Active Carbon Absorption of Chemicals

SLQ Wiki Fabrication Lab 2025/11/22 18:31

Active Carbon Absorption of Chemicals

The Atmos 500 uses a three stage process to remove airborne contaminants. The first stage filters large particles, the second and activated carbon bed, the third is a HEPA filter (small particles).

Of the three the activated carbon stage is the most important for removing smells and potentially toxic out-gasses caused by the laser cutting process, and is most critical to the operation of the fabrication lab.

While most organic compounds will adsorb on activated carbon to some degree, the adsorption process is most effective on higher molecular weight and high boiling point compounds. Compounds having a molecular weight over 50 and a boiling point greater than 50 degrees centigrade are good candidates for adsorption ¹⁾

These charts are adapted from More information about the Regeneration of Active Carbon - Lenntech

Chemicals with very high probability of being adsorbed by active carbon

<datatables>

| 2,4-D | Deisopropyltatrazine | Linuron |
|----------------------------|----------------------|------------------------|
| Alachlor | Desethylatrazine | Malathion |
| Aldrin | Demeton-O | MCPA |
| Anthracene | Di-n-butylphthalate | Mecoprop |
| Atrazine | 1,2-Dichlorobenzene | Metazachlor |
| Azinphos-ethyl | 1,3-Dichlorobenzene | 2-Methyl benzenamine |
| Bentazone | 1,4-Dichlorobenzene | Methyl naphthalene |
| Biphenil | 2,4-Dichlorocresol | 2-Methylbutane |
| 2,2-Bipyridine | 2,5-Dichlorophenol | Monuron |
| Bis(2-Ethylhexyl)Phthalate | 3,6-Dichlorophenol | Napthalene |
| Bromacil | 2,4-Dichlorophenoxy | Nitrobenzene |
| Bromodichloromethane | Dieldrin | m-Nitrophenol |
| p-Bromophenol | Diethylphthalate | o-Nitrophenol |
| Butylbenzene | 2,4-Dinitrocresol | p-Nitrophenol |
| Calcium Hypochloryte | 2,4-Dinitrotoluene | Ozone |
| Carbofuran | 2,6-Dinitrotoluene | Parathion |
| Chlorine | Diuron | Pentachlorophenol |
| Chlorine dioxide | Endosulfan | Propazine |
| Chlorobenzene | Endrin | Simazine |
| 4-Chloro-2-nitrotoluene | Ethylbenzene | Terbutryn |
| 2-Chlorophenol | Hezachlorobenzene | Tetrachloroethylene |
| Chlorotoluene | Hezachlorobutadiene | Triclopyr |
| Chrysene | Hexane | 1,3,5-Trimethylbenzene |

| m-Cresol | Isodrin | m-Xylene |
|-------------|-------------|-------------|
| Cyanazine | Isooctane | o-Xylene |
| Cyclohexane | Isoproturon | p-Xylene |
| DDT | Lindane | 2,4-Xylenol |

</datatables>

Chemicals with high probability of being adsorbed by active carbon

| Aniline | Dibromo-3-chloropropane | 1-Pentanol |
|--|---------------------------|---------------------------|
| Benzene | Dibromochloromethane | Phenol |
| Benzyl alcohol | 1,1-Dichloroethylene | Phenylalanine |
| Benzoic acid | cis-1,2- Dichloroethylene | o-Phthalic acid |
| Bis(2-chloroethyl) ether trans-1,2- Dichloroethylene Styrene | | |
| Bromodichloromethane | 1,2-Dichloropropane | 1,1,2,2-Tetrachloroethane |
| Bromoform | Ethylene | Toluene |
| Carbon tetrachloride | Hydroquinone | 1,1,1-Trichloroethane |
| 1-Chloropropane | Methyl Isobutyl Ketone | Trichloroethylene |
| Chlorotoluron | 4-Methylbenzenamine | Vinyl acetate |

Chemicals with moderate probability of being adsorbed by active carbon

For these chemicals active carbon is only effective in certain cases.

| Acetic acid | Dimethoate | Methionine |
|---------------------|---------------|-------------------------|
| Acrylamide | Ethyl acetate | Methyl-tert-butyl ether |
| Chloroethane | Ethyl ether | Methyl ethyl ketone |
| Chloroform | Freon 11 | Pyridine |
| 1,1-Dichloroethane | Freon 113 | 1,1,2-Trichloroethane |
| 1,2-Dichloroethane | Freon 12 | Vinyl chloride |
| 1,3-Dichloropropene | Glyphosate | |
| Dikegulac | lmazypur | |

Chemicals for which adsorption with active carbon is unlikely to be effective

However it may be viable in certain cases such as for low flow or concentrations.

| Acetone | Methylene chloride |
|----------------------|--------------------|
| Acetonitrile | 1-Propanol |
| Acrylonitrile | Propionitrile |
| Dimethylformaldehyde | Propylene |
| 1,4-Dioxane | Tetrahydrofuran |
| Isopropyl alcohol | Urea |
| Methyl chloride | |

Factors that influence the performance of active carbon in air

- Type of compound to be removed: In general compounds with a high molecular weight, lower vapor pressure/higher boiling point and high refractive index are better adsorbed.
- Concentration: The higher the concentration, the higher the carbon consumption.
- Temperature: The lower the temperature, the better the adsorption capacity.
- Pressure: The higher the pressure, the better the adsorption capacity.
- Humidity: The lower the humidity, the better the adsorption capacity.
- 1) source: Wastewater Engineering; Metcalf & Eddy; third edition; 1991; page 317

Read more: http://www.lenntech.com/library/adsorption/adsorption.htm#ixzz4880i9cJh

1)

www.carbtrol.com/voc.pdf|Shepard, 2001