Zeolite as a Zinc filtration removal media

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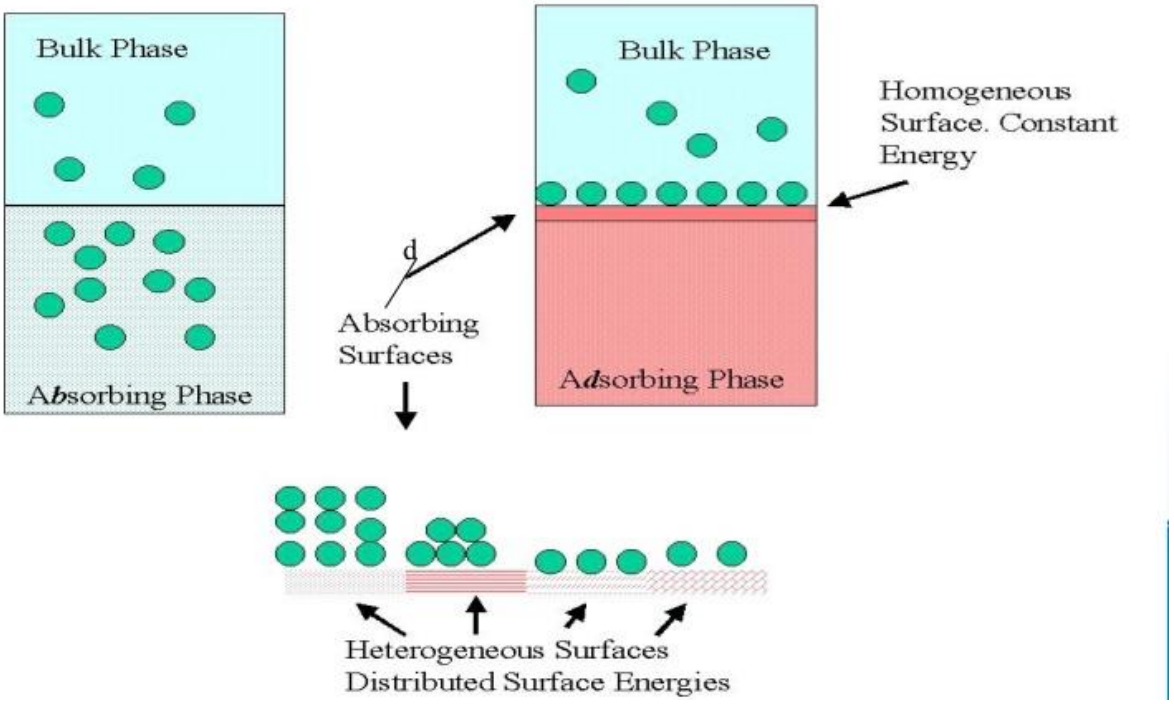
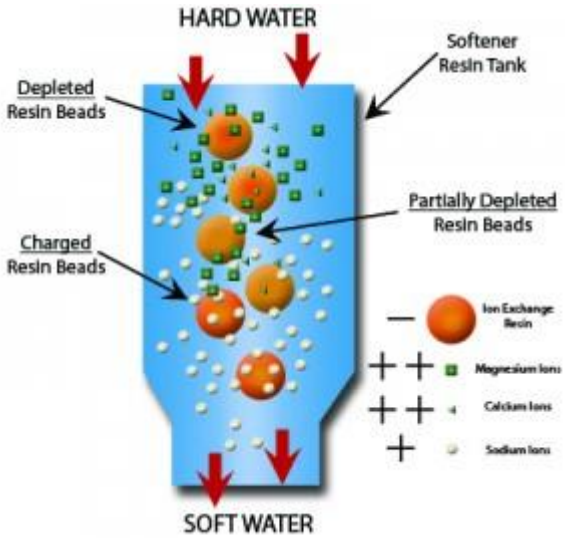
The levels of Zinc in stormwater runoff has been regulated and benchmarks have been set for the zinc levels allowed. Zinc can be produced from a wide range of areas including galvanized roofs and surfaces, motor oils, wear debris from tires, atmospheric deposition and fertilizers. There are a wide range of processes that are designed to remove Zinc from stormwater:

- Adsorption – Adsorption is the most common and simplest process and is the adhesion of ions or molecules to the surface of the absorbent, with this layer then being removed through maintenance or filter replacement.



