

Field of application for activated carbon



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1. Catalytic chlorine elimination

If tap water should be used for aquaria it must be free of chlorine to prevent acid burns at fish gills. The chlorine elimination is a very fast process so the contact time between water and activated carbon may be very short – some seconds are enough. In practice use activated carbon about 15 cm or more in a column. The chlorine will be eliminated if water is flowing through the activated carbon bed. The destruction is a catalytic process so the carbon will have a unlimited life time. In practise the surface of the carbon will be pleated with substances and reduce the effect.



small and large
activated carbon
filters

So change the activated carbon regularly every 6...12 months. If other unwanted substances like nitrate, salts, hardness, rests of pesticides and medicine should be eliminated you need other water treatment methods as reverse osmosis or ion exchange resins. To eliminate organic impurities with activated carbon you need 100× longer contact times!!!

2. Ozone destruction in water and air



professional rest ozone
destructor

If you use ozone for enhancing skimmers in sea water aquaria or for destructing tannins in fresh water ponds you must destruct unused ozone after the filter technique. Large skimmers are producing high amounts of exhaust air with ozone. **Ozone is very dangerous and attacks mucous membranes!** In low concentrations you smell ozone, in high concentrations you will swoon and die.

You must change the activated carbon in rest ozone destructors every 6...12 month

because it will be disintegrated with the time.

3. Adsorption of organic substances

Because of the very high surface of activated carbon (400...2000 m²/g) a lot of organic substances are able to adsorb (attach). The process of adsorbing is in gases (air filter) very fast. So you need only a little bit carbon to clean air for e.g. air stones. With air filters you can get out nicotine (cigarette smoke) or organic dis-solvent as evaporations of fresh colours, cleaning chemicals, etc. In the air inlet of a skimmer a small activated carbon filter is able to protect the aquarium against contaminants. Change the carbon every 3...6 months.

For eliminating organic substances in water you need long contact times to adsorb harmful substances. The contact times should never drop below 30 minutes in flow through systems (e.g. tap water treatment). It means in effect that only 1 drop per second should flow through an activated carbon bed of 1 liter.

In circulation systems (e.g. aquarium) you can eliminate organic substances like heavy degradable (persistent) stuff, too. The contact time is in that case not important, because the water is flowing several times through the filter. On the contrary: if the water is flowing too slow through a filter ORP (redox) reducing processes that are not welcome will occur. The adsorption capacity of the activated carbon will decrease after some days. Remove the carbon and never use it again. Depending on the yellow colour (e.g. tannins) of the water use fresh activated carbon every 1...3 months – not more. Unfortunately activated carbon is adsorbing important substances, too: vitamins, amino acids and with co-adsorption trace elements. So these substances are not available for animals and plants (algae). To have a clue how often to change the carbon you can look at the yellow colour of the water. Take white sheet of paper and drown it half into the water. If the submerge paper is still white you do not need activated carbon. If it is a little bit yellow fill up the activated carbon filter with fresh material. But activated carbon cannot replace a regularly water change – neither in fresh water nor in sea water aquaristic. (RAMSCH 1992, SELNER & RAMSCH 2000a)

4. Biological filtration

If activated carbon is used in filters for a longer time useful bacteria will settle on the surface of the carbon. They are able to degrade organic substances that are adsorbed before. Because of the adsorption capacity of the carbon the bacterial are able to degrade the organics faster and bacterial living on conventional filter material. Change every 6 months 1/3 of the activated carbon bed (a three chamber filter is very helpful).

Activated carbon that is used for sea water aquaristic must have some conditions to get proper results:

- Fast degassing provides a fast action
- No influence of pH and ORP (redox)
- Extremely low phosphate concentration
- Low dust concentration to realize crystal clear water
- High adsorption capacity for a long life time and a large effect
- High inter-space volume to prevent clogging the filter. Pelleted carbon has more inter-space volume than granulated carbon. (Powdered activated carbon is normally not usable for aquaria.)

AquaCare provides high grade activated carbon with best properties to ensure a save and professional aquaristic.



Activated carbon is probably one factor for
colourful animals.
Photo: AquaCare