1. **Acid / Base neutralization**
2. **Oxidization**
3. **Catalysis**
4. **Ion exchange**



Manufacturing

Aerolace® technology is flexible to work with a number of different materials. Common applications include activated carbon, ion exchange resin beads, activated alumina impregnated with potassium permanganate, and zeolite.

Aerolace® production requires particle size range from 10 mesh to 80 mesh. Particle loading can range from 100 g/m^2 to 1500 g/m^2. The loading is adviced in an aerodynamic process in one single pass. The result is a highly homogeneous structure, which will not separate into layers. Other manufacturing features include:

- Standard with edge sealing to allow for cleaner converting process.
- Media structure may be adjusted to accommodate permeability, pleatability, and other converting requirements.
- Possible to produce with blended materials
- May be laminated with other material, such as melt blown or triboelectric particle media.

Selection of adsorbent

1 Activated carbon (generic): the most common type of adsorbent for general purpose odor adsorption. Aerolace® utilizes high activity coconut carbon, which is highly effective on adsorbing organic gases such as Toluene, PGMEA, Benzene … etc.

2 Activated carbon (impregnated): Impregnation with activated carbon causes chemical reaction between the chemical impregnant and the target gas thus neutralize the harmful target gas. This method enables activated carbon to remove gases that are otherwise not easily adsorbed by generic carbon. Commonly seen impregnated compounds are acid and alkalinity for neutralizing alkaline and acid gases respectively.

3 Ion-exchange Resin: Available with both cation and anion exchanger, which are effective for removing alkaline and acid gases respectively.

4 Potassium permanganate impregnated aluminum oxide: Potassium permanganate is a strong oxidizer that can nullify a wide range of harmful gases by oxidization. Common applications for this product including the removal of formaldehyde, and organic acides.

5 Aerolace® process is flexible to impregnate any functional granule between 20 ~ 60 mesh, which can withstand curing temperature up to 150°C.

Pleating

Pleaters are available with post heating. Pleat height range from 8mm ~ 270mm.

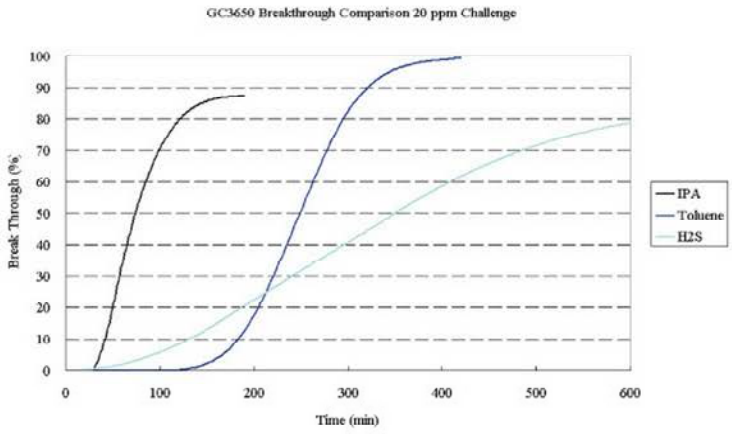
Testing

Two types of testing procedures are available in-house.

1. One pass break through test. this breakthrough testing apparatus is capable of evaluating the efficiency and service lift for flat media.
   Tests are conducted with 20~50 ppm of up stream concentration. The gases frequently tested in-house include :

- **Acetaldehyde**
- **Ammonia**
- **H_2S**
- **SO_2**
- **NO_2**
- **DMS**
- **Toluene**
- **N-butane**
- **CTC**

2. Closed circulation test : A one cubic meter test chamber is used to test gas removal rate for filters, or entire room air cleaner. Gases tested can be single gases as listed above, or mix gas such as cigarette smoke.



Application

H.V.A.C. Filter

In microelectronics industry, the benefit from the use of chemical filter has been closely scrutinized. The proper control of Airborn Molecular Contaminant (AMC) has been known to improve production yield thus increase profitability. In addition, with the increasing polluted ambient air, it is also necessary to employ chemical filter for make-up air, as well as re-circulation air.

The innovative controllable micro structure of Aerolace® media delivers high efficiency performance which makes it ideal for this type of application where AMC concentration in parts per billion (ppb) is to be removed.

Indoor Air Quality (IAQ) Filters

With the increasing awareness of indoor air quality (IAQ), room air cleaner filter, furnice filter, and commercial area air handler filters, have transformed from particulate filtration only, to a combination of particulate and chemical filtration. An area of importance in IAQ application is the removal of cancer causing cigarette smoke, paint fume, new house odor (formaldehyde), and other nuisance odors. Aerolace® media can be chemically impregnated to effectively remove most harmful gases in IAQ application.

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Automobile Cabin Filter

Studies have indicated automobile exhaust emissions have made air above a regularly trafficked highway hazardous to human health. Harmful fumes such as SO_2, H_2S, HO_2, N-butane, a other vaporous organic compounds, which are discharged from automobile exhaust system, will find their way into the cabin area through air conditioning system. Therefore it is essential to have an effective chemical filter media layer in a automobile cabin filter to remove these harmful fumes. Aerolace® cabin filter media utilizes a blend of impregnated carbon to effectively remove the above mentioned harmful substances from the ambient air.

Most automobile air conditioning systems are designed with comfort and low noise level as first priority. As a result, its blower units usually have very low static pressure rating. The controllable micro structure of Aerolace® media makes it ideal for this type of low pressure drop application.

Respirator Filter

Aerolace® activated carbon media is ideally suited for respirators and disposable facemasks, where removal of nuisance odor, paint fume, and other light industrial gases is required. To increase exterior surface area, smaller mesh size, and higher activity carbon is used. Aerolace® can be engineered to meet your most stringent application requirements.

Aerolace® media can also be chemically impregnated to remove gases not easily physically adsorbed.

Water Filter

Aerolace® media can be rolled to form a low resistance, high efficiency water filter. Compared to extruded carbon tubes, this low resistance construction makes it particularly suited for none-powered applications. Because carbon granule's active surface area are not obstructed by resin binder, the filtration efficiency is significantly increased.

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