- Chemical precipitation - The most common form of chemical precipitation to remove Zinc is through the use of insoluble hydroxide salt. The salt is formed by the adjustment of pH to roughly 10 level and this salt cause the Zinc to attached and create an insoluble substance that is considered a solid, allowing the simpler removal of the zinc. The system must be allowed to settle for the precipitation to occur making this process more difficult to occur.
- Ion exchange – this process can be used to remove zinc from stormwater. Ion exchange systems can be designed to treat zinc by forcing the water through cation and anion resin beds along with activated carbon to produce deionized water. This process essentially causes an exchange of ions and causing the replacement of these ions with similarly charged ions of which are not considered pollutants in storm water. Since Zinc ions are positively charged, a cation exchange process is used to exchange the positively charged ion with that of what is available on the surface of the resin or the media. This process can also be known as water softening.



Adsorption and ion exchange can be effectively employed for the treatment of metal-contaminated wastewater streams and are considered the two best chemical processes to ensure the removal of Zinc. The use of low-cost materials as sorbents increases the competitive advantage of the process. Natural and modified minerals have been extensively employed for the removal of nickel and zinc from water and wastewater. This work critically reviews existing knowledge and research on the uptake of nickel and zinc by natural and modified zeolite, bentonite and vermiculite. It focuses on the examination of different parameters affecting the process, system kinetics and equilibrium conditions. The process parameters under investigation are the initial metal concentration, ionic strength, solution pH, adsorbent type, grain size and concentration, temperature, agitation speed, presence of competing ions in the solution and type of adsorbate. The system's performance is evaluated with respect to the overall metal removal and the adsorption capacity. Furthermore, research works comparing the process kinetics with existing reaction kinetic and diffusion models are reviewed as well as works examining the performance of isotherm models against the experimental equilibrium data.

Now, finding a media that is suitable to remove Zinc as a specific heavy metal ion that is present in water is difficult. There are a various range of options available, but we at Protector believe that the use of Zeolite is the solution. Zeolite is a microporous, aluminosilicate mineral commonly used as an adsorbent and catalytic material. Zeolite occurs naturally but is also easily manufactured on an industrial scale and is hence one of the larger adsorption materials available. Zeolites have a porous structure that can accommodate a wide variety of cations such as sodium's, potassium's and magnesium's and hence are highly reactive to remove chemicals from waterways. It is also a powerful remover of:

- soluble metals
- nutrients
- organic material.

The best aspects of Zeolite for the removal of Zinc is its able to use both adsorption and ion exchange as chemical filtration techniques. The zeolite has a three-dimensional structure with pores. It consists of silicon, aluminium and oxygen ions. The silicon ions are neutrally-loaded in the crystal structure. The aluminium ions cause negative areas to exist. From this it is able to attract positively charged ions that are present in the water, such as zinc ions and is one of nature's few negatively charged minerals. In this way the Zeolite is able to act as an ion exchange to remove the Zinc ions that are present in the water through the exchange of ions and hence Zinc is able to be removed this way.

Similarly due to the porous nature of Zeolite, its alumina silicate composition and its structure adsorption also is able to occur at more efficient rate than other filter media. This allows the zeolite to form adhesions with the contaminants it is designed to remove, creating a film of contaminant layer that can then be removed through maintenance and washing. Zeolites can be obtained with pore sizes between 0.3 – 3 nm. This pore size is uniform for one type of zeolite. A zeolite will not adsorb molecules that are larger than the pore size. Molecules without an affinity will also not be adsorbed.

Hence in systems desiring the removal of specifically Zinc from stormwater, the filter media of Zeolite would be the best design and most cost effective solution. Zeolite has a large surface area so has a large removal rate of contaminants due to its honeycomb, porous nature, its naturally negatively charged and is more efficient as a removal taking out finer Zinc particles to >90% of 0.5 to 10u in range.

The EnviroProtector Media is a 80:20 mix of Zeolite and Activated carbon that performs beyond the 90 percentile range of heavy metal reduction, providing the ideal solution for Zinc removal. Protector Work with their counterparts to provide scheduled servicing and cost effective media change outs. Maintance of the EnviroProtector is simple and makes the perfect choice when coming to a long term investment.

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