Understanding Shower Filter Media
Carbon vs. KDF-55

Rainshow'r started the industry of chlorine reduction for the shower, bath and garden nearly two decades ago. Our experience in this industry has given us a significant knowledge of dechlorinating media. Because of our experience in this field we are often asked questions about the difference between different dechlorinating media, particularly KDF-55 the media we use and Granular Activated Carbon (GAC). We hope this paper will answer your questions.

There are only two media that will dechlorinate water with any proven degree of effectiveness. These are KDF-55 and GAC. We believe that KDF-55 is the superior media for use in shower filters.

KDF-55 is atomized brass in granular mesh size from 0 mesh to 100 mesh. It is an alloy of 50% copper and 50% zinc. Rainshow'r pioneered the use of KDF-55 for use in shower filters in 1989. All of our competitors have copied our initial technology, and almost all shower, bath and garden filters today use KDF-55 technology. We would estimate in excess of 95% of all such filters use this brass formula.

How it works

KDF-55 works electro-chemically generating 1100 to 1200 millivolts of electricity when water flows through it. This process reverses the electro-chemical process by which chlorine was separated from sodium in a brine solution. This new electro chemical process is the only way to recombine two chlorine ions with some prevalent metal in the water to create a simple harmless chloride.

Let's explain what that means

Chlorine is a basic element of nature. It is #17 on the Periodic Table of Elements. Like oxygen, hydrogen and nitrogen among others, it is a gas. As a gas it is never found free in nature. It always combines with something else to form a chloride, such as sodium chloride (table salt), calcium chloride, potassium chloride etc.

To be used in water treatment chlorine gas must first be separated (freed) from its sodium chloride bond. This bond is broken through the use of an electro-chemical action. Commonly this is done by taking a saturated solution of water and common table salt (Sodium Chloride), placing it in a closed environment with positive and negative electrodes and turning on the

electrical power. That allows the separation of a yellow green gas known as free chorine and a soft metal (sodium).

Chlorine is toxic to living organisms such as cholera, typhoid and other pathogenic bacteria. The controlled use of liquefied chlorine gas makes it a valuable tool in killing pathogenic bacteria and sanitizing water supplies.

Once separated the chlorine gas is liquefied and can now be injected into water supplies to sanitize it. However, even after the chorine has done its job some residual chlorine remains in your drinking water and your shower or bath water. That's where we come to the rescue.

As we said above Rainshow'r reverses the electro-chemical process, by generating a new electro-chemical process. To repeat, this allows two ions of chlorine to recombine with some prevalent metal in the water to create a simple, soluble and harmless chloride which washes out of the shower.

Professionally recognized testing on shower filters has only been done on those using KDF-55. To date no filters using carbon or other media have been submitted for testing to independent, internationally recognized testing organizations such as NSF International of Ann Arbor, Michigan or the Water Quality Association of Lisle, Illinois.

Rainshow'r filters are tested and certified by NSF or the Water Quality Association.

Granular Activated Carbon (GAC) is universally used to remove or reduce certain organic contaminants, but also chlorine, which is not an organic substance. However, when used in shower devices GAC has three strikes against it.

1) Carbon works on an adsorptive technology not an electro-chemical one. It absorbs chlorine rather than converting it. As a result its effective life is much shorter than KDF. Its life is measured in *hundreds* of gallons as opposed to KDF–55 which is measured in *thousands* of gallons. Because it adsorbs contaminants there comes a point where it can hold no more. At that point it begins to "dump" or offload some of what it has adsorbed.

2) GAC is designed to work with cold water not hot water. Exposing it to hot water can prematurely offload captured contaminants and throw them into the water supply. Not a good idea.

3) GAC is very light in weight. To have any reasonable amount of removal capability you need a large amount of GAC, at least 8 oz. to 16 oz. It would take a filter body anywhere from five to ten times larger than a KDF shower filter to hold that amount of media.

Using GAC in a shower filter also raises bacterial concerns.
The major problem associated with carbon, in any form, is bacterial contamination. Wet activated carbon, richly infused with trapped organic matter provides an ideal breeding ground for bacteria. High bacterial levels occur when the carbon is fully saturated and then let to stand [e.g., overnight]. As the water temperature inside the carbon cartridge rises, bacteria breeding escalates. GAC cannot hold onto bacteria, so when water flow is reintroduced a contaminated sample can be output. Bacteria gets into the GAC filter in the first place because disinfection at the water treatment plant does not guarantee the destruction of all bacteria.

Both KDF and GAC need adequate contact time in order to do their work. Too high a flow rate for either media greatly reduces its ability to deal with chlorine. This is particularly true of GAC. A ten inch drinking water cartridge requires a flow rate of 1/2 gallon to 3/4 gallon per minute, not the typical 2 1/2 gallons per minute (or more) that a shower filter encounters with much less media if GAC is used. Additionally the drinking water cartridge might have 10 to 14 ounces of GAC as compared with 2 to 2 1/2 ounces in an average shower filter body.

On occasion we will hear that a health professional has told a filter user that the copper and brass content in the brass alloy is not recommended for that specific person. We are not skilled or knowledgeable enough to comment on this in any way. We would certainly suggest that such a person follow the directions of their advisor. However, we should add that we have never seen evidence of a negative reaction to copper and our understanding has always been that zinc is beneficial to the skin.

Can either media remove heavy metals? No!

Neither can remove heavy metals such as lead, cadmium, arsenic or mercury. GAC cannot do it because it is an organic media and heavy metals are inorganic. GAC can deal with organic contaminants and most volatile contaminants like chlorine, but not metals.

KDF has success in electro-plating out of solution some of the heavy metals, but only in much larger devices which typically use about seventy-two (72) pounds of KDF in flow compensating designs. But, it cannot do it at high flow rates (like showers) with only 12 to 17 ounces of KDF. If anyone makes the claim that they can, please ask them to prove it with independent third party data. It can't be done.

How about THM's?

Another question frequently asked is about another contaminant known as Trihalomethane or THM.

THM's can occur in water when Free Chlorine combines with high levels of organic matter. Since chlorine is very reactive and wants to combine with something it will combine with organic matter. This THM conversion is considered a potential health hazard if ingested. There is no evidence that it is a dermal or skin concern in a shower.

A high quality drinking water filter should be able to reduce THM's if the flow rate is correct (1/2 gallon to 3/4 gallon per minute) and if the GAC is of high quality and correctly packed in the cartridge. Neither GAC nor KDF-55 can deal with THM's in a shower filter. In the case of GAC the flow rate is much too high.

Should I be worried about chloramine?

Chloramine is a compound resulting from the simultaneous injection of Free Chlorine (CL2) and ammonia (NH3) into a water supply. As we have said chlorine is reactive and wants to combine with something. In the presence of ammonia it combines with that.

Ammonia has no pathogenic killing property, but is believed it to extend the disinfection time for chlorine. As a result the life of this artificially created compound is extended beyond that of Free Chlorine by itself. Not only is the life of chloramine (NH2CL) extended but it is relatively stable for the two or three days of its existence. That means it is hard to remove. That is true for both for showers and for drinking water devices.

So why use ammonia? Because the chlorine has now combined with the ammonia it is not capable of combining with organic matter. That in turn reduces its ability to create the potentially dangerous THM.

Because of this short-term tenacity of the chloramine it does not become a dermal or skin problem in a shower. Why? The purpose of the ammonia is to keep the chlorine from combining with organic matter. Since your whole body including your skin is organic a choramine cannot create the same toxic or hyper-oxidizing problem that Free Chlorine does.

We hope this discussion is useful to you. If you have any questions feel free to by e-mail us